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| **1** | **Integrating active transportation and health into transportation planning** |

PRE-CONFERENCE SATELLITE MEETING

P. McCue[1] ▪ [1]Premier's Council for Active Living NSW

Walking and cycling as transport modes offer positive health, environmental and economic outcomes however these interdisciplinary co-benefits are typically underestimated in conventional transport planning appraisals. This seminar will provide an overview of the co-benefits and hidden health costs of conventional transport planning decisions and describe current international practices regarding the quantification of the health benefits of active travel. The seminar will conclude with a panel discussion to explore the role of political leadership, inter and intra governmental partnerships and cross-sectoral collaboration to ensure the inclusion of health as a required component of transportation planning and investment decisions.

| **2** | **Sports Medicine Emergency Care Course** |

PRE-CONFERENCE WORKSHOP

S. Brun[1,2,3]* ▪ [1]Musculoskeletal and Sports Medicine, School of Medicine and Dentistry, James Cook University, Queensland, Australia
[2]Immediate Past President Sports Doctors Australia ▪ [3]SMA National Board Member

This fully comprehensive short course for the On-field Emergency Care of the seriously injured or ill athlete has been developed and accredited by Sports Doctors Australia. The course is also recognised and accredited by RACGP for category 1 QI & CPD points and rural GPs who are registered in the emergency component of the Rural Procedural Grants program can access this grant for attending this course.

Given the more serious nature of sporting events and the greater demand for high quality and competent medical care within sport, the SMECC has been designed for the medical practitioner who has the responsibility for the care of athletes or sporting teams of all levels. The course focuses on the on-field management of the seriously injured and seriously ill athlete and involves the essential theory and will focus on the practical application of immediate emergency medical management and is designed around systems and skills stations, whereby the doctor becomes confident at recognising and managing serious incidents without immediate hospital or medical backup.

1. Each station is sport based, and focuses specifically on the four major systems requiring acute medical intervention.
   The systems covered and some of the skills learnt will include: Airway problems;
   a. Recognising and managing the compromised airway or an airway which has the potential of becoming compromised.
   b. Practicing the basics of establishing and maintaining an airway, including: Cervical spine control, Oxygen Therapy and appropriate delivery systems, Bag and mask resuscitation, inserting an oral/nasal airway, ETT and LMA insertion and needle cricothyroidotomy.
2. Breathing problems;
   a. Recognising and managing the athlete suffering from both medical and surgical problems of this system including asthma and pneumothorax.
3. Circulatory problems;
   a. Recognising and managing the shock state and the various types of shock, fluid resuscitation and fracture management and stabilisation.
   b. Identification and management of life threatening arrhythmias will also be addressed.
4. Head and spinal injuries.
   a. Recognising and managing the head injured patient including how to assess these patients, such as determining ominous neurological signs and how to immobilise a patient with a spinal injury.

Each station will identify compromise and potential compromise of the system covered. It will also focus on essential intervention as well as certain contraindications to management.

The stations will also emphasise the basics of emergency management as well as the critical advanced medical skills required to stabilise the seriously injured athlete. The course will then tie together as a complete management model so as the participant will gain the confidence and skills required managing the seriously injured athlete.

Course pre reading: Medical Emergencies in the Sporting Context. In: Peter Brukner & Karim Khan, editors.
Clinical Sports Medicine. 4 ed. Sydney: The McGraw-Hill Companies; 2012. p. 972–95.

| **3** | **Sedentary behaviour** |

PRE-CONFERENCE SATELLITE MEETING

H. van der Ploeg[1]* ▪ [1]University of Sydney

This seminar will present the latest on sedentary behaviour and its detrimental effects on health. Invited experts in the field will give presentations on the epidemiology, surveillance and measurement of sedentary behaviour as well as on the progress being made with interventions specifically targeting sedentary behaviour. After the presentations, there will be room for discussion with the presenters in the form of an expert panel.
Program:
Chair and panel discussant: Neville Owen

0900 Welcome	1050 Sedentary behaviour in children – Stuart Biddle
0910 The epidemiology of sedentary behaviour – Wendy Brown	1110 Interventions to reduce sedentary behaviour – Genevieve Healy
0930 The physiology of sedentary behaviour – David Dunstan	1130 Panel discussion – where to next?
0950 The measurement of sedentary behaviour – Chuck Matthews	*1215 – 1330 Lunch*
1010 The prevalence of sedentary behaviour – Hidde van der Ploeg	
1030 Morning tea	

4   Stories about physical activity

PLENARY KEYNOTE

K. Powell[1]* ▪ [1]Public Health and Epidemiologic Consultant, Atlanta, Georgia, USA

During the past half century we have learned much about the diverse and important health benefits of regular physical activity. During the same time period physical activity has been disappearing from our lives. In a series of six short stories we will review these trends and their implications for the future, including the need for population-wide interventions and the need for careful thinking about physical activity.

5   Platelet rich plasma and other modern treatment options – witchcraft, placebo or fact?

SYMPOSIUM

Sports Doctors Australia

It seems that only 10 years ago, we had very little in the way of evidence-based medicine when it came to the treatment of chronic, degenerative tendinopathy. What an amazing 10 years it has been! We have seen eccentric strengthening, neovascular sclerotherapy, Autologous blood injections, Platelet rich plasma injections and an ever increasing list of other injectables being used. This doesn't even touch on Prolotherapy, Extracorporeal shock wave therapy, GTNpatches, etc. This symposium is a must for anyone involved in the management of sporting and non-sporting people with tendinopathy. Through a panel of experts in their fields, we will discuss the successes and failures of these 'modern' treatments through case based discussions, expert panel responses and audience participation. Interesting issues will be debated, including the evidence base for these popularly used treatments. This symposium should be of great value for primary care sports doctors, Specialist sports physicians, Orthopaedic surgeons, Physiotherapists and Podiatrists as well as anyone involved in the management of tendon problems. The panel for this symposium will include Dr James Linklater, Dr John Orchard, Associate Professor Jill Cook and Professor Karim Khan.

6   Explaining physical activity behaviour in adolescent girls from disadvantaged secondary schools: A test of social cognitive theory

The Coca-Cola Company Sponsored Session

D. Dewar[1]* ▪ D. Lubans[1] ▪ R. Plotnikoff[1] ▪ P. Morgan[1] ▪ A. Okely[2] ▪ S. Cositgan[1]
[1]Priority Research Centre in Physical Activity and Nutrition, School of Education, University of Newcastle
[2]Interdisciplinary Educational Research Institute and Faculty of Education, University of Wollongong

Introduction: Bandura's Social Cognitive Theory (SCT) is a prominent health behaviour theory that has been used to guide the development of physical activity interventions for adolescents, yet few studies have tested the utility of the structural pathways proposed in the model. This paper aimed to examine the utility of SCT to explain both objective and self-reported physical activity in a sample of adolescent girls.
Methods: The study sample included 296 adolescent girls (age 14.16±0.44) from 12 schools located in low-income communities in New South Wales, Australia. Participants completed validated SCT scales assessing physical activity related self-efficacy, intention, behavioural strategies, family support, situation, outcome expectations, and outcome expectancies. Participants also completed a validated 7-day self-report measure of physical activity and wore accelerometers for one week. Structural equation modeling was used to test the models in AMOS.
Results: The models explained 37% and 14% of the variance in intention and self-reported physical activity respectively, and 34% and 10% of the variance for intention and objectively measured physical activity respectively. Only the models which included objectively measured physical activity provided an adequate fit to the data. Self-efficacy was positively associated with time spent in physical activity for all models, however, the pathways from intention to behavior was statistically significant only in models that included self-reported physical activity.
Discussion: Although this study has demonstrated the utility of SCT constructs to explain physical activity in adolescents girls, not all of the proposed structural pathways were supported, particularly when objective physical activity data were included. Researchers are encouraged to explore the role that implementation intentions may play in explaining adolescent girls' physical activity behaviour.

7   Settings for physical activity – Developing a site-specific physical activity behavior model based on multi-level intervention studies

J. Troelsen[1]* ▪ C. Klinker[1] ▪ C. Pawlowski[1] ▪ L. Christiansen[1] ▪ M. Toftager[1] ▪ E. Olesen[1] ▪ B. Linke[2] ▪ J. Schipperijn[1]
[1]University of Southern Denmark ▪ [2]The Region of Southern Denmark

Introduction: Ecological models of health behavior have potential as theoretical framework to comprehend the multiple levels of factors influencing physical activity (PA). The potential is shown by the fact that there has been a dramatic increase in application of ecological models in research and practice. One proposed core principle is that an ecological model is most powerful if the model is behavior-specific. However, based on multi-level interventions in a Danish context, it must be considered that ecological models also should be site-specific to capture local and cultural aspects related to PA.
Methods: Three major multi-level intervention studies are carried out in Denmark with the objective to promote PA in 17 local communities. 1) The SPACE-study is a comprehensive intervention in 7 local school districts (N=1,348). 2) The When Cities Move Children-study is investigating the effects of urban refurbishment on adolescents' movement patterns (N=653) and 3) The Valuable Detours for PA-project is a intervention study in 9 municipalities measuring the effect of new established outdoor facilities for PA among 12–85 years old citizens (N=10,434). The SPACE and the WCMC study used objective measurements of PA combined with e-surveys, the VDPA study is based on self-reported e-survey data.

Results: Merging the data from the three intervention studies clarifies different local and cultural aspects with specific effect on PA behavior. This finding is closely related to the fact that the new outdoor PA facilities in the 17 local communities have different size, composition and are targeted to different subgroups with different organizational setup to support the use of the facilities. Despite the conceptual and contextual differences PA behavior is also affected by cultural and social values related to the specific site which not alone can be explained by intrapersonal, interpersonal or organizational factors.

Discussion: The Ecological Model of Four Domains of Active Living specifies that factors at multiple levels can influence PA behavior, and emphasizes the importance of behavior-specific models. On this theoretical basis the three mentioned multi-level interventions were planned and implemented. Based on the empirical studies we argue that site-specific factors have to be taken into consideration. A theoretical implication of this finding is to develop a site-specific physical activity behavior model adding a layered structure to the ecological model representing the determinants related to the specific site.

Support: This study was supported by TrygFonden, Realdania, and The Danish Foundation for Culture and Sports Facilities.

| 8 | Examining theory and evidence to inform the development of an active commuting intervention: An iConnect case study |

G. Baker[1]* ▪ **E. Bird**[2] ▪ **J. Powell**[2] ▪ **N. Mutrie**[1] ▪ [1]University of Strathclyde ▪ [2]University of the West of England

Introduction: Recent systematic reviews have provided mixed evidence of the efficacy of interventions designed to increase levels of walking and cycling. Guidance from the Medical Research Council proposes that intervention development should begin by examining existing evidence and theory to develop a theoretical understanding of how behavior change occurs. However, even those studies that are considered theoretically based consistently fail to report on how theory is used in intervention development and evaluation. The aim of this study was to examine the theoretical basis of previous walking and cycling interventions with a view to informing the development of an individual-level, self-help intervention designed to increase active commuting.

Methods: A systematic review of controlled, individual-level walking and/or cycling intervention studies involving adults was conducted. A reliable theoretical coding scheme was utilized to extract information under six categories including: mention of theory/model of behavior, targeting of relevant theoretical constructs and measurement of these constructs. Behavior change techniques were identified using a reliable 26-item taxonomy manual. Interventions were categorized as having (in terms of walking and/or cycling) a statistically significant effect; a statistically insignificant effect; and effects of uncertain statistical significance.

Results: Forty-six distinct interventions were examined. Overall, only 15 interventions mentioned a theory/model; interventions reporting a statistically significant effect on PA were more likely to have a theory/model than interventions of uncertain statistical significance (p<.05). Theoretical models specified were: the Transtheoretical Model (used in 7 studies); Social Cognitive Theory (6 studies); Client-centered approach (1 study); and Choice theory (1 study). Overall, the quality of reporting of what theoretical constructs were targeted and what behavioral change techniques were utilized was poor. Additionally, there were few examples of where theoretical constructs were explicitly linked to techniques in terms of how behavior change was expected to occur.

Discussion: These findings highlight the complexities associated with developing a new walking and cycling intervention based on theory and previous evidence. Consistent with previous health promotion reviews, interventions that mention theory appear more likely to produce a significant effects yet little can currently be drawn on how theory is applied and linked with behavior change techniques. To facilitate greater understanding of the role of theory, future studies should: provide a clear justification for the use of a specific theoretical model; and fully explain the interaction between theoretical constructs and behavior change techniques that is proposed to produce behavior change.

| 9 | Intervention design using self-determination theory to promote activity in depressed patients, older adults, and slimmers |

K. Fox[1]* ▪ [1]University of Bristol

Increasingly public health is asking for evidence-based interventions targeted at individuals and their physical activity that are framed in an established behavior change theory. Recently self-determination theory (SDT) has been widely appraised and adopted. Its focus is on understanding and facilitating individual needs satisfaction and it provide a pathway of progression from external to internal motives for lasting behavior change. This is particularly attractive in settings such as physical activity promotion where health professionals are seeking strategies through which they can provide support for long term physical activity gains. This paper provides an exposition of the design and delivery of an intervention to increase physical activity in primary care patients with mild or moderate depression. TREAD was a pragmatic randomized controlled trial delivered in the UK by a physical activity facilitators (PAFs) based in primary care through face-to-face sessions and phone calls over an 8 month period. Targets in the intervention were competence/confidence, autonomy, social support and relatedness. Principles of motivational interviewing were adopted as it encourages patients to take responsibility for their own decision-making and is compatible with SDT. The intervention was successful in increasing physical activity in this challenging population although it did not have a significant impact on depression. Evaluation interviews were conducted with 19 patients at four months and with 12 of them again at 12 months. Patients confirmed that the approach and strategies used by PAFs had helped them feel more able to take charge of their physical activity, feel more competent, supported and more confident in their daily lives and these findings were supported by questionnaire data in the trial. We have also used SDT to underpin intervention design with older adults. Project ACE (Active, Connected and Engaged Neighborhoods) recruits, trains and coordinates volunteering (Activators) active older adults to build a small local case load of sedentary participants who wish to become more active. The intervention uses strategies to build competence and relatedness in the Activators as well as the participants. Finally, the application of SDT in a partnership with a national slimming organization to increase physical activity in women attempting to lose weight is described. Of particular interest is how abstract theoretical concepts are translated into meaning and attractive materials for a population who have given little consideration to exercise. The presentation is aimed at providing pointers to researchers and practitioners wishing to develop physical activity services requiring interaction between professional and patients.

10   Reducing sedentary time in young adults at risk of diabetes: Project STAND

S. Biddle[1,3]* ▪ **M. Davies**[2,3] ▪ **K. Khunti**[2,3] ▪ **T. Gorely**[1,3] ▪ **C. Edwardson**[1,2,3] ▪ **E. Wilmot**[2,3] ▪ **M. Nimmo**[1,3] ▪ **T. Yates**[2,3]
[1]Loughborough University ▪ [2]University of Leicester ▪ [3]Leicester-Loughborough Lifestyle NIHR Biomedical Research Unit

Sitting time is becoming a major focus of public health research as evidence builds on the detrimental effects of too much sitting – 'sedentary behaviour'. Moreover, contemporary society provides many opportunities for sitting through work, leisure and door-to-door motorised travel. While some may think that sedentary behavior is simply the same as low levels of physical activity, this is not the case. Sedentary behavior involves a cluster of sitting behaviours that may be independent of levels of moderate-to-vigorous physical activity. Moreover, key sedentary behaviours may be encouraged, prompted and reinforced in different ways to physical activity. There are a number of interventions that have attempted to reduce sedentary time in young people but very few interventions with adults despite the growing evidence linking high levels of sitting with deleterious markers of metabolic health and risk of diabetes. Given the major public health concern over rising levels of type 2 diabetes, and the lack of research on younger adults, these factors point to the need to evaluate the efficacy of interventions with this age group. To this end, Project STAND (Sedentary Time ANd Diabetes) is a proof of concept randomised controlled trial to reduce sedentary behaviour in adults aged less than 40 years and at risk of diabetes. The DESMOND protocol was used whereby participants in the intervention arm were recruited to a 3-hour educational workshop focused on diabetes and sedentary behaviour change. The presentation will highlight a) the behavioural theories and frameworks underpinning the intervention, including Behavioural Choice Theory, Commonsense Model, Social Cognitive Theory, and Implementation Intentions, b) the training of workshop educators and c) the content and structure of the workshops. The presentation is aimed at providing practical guidance to health professionals and researchers wanting to develop sedentary behavior change strategies for adults.

11   Applying self-determination theory and motivational interviewing to weight control: Linking values, goals and behaviour

P. Teixeira[1]* ▪ [1]Technical University of Lisbon, Faculty Human Kinetics, CIPER

There are numerous challenges in understanding and promoting healthful weight control in an "obesogenic" environment. Understandably, many question whether obesity can be realistically fought "one person (or one patient) at a time" or if it is justifiable to spend finite resources exploring so-called individual-level determinants of the behaviours involved in weight control. Meanwhile, overweight and obese persons are living in the present environment and in too many cases suffering the frustrations of weight cycling, unsatisfactory diets, exercise abandonment in large scale, and ineffective pharmacological treatments. Individually (i.e. "one person at a time") thousands of children, adolescents, men and women of all ages consult daily with health professionals, seeking counsel and more effective solutions to deal with their excess weight. One promising approach to guide the process of changing health behaviours is using the techniques of Motivational Interviewing (MI) and adopting the principles of self-determination theory (SDT) in interventions. Both MI and SDT are person-centered and process-oriented, both emphasize that optimal behavior change must involve deep personal commitment, and both have at its center the concept of motivation, endorsing the development of more "internal" motives and goals. While SDT has been developed and evaluated continuously for over 30 years, SDT and/or MI have more recently been tested in interventions to change health behaviors (weight control, exercise, diet, glucose control, smoking, dental care) with encouraging results. This presentation will briefly describe SDT and MI and how it can guide weight control interventions explicitly focused on long-term autonomous change. Nest, results from the P.E.S.O. study, a 3-year RCT focused on exercise motivation and long-term weight control based on SDT will be presented and discussed. Finally, and drawing on an overview of empirical studies using SDT and/or MI for weight management, recommendations for clinical and preventive interventions will be provided.

12   Testing mediator variables in a physical activity intervention for women with Type 2 Diabetes

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Introduction: Type 2 diabetes mellitus (T2DM) is a serious chronic disease. Participation in regular physical activity (PA) has been linked to improved blood glucose control, cardiovascular disease risk and all-cause mortality among individuals with T2DM. Unfortunately, many individuals living with diabetes have difficulty initiating and maintaining a PA program, therefore identifying effective strategies to improve PA adherence in this group is an important public health objective. The aim of this study was to identify potential mediators of PA change in women with T2DM.
Method: This study is based on secondary data from the Alberta Diabetes and Physical Activity Trial, in which participants with T2DM (n=287) were randomly allocated to one of three intervention strategies. Women from the full intervention group (standard PA materials+stage-matched printed material, pedometer and telephone counselling, n=49) and the control group (standard PA materials, n=44) were included. PA outcomes were minutes of MET-weighted moderate and vigorous PA per week (self-report) and total steps over 3 days measured by pedometry (objective), and were recorded at baseline and 12-months. 13 social-cognitive constructs were measured and tested in a mediating variable framework. This involved an action theory test (A), a conceptual theory test (B) and a test of the significance of the product-of-coefficients (AB). Mediation analyses were conducted across the intervention timeframe (baseline to 12-months) for self-report and objective PA.
Results: Intention strategies for PA (AB=460, SE=270, 95% CI=100 to 1280), perceived behavioural control (PBC) (AB=360, SE=260, 95% CI=0 to 1110) and barrier self-efficacy (AB=480, SE=300, 95% CI=20 to 1340) were mediators of the intervention effect on objectively measured PA. The proportion of the intervention effect on objective PA mediated by intention was 23%, 18% by PBC and 24% by barrier self-efficacy.
PBC (AB=30.9, SE=24.0, 95% CI=0.9 to 109.7) and barrier self-efficacy (AB=83.5, SE=40.0, 95% CI=24.2 to 197.3) were mediators of the intervention effect on self-reported PA. The proportion of the intervention effect on self-reported PA mediated by PBC and by barrier self-efficacy was 69% and 68% respectively.
Discussion: The consistent mediating effects of PBC and barrier self-efficacy on change in self-reported and objectively measured PA supports their importance as mediators of PA behaviour change in women with T2DM. The evidence from this study is that future interventions should apply strategies to increase confidence and control to overcome PA barriers.

13   Patterns of sedentary time of 19 month old children meeting or exceeding screen time recommendations

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Introduction: Evidence of a number of adverse outcomes of television viewing in young children has led to recommendations to limit exposure. Australian screen time recommendations state that no children under two years should spend any time watching television or using electronic media. Investigating patterns of sedentary time in children who exceed screen time recommendations may identify specific times of the day that could be targeted to reduce such sedentary behaviors. The aim of this study was to examine the patterns of sedentary time of young children (19 months) meeting or exceeding screen time recommendations.

Methods: One hundred and forty-eight 19-month old children (52% boys) from the Melbourne Infant Feeding Activity and Nutrition Trial (InFANT) Program control group had their sedentary time objectively measured using hip-mounted ActiGraph GT1M accelerometers for seven consecutive days. Sedentary time was defined using a validated cut-point of ≤192 counts per minute. The average amount of time that children spent sedentary per hour (between 0600 and 2000) and per day was determined. The amount of time children spent watching television on an average day was proxy-reported by their parents, and the proportion of children meeting screen time recommendations was determined. Differences in sedentary time per hour and per day for children meeting and children exceeding recommended television viewing were assessed using one-way ANOVAs.

Results: Twenty-two percent of children met Australian screen time recommendations. On average, children were sedentary for 422 minutes a day. No significant differences were observed in daily sedentary time between those meeting (420 min) or exceeding (423 min) screen time recommendations. Children who exceeded the recommendations were significantly more sedentary between 0800–0900 than those who did not. There was a trend across the rest of the day for children who exceed screen time recommendations to accumulate more sedentary time per hour than children meeting screen time recommendations, though these differences were not significant.

Discussion: Few significant differences in hourly or daily sedentary time were observed between those meeting and exceeding screen time recommendations, suggesting that television viewing may not be a suitable proxy of sedentary behavior in this age group. Notably, less than a quarter of children met Australian screen time recommendations. Given the adverse health implications of television viewing in children under two, interventions are warranted to decrease screen time behaviors.

14   Correlates and implications of high screen time among high and low active Irish nine-year olds

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Background: Previous research has indicated that high sedentary behavior (SB) is associated with ill health including weight gain independent of physical activity (PA). The purpose of this analysis was to examine the combined influence of screen time (SB) and PA on risk of overweight/obesity (OW/Ob) in a large nationally representative cohort of 9 year old Irish school children, with particular reference to the risks of high screen time in the most active of these children. A further aim of the analysis was to examine the correlates of high screen time in this cohort.

Method: The Growing Up in Ireland study is a longitudinal study of nine year old children. Children and parents completed interview administered questionnaires and objective measures of height and weight were recorded. Children were dichotomized into high and low PA and SB groups and subsequently into one of four combined PA/SB categories using parental self report data. Chi squared statistics and forced entry logistic regression was used to identify factors associated with OW/Ob and with SB.

Results: There was evidence of a dose response relationship between screen time and OW/obesity while sedentary indicators such as having a TV in the bedroom and owning a mobile phone were also significantly related to OW/Ob regardless of activity status. Children in the high SB/low PA category had the highest odds (OR: 2.13) of OW/obesity compared to the referent group (low SB/high PA) and risk for high SB was greater than for low PA. Non membership of a sports club, mobile phone ownership, electronic media, leisure activities with parents and child obesity were related (p<.05) to increased sedentarism among high and low active children.

Discussion: Screen time of >3 hours per day and the availability of sedentary technology increased risk of OW/Ob in children who reported high and low levels of PA. ORs were stronger for sedentary indicators and OW/Ob than those for PA suggesting that sedentarism predicts BMI to a greater extent than PA during the ages of 6–10 years. 'Gadget' children who engage in sedentary rather than active leisure activities with their parents and with others are more likely to report high screen time and thus, have a greater risk of OW/Ob. This study reinforces findings in previous research that demonstrated SB to be a predictor of weight gain independent of PA and justifies efforts to reduce SB as part of existing public health initiatives.

15   Determinants of change in children's objectively measured sedentary time

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Introduction: Sedentary behaviours are highly prevalent amongst children and may be adversely associated with cardio-metabolic health, independently of participation in physical activity. To inform intervention development, this study examined parental and home-environmental determinants of 1-year change in children's objectively measured sedentary time after-school (Monday–Friday, 1500–2300) and at the weekend (Saturday–Sunday, 0600–2300).

Methods: Data are from the Sport, Physical Activity, and Eating Behaviour: Environmental Determinants in Young People (SPEEDY) study. Participants wore accelerometers at baseline and 1 year later. Longitudinal data for the after-school and weekend analyses were available for 854 (41.5% male, mean±SD age 10.2±0.3years) and 718 (41.8% male, age 10.2±0.3years) participants respectively. Information on 26 candidate predictors, including socio-economic status (SES), availability of electronic media and parental rules for active and sedentary behaviours was self-reported by children and/or their parents at baseline. Change in the proportion of registered time spent sedentary (<100cpm) was used as the outcome variable in multi-level linear regression models, adjusted for age, sex, body mass index and baseline sedentary time. Simple and multiple models were run and interactions with sex explored.

Results: In absolute terms, sedentary time increased over 1 year (after-school: 4.9±45.1 min/day; weekend 8.0±89.3 min/day). SES was positively associated with change in after-school (beta; 95% CI: 1.02; 0.37, 1.66) and weekend (1.42; 0.65, 2.18) sedentary time. Negative associations with change in after-school sedentary time were observed for having more siblings (-1.00; -1.69, -0.30), greater availability of electronic media (-0.81; -1.29, -0.33), and, for boys, more frequent family visits to the park (-1.89; -3.28, -0.51) and family participation in sport (-1.28; -2.54, -0.02). Maternal weekend screen-time (0.45; 0.08, 0.83) and, in girls, greater parental restriction on playing outside (0.91; 0.08, 1.74) were positively associated with change in weekend sedentary time. For participants with a (step-) father living at home, father's weekend screen-time was positively associated with change in weekend sedentary time (0.40; 0.01, 0.78). Father's physical activity was positively associated with change in boys' after-school sedentary time (1.34; 0.53, 2.15).

Discussion: Nine determinants of change in sedentary time were identified, some of which were time- or sex-specific. Higher SES children exhibited greater increases in sedentary time after-school and at weekends compared to children of low SES, highlighting a potential target population. Intervention strategies that aim to reduce parents' weekend screen-time, increase family participation in sports or recreation (for boys) and promote freedom to play outside (for girls) may contribute towards preventing the age-related increase in sedentary time.

16   Understanding the age-related increase in sedentary time in children and youth: An uphill battle

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Introduction: Perhaps the most consistent finding in physical activity epidemiology is that there exists an age-related decline in physical activity. However, on the opposite end of the energy expenditure continuum, relatively few studies have been conducted that aim to characterise age-related changes in sedentary time. Therefore, the purpose of this study was to characterise age-related changes in sedentary time with a view to exposing critical periods and to quantifying gender differences.

Methods: Pooled data from 20 studies between 1997 and 2009 comprising 36,731 children (3–18 years, 60.9% female) from the International Children's Accelerometry Database (ICAD). Time spent sedentary (<100 counts/min) was measured via accelerometry by way of re-analysed raw Actigraph data. Average Sedentary Minutes Per Day were calculated for each valid day (≥10 hours of wear time; non-wear was demarcated as ≥60 minutes of consecutive zeros allowing for 2 minutes of interruption). ANCOVA models were used to determine changes in sedentary time across age (in whole years) while controlling for accelerometer wear time and adjusting for multiple comparisons.

Results: Combined data from these cross-sectional and longitudinal studies indicate that children accumulate ~4.5 hours of sedentary time each day between the ages of 3–6 years, after which there is a reasonably steady increase through to 18 years. By age 10 sedentary time reaches the 6 hour level, and by age 17–18, sedentary time accounts for nearly 8 hours of ones waking day. The increase in sedentary time is steepest between the ages of 11–13 years. Interestingly, the sedentary time curves are tightly coupled up until age 9, after which time gender differences are clearly discernable with the boys less sedentary than the girls. The magnitude of the gender gap is ~34 minutes on average, but appears greatest at age 13–14 where it is nearly 1 hour.

Discussion: The increase in sedentary time with age is antithetical to public health aims; therefore, methods of countering this incline need to be developed, based upon an improved understanding of this phenomenon and its causes.

17   Sitting at Home: A review of the influence of the home physical environment on children's sedentary and activity behaviour

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Introduction: The home setting is an important sphere of influence on the sedentary behaviour and activity of children and younger adolescents. Whilst there has been much investigation of the neighbourhood level physical environment, the home physical environment has received less attention. The purpose of this study was to systematically review recent literature on the influence of the home physical environment on sedentary behaviour and physical activity of children and adolescents aged 8–14 years.

Methods: Medline, Web of Science, PsycINFO and SPORTDiscus databases were searched for English language peer reviewed journal articles published between 2005 and 2011. Thirty-six observational and 11 experimental studies met the inclusion criteria and were reviewed.

Results: Most studies were conducted in high income countries including USA (n=14), Australia (n=8), New Zealand (n=4), UK (n=4) and The Netherlands (n=4). Twenty-one observational studies measured physical activity outcomes, with over half including objective measures; while 20 measured sedentary behaviour outcomes, with three using objective measures. The most common measures of the home physical environment were electronic media devices (n=27), physical activity equipment (n=14) and yard/gardens (n=5). In more than half of studies, positive associations were found between household electronic media devices and sedentary behaviours. Amongst the experimental studies reviewed, the two main strategies to change the home physical environment were, introducing a TV limiting device or an active video game. Introducing a TV limiting device resulted in a decrease in TV viewing in intervention groups compared to control groups. Introducing an active video game showed an increase in active video game play and a decrease in sedentary video game play in intervention groups compared to no intervention control groups in RCT studies.
Discussion: In an era of changing home and technology environments, this review provides an up to date summary of the evidence related to the influence of the home physical environment on children's sedentary and activity behaviours. Health promotion interventions should promote strategies to limit electronic media equipment in the home including in children's bedrooms. TV limiting devices and active video games show some promise for decreasing sedentary screen time and increasing children's activity at home, although maintenance remains an issue. Exploration of potential influences in this domain outside of physical activity and media equipment, and further intervention studies, are recommended. The relationship of sedentary time with the physical, social and virtual elements of the home environment is of particular interest.

18   Principals' and teachers' perspectives about strategies to interrupt sitting time in primary school classrooms

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Introduction: It has been suggested that redesigning the school environment will encourage children to move more. However, little is known from the educators' perspective which strategies would be suitable to implement without interrupting learning and whether educators are prepared to accommodate changes in the classroom environment.
Methods: Twenty educators (10 principals and 10 teachers; age 44.9±13.1 years; mean±SD) from six primary schools from low, mid and high socio-economic areas were recruited from across the Auckland region, New Zealand. A semi-structured face-to-face interview was conducted with each participant. They responded to questions pertaining to classroom set up, standing desks, swiss balls, workstations, space, safety, style of teaching, movement, and rewards. The length of each interview was approximately 30 minutes. Audio recordings from interviews were transcribed verbatim and coded. Major themes were identified. Investigators agreed that data saturation was reached and did not lend itself to any more interviews.
Results: Six major themes were identified that were consistent across principals and teachers: 1) Style of teaching had changed, 2) activity/sitting within the classroom depended on the subject, 3) teachers were receptive to the notion of interrupting sitting time in the classroom, 4) health initiatives took away valuable time from learning, 5) concerns regarding standing desks and Swiss balls and 6) teachers and principals were willing to try new approaches.
Discussion: Findings indicate that the current style of teaching will accommodate a re-design of the classroom environment to increase movement in children. While concerns were expressed regarding the incorporation of standing desks and swiss balls, teachers and principals were willing to try new approaches.

19   A cross cultural comparison of sedentary behavior of African and European youth

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Introduction: The study of sedentary behavior in rural Africa children and adolescents is scarce, and the goal of this research was to compare the sedentary behavior and light physical activities (LPA) between a rural sample from Mozambican school aged youth (6 to 16 years old) with their European peers, namely from Portugal.
Methods: The sample comprises 146 Mozambican (MZ) and 195 Portuguese (PT) youth of both gender, and was split in 3 age groups (6–8yrs; 9–11yrs; 12–16yrs). The Actigraph model 7164 was used to obtain information marking daily PA and sedentary behaviours during 7 consecutive days in PT, and 1 only day in MZ (due to operational and logistic problems). Data files from all participants were screened by detecting blocks of consecutive zeros. Periods with 60 minutes of consecutive zeros were detected and flagged as times in which the monitor was not worn. Participants had to have at least 10 hours of data to count as a valid day. After complete screening, the raw activity "counts" were processed for time spent in the different PA intensities computations. Sedentary behavior was defined as PA with energy expenditure at the level of 1.0–1.5 metabolic equivalent units (METs). LPA was defined as PA with energy expenditure at the level of 1.6–2.9 METs. Puyau regression equation was used to determine the cut-points for PA intensities. Sedentary behavior was identified using a cut-point of <670 counts.min^{-1}, and LPA using a cut-point of >670 and <3003 counts.min^{-1}
Results: Mozambican rural school aged sample showed, at all age-groups and gender, an accentuated lower time spent in daily sedentary activities with a magnitude of difference around 1.5 higher for PT (Boys: MZ=370.9±78.2 vs PT=590.8±81.9; Girls: MZ=389.4±90.5 vs PT=596.2±86.2; F=493.7; p=0.0000). Using country, age and sex as factors, no statistically significant interactions were found. By turn, time spent in light activities were higher in MZ (Boys: MZ=197.5±47.9 vs PT=157.9±42.7; Girls: MZ=211.8±56.0 vs PT=158.9±47.7; F=66.7; p<0.001) in a magnitude of 1.3 higher for MZ. No significant interactions (p>0.05) were observed.
Conclusions: Based on simultaneous observational studies, a significant higher time spent in light activities and less in sedentary behavior from the MZ rural school aged population may to be related to survival households activities, long distance walks and outdoor games still present in African rural areas.

20   Associations between physical activity and sedentary behaviour in adolescents: A systematic review

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Introduction: Adolescents spend a large proportion of their discretionary time in sedentary pursuits, such as watching television, which may be adversely associated with psychosocial and physical health. One mechanism through which sedentary behaviour may effect health is through the displacement of more physically active behaviours. A clearer understanding of the association between physical activity and sedentary behaviours will contribute towards identifying the mechanisms underpinning associations with health outcomes and highlight potential targets for intervention. This systematic review examined the direction and magnitude of the association between sedentary behaviour and physical activity in adolescents.
Methods: Observational studies published in English up to and including October 2011 were located through computerised searches, reference lists of primary studies and reviews, and manual searches of personal archives. Included studies presented statistical associations between at least one measure of sedentary behaviour and one measure of physical activity among samples of adolescents aged 12–18 years.
Results: From 10,582 search hits, 513 full papers were retrieved, of which 74 studies met all inclusion criteria. Included studies were published between 1987 and 2011, 64 were cross-sectional and 10 had a prospective design. Sample sizes ranged from 88 to 47,201. Sedentary behaviour was mainly assessed using self-report questionnaires (n=71), with 3 utilising objective measures. Physical activity was mainly measured using self-report questionnaires (n=67) with 7 utilising objective measures. Most studies examined associations between television viewing (n=30) or screen time (n=30) and total physical activity levels (PAL) (n=46) or MVPA (n=15). Sedentary behaviour was negatively associated with physical activity in 45 studies, positively associated in 1 study and associations were unclear or non-significant in 28 studies. For studies that reported a negative association, effect sizes were mostly small (n=33), with 7 showing moderate, and 2 showing large associations. Three studies used objective measures for both sedentary behaviour and physical activity, with 2 showing moderate-large negative effects between total sedentary time and MVPA and 1 showing no association.
Conclusions: The evidence for an association between sedentary behaviour and physical activity in adolescents is somewhat mixed, though the majority of studies report a small/moderate negative association. Whether these associations reflect true displacement is unclear because of the nature of the studies (i.e. not time-stamped). Research to date has focussed predominantly upon associations between self-reported physical activity and screen-based sedentary behaviours; it remains unclear how other types of sedentary behaviour, for example the use of motorised transport or homework, are associated with PA.

21   An investigation of offensive agility techniques in elite netball

The Athlete's Foot Sponsored Session

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Introduction: Agility has been repeatedly acknowledged as an important component in the performance of sports where multiple changes of direction are present. Netball has been identified as a sport involving sharp changes of direction in order to 'break free' from an opponent; and therefore agility becomes an important aspect of netball game play, particularly when performing attacking movement. Various researchers have examined areas of agility and netball; however currently no research exists examining the offensive agility profiles of netball players. Understanding how players perform changes of direction and which manoeuvres are more successful may provide valuable information in maximizing attacking player performance. Therefore, the purpose of this study was to examine how elite netball players perform changes of direction with the objective of eluding a defender, and assess the success of the various techniques employed.
Methods: A descriptive design using computerised analysis software (Dartfish, Australia) was employed. Players from the Australian female netball team were observed during three international matches from 2009/2010. Offensive agility manoeuvres were assessed for the type of manoeuvre performed and the performance outcome. A one-way independent analysis of variance (ANOVA) was used to compare the overall mean frequency of manoeuvres performed by the various court positions. Post-hoc analyses were undertaken using Tukey's HSD test. Overall success rate and odds ratios were calculated in assessing the success of the various techniques.
Results: The side step was the most commonly used technique by all positions, followed by the shuffle and split step. ANOVA revealed the GK and GD performed significantly fewer manoeuvres than the WA (p<0.001), and the GA and GS (p=0.001). The WD performed significantly fewer manoeuvres than the WA (p=0.002). The rankings for success of manoeuvre from most to least successful were: stop and back, side step, split step, shuffle, and spin.
Discussion: A variety of offensive agility techniques are employed by elite netball players to evade defenders during one-on-one situations, and therefore the practice of these techniques should be included in training programs. The higher frequency of offensive agility manoeuvres performed by the mid and attacking court positions suggest this skill to be an important aspect of attacking play in netball. Certain manoeuvres may provide players with a better chance of evading a defender; however situational factors, such as the time available and defensive player features may influence the success of a manoeuvre.

22   Joints angle, moment and muscle activity during Nordic Walking compared to walking

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Introduction: NW (NW) is an established discipline among endurance sports, which is widely used in health and leisure time sports. NW is a suitable discipline to gain health benefits from regular participation in endurance sports (ACSM 1998). The present study investigated joint angles, moments and muscle activities during the NW and compared to the normal walking.
Methods: The healthy female college student (n=4, age; 22±1 years, height; 158.5±4.4 cm, weight; 52.8±5.1 kg, BMI 21.1±0.8 kg/m^2) participated in this study. The subjects performed NW trials and walking trials at the same cadence of 120bpm in randomized order. The walking path was covered

with artificial turf to imitate a surface with adequate friction for the walking poles. As recommended by the NW associations the subjects chose a pole length of 66–67% of body height. The measurements of kinematic data during the walking and NW were collected by using the VICON 460 motion analysis system (Oxford's Metrics, Oxford, UK) with six cameras at 120 Hz placed on the laboratory ceiling. VICON workstation software was used to calculate position of the subject's center of gravity (CG) and the relative angles between coordinate systems of each segment in the lower limb and the laboratory coordinate system. The electromyography (EMG) system (WEB-5000, Nihon Kohden, Japan) was used to collect muscle activities from the deltoid (DE), triceps brachii (TB), rectus abdominis (RA), erector spinae (ES), hamstrings (HA), vastus lateralis (VL), gastrocnemius (GA), and tibialis anterior (TA). The EMG signals were amplified and recorded by a computer via A/D converter.

Results: There were no significant differences in the angles and the moments of the hip, knee, and ankle joints between the NW trial and normal trial. The CG displacement was significantly greater during the NW trial than the walking trial (40.7 ± 5.6 vs 50.6 ± 7.4 mm, $p < 0.01$). Significant increase in the root mean square of EMG was found in the TB muscle during the NW trial than the walking trial, but not in the other muscles. However, no significant different was EMG in other muscle during NW and walking.

Discussion: The results showed that the CG displacement was significantly reduced during the NW compared to the walking. However significant differences were not found in the joint moments and the EMG activities between the NW and the walking. It was suggested that NW could contribute for decreasing burden on the lower extremities.

23   Can derived measures of jump performance predict lower limb soft tissue injury in Australian Football?

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Introduction: Lower limb soft tissue injury is an ever-present hazard in elite team sport. This type of injury accounted for almost half of all injuries in team sports played at the 2004 Olympic Games. The high incidence rate of non-contact lower limb soft tissue injury is also common in the sport of Australian Rules Football and accounted for almost 40% of overall injury incidence and 33% of total injury prevalence in the 2009 professional season. Attempts to identify athletes at risk of lower limb soft tissue injury have been trialed in many sports with assessment protocols such as balance and isokinetic power yielding varying degrees of success. Field-based tests of performance such as vertical jump ability have also been trialed with greater success. These studies used variables of jump height, contact time and peak force. Correlations between injury and measures of rate of force development, reactive strength index and leg stiffness during vertical jumping are however lacking in the literature. Thus this study aimed to investigate the predictive ability of derived measures of vertical jump performance for lower limb soft tissue injury in Australian Football.

Methods: Thirty elite Australian Rules Footballers performed three maximal countermovement jumps on a monthly basis throughout the professional season. Kinematic and kinetic data for each jump was collected from a linear position transducer and portable forceplate respectively. From this data, values of Reactive Strength Index (RSI), Modified Reactive Strength Index (RSImod), Rate of Force Development (RFD) and Leg Stiffness (LS) were calculated. Graded injury data for the season was also collected, coded and regressed against the four aforementioned jump measures using multinomial logistic regression analysis to assess the predictive power of the jump measures.

Results: Ten injuries involving the soft tissue of the lower limb were sustained by the participant cohort during the study period. Regression analysis revealed decreased RSI and RFD, combined with increased levels of LS significantly predicted subsequent injury ($p = 0.024$) in the participants.

Discussion: The results of this study show decreased RSI and RFD values, coupled with elevated LS values significantly predicted subsequent lower limb soft tissue injury in a cohort of elite Australian Rules Footballers. This simple jump testing protocol has the potential to easily and efficiently identify players at risk of sustaining a lower limb soft tissue injury. Further investigation is needed to judge the utility of similar measures in other field team sports.

24   Does wearing full-length women's tights that incorporate ASICS Inner Muscle technology improve sprint performance?

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Introduction: ASICS Inner Muscle technology is used in a range of clothing that is designed to help train specific muscles and improve movement and posture. The women's Inner Muscle tights are marketed as being able to lengthen strides and increase speed and ease of movement, although these claims have not been independently verified. This study aimed to determine whether wearing full-length Inner Muscle tights (experimental) increased stride length when running and, in turn, increased running speed, and/or increased ease of movement compared to when women wore standard full-length tights (control).

Methods: The time taken for 17 active women (aged 18–25 years) to sprint 20 m, while they wore the experimental and control tights (counterbalanced; blinded to tight type), was quantified three times using timing gates and high-speed video. Each participant's running speed (m/s) was then calculated and their stride length (m) directly measured from the video images. Participants also rated their ease of movement whilst wearing both tights (Visual Analogue Scale).

Results: Paired t-tests indicated there was no significant between-condition difference for the fastest 20 m running time or the stride length displayed by the participants. However, average running time ($p = 0.018$) and average running speed ($p = 0.017$) over 20 m were significantly faster when participants wore experimental tights (2.91 ± 0.15 s; 6.88 ± 0.36 m/s) compared to control tights (2.95 ± 0.15 s; 6.80 ± 0.36 m/s, respectively). Ease of movement was also rated significantly higher when wearing experimental (8.22 ± 0.98) compared to control (7.00 ± 1.96; $p = 0.022$) tights.

Discussion: Contrary to advertising claims, there was no significant difference in stride length and no functional improvement in running speed when participants wore the tights that incorporated Inner Muscle technology. Although statistically different, the between-condition difference in average running time (0.04 s) was too small to be functionally relevant, and was within the range of measurement error. These findings suggest that wearing the full-length Inner Muscle tights in a single bout of running did not improve sprint performance. In contrast, participants consistently rated ease of movement when wearing the experimental tights to be significantly higher than when wearing the control tights.

Conclusion: As the Inner Muscle technology garments are designed to enhance training performance, further research should investigate whether wearing the experimental tights on a regular basis for an extended period of training improves sprint performance.

25 Anthropometric characteristics of junior representative rugby league players in Australia

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Introduction: Rugby league is a popular physically demanding collision sport. Although physique is reported to discriminate player position, tackling ability and team selection, few studies have described physique characteristics of players at the professional or development level. This study aimed to describe anthropometric characteristics of Australian rugby league players competing at junior representative level.

Methods: Players from a state-wide under 18's competition were recruited. Socio-demographic information collected included age, ethnicity (Polynesian or non-Polynesian) and player position (forward or back). Anthropometric information was collected using the International Society for the Advancement of Kinanthropometry (ISAK) restricted profile and included: stretch stature; body mass; body mass index (BMI); 8 skinfold sites (triceps, subscapular, biceps, iliac crest, supraspinale, abdominal, front thigh, medial calf); 5 girths (arm relaxed, arm flexed and tensed, waist, gluteal, calf); 2 biepicondylar bone breadths (humerus, femur). In addition to sum of 8 skinfolds, percent body fat and somatotype was calculated using published equations relevant to the population. Data: mean±SD.

Results: 116 players aged 16.8±0.6y participated. Mean body mass, sum of 8 skinfolds and percent body fat were 87.0±11.6kg, 95.7±31.9mm and 14.0±4.6% respectively. Compared with backs, forwards had significantly higher BMI (28.4±3.0 vs 25.4±1.7kgm^{-2}; p<0.001), skinfolds (110.4±32.0 vs 79.8±23.00mm; p<0.001); girths (all p<0.001); bone breadths (humerus: 7.6±0.4 vs 7.5±0.4cm; p=0.033; femur: 10.8±0.6 vs 10.3±0.5cm; p<0.001); and percent body fat (16.1±4.8% vs 11.8±3.2%; p<0.001). Players of Polynesian descent exhibited significantly higher stature (181.0±5.7 vs 178.7±6.3cm; p=0.047); body mass (90.6±11.7 vs 84.7±11.1kg; p=0.008); BMI (27.6±3.1 vs 26.5±2.7kgm^{-2}; p=0.039); girths (arm and calf; all p<0.05); and bone breadths (humerus: 7.8±0.4 vs 7.5±0.4; p<0.001; femur: 10.9±0.5 vs 10.3±0.6; p<0.001) than non-Polynesians. Assessment of somatotype against player position and ethnicity revealed significantly higher endomorphy (3.6±1.0 vs 2.6±0.7; p<0.001), mesomorphy (7.5±1.3 vs 6.5±0.8; p<0.001) and lower ectomorphy (1.0±0.9 vs 1.7±0.7; p<0.001) in forwards compared with backs. Mesomorphy (7.6±1.2 vs 6.7±1.1; p<0.001) was also significantly higher in the Polynesian players.

Discussion: Junior representative rugby league forwards had significantly greater body mass, muscularity, adiposity and larger bone size compared to backs. These anthropometric characteristics are reported as desirable for performance in forwards and are likely also protective of the higher impact nature of this position. Polynesian players were significantly taller, heavier and more muscular with larger bone size than those from other ethnic backgrounds. This may bias toward selection of Polynesians in junior rugby league, particularly for forward positions.

26 Required task repetitions for kinematic variable stability in overarm throwing

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Introduction: Selection of the number of task repetitions a participant performs (trial size) is an important consideration when designing human movement research but one that is often overlooked or poorly reported. Trial size, like sample size, has implications for statistical power as well data reliability. Another consideration when determining trial size is variable stability, i.e. after how many task repetitions does the within individual mean of dependent variables become stable and therefore representative. Criteria for variable stability among common human movement tasks have not been extensively reported. Some information exists, predominantly for lower limb kinetic measures, yet, little data regarding kinematics, particularly of the upper limbs, have been presented.

Methods: Nine male and four female participants (N=13) consented to inclusion in this study. Each participant performed 30 repetitions of an overarm accuracy throwing task. The number of throws required for variable stability was determined using a sequential averaging technique. This technique was employed on the first 10, 20, 30 and middle 20 throws of each participant. Nine kinematic variables (shoulder, elbow, forearm and wrist angles) of the throwing arm at the point of release as well as ball release height, velocity and angle were analysed.

Results: For the first 10, 20, 30 and middle 20 throws, *an* average (95% CI) of *7*(*1*), 11(2), 15(3) and 11(2) throws were required for kinematic variables to be considered stable. Similarly ball release variable stability was achieved in 6(1), 12(2), 17(3) and 11(3) throws. Abduction-adduction and horizontal abduction-adduction angles consistently required the most repetitions for variable stability across participants while forearm pronation-supination required the least. Ball release angle required the fewest repetitions for stability amongst the release variables.

Discussion: Results of sequential analysis of the first 20 and first 30 throws suggest that trial sizes of 14–18 should yield kinematic and ball release variable stability for overarm accuracy throwing tasks. The fewer repetitions required for stability when sampling the middle 20 throws indicates there may be some learning and/or fatigue effects present among values determined from 30 throws. Performing sequential analysis on a sample of 10 throws appears to underestimate the number of repetitions required for variable stability. While these results are specific to this task, the results and methodology may have implications for other movements and research areas.

27 Reliability and validity of two-dimensional motion analysis during a stop-jump movement.

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Introduction: In order to develop a simple, valid and reliable kinematic movement screening tool, methods of assessment and measurement must be validated according to a criterion measure. Three-dimensional motion analysis is currently considered the criterion for lower limb motion analysis, although the setup is costly and impractical for coaches and/or clinicians to implement as part of an athlete movement screening process. Therefore, the aim of this study was to examine the reliability and validity of two-dimensional kinematic analysis of the lower limb and trunk segments for movement screening during stop-jump movement, as this may provide a more practical alternative for coaches and/or clinicians.

Methods: Twenty-two junior pre-elite male basketball athletes performed five successful stop-jump movements, during which three- and two-dimensional lower limb and trunk motion was simultaneously recorded. Validity of two-dimensional data analysis was determined by comparing

the two systems by linear regression to calculate the standard error of the estimate (SEE). Intra-rater reliability of two-dimensional kinematic data analysis was assessed by analysing six participants' right leg, on three separate occasions using consecutive trial pairs of the two-dimensional kinematic data (Analysis Session 1 and 2; Analysis Session 2 and 3). Intra-rater reliability was determined by typical error of measurement (TEM) and intra-class correlation coefficient (ICC). SEE and TEM are both expressed by coefficient of variation.

Results: The linear regression showed that between three- and two-dimensional data there is a low SEE (1.6–5.3%). Excellent test-retest reliability was determined in the pilot data by high ICC (0.965–0.996) and low TEM (0.8–2.10%).

Discussion: The results of this study suggest that a stop-jump movement captured via two-dimensional data collection can be reliably used to estimate three-dimensional data values, as indicated by the low SEE of the linear regression. This suggests that coaches and/or clinicians can potentially use a two-dimensional motion analysis as a reliable method of movement screening. The intra-rater *reliability* of performing the two-dimensional *analysis* during a stop-jump task indicates that there is excellent reliability for the lower limb and trunk segments. Therefore, based on the results of this study, it is suggested that two-dimensional motion analysis is a reliable and valid alternative for coaches and clinicians relative to the costly, criterion three-dimensional motion analysis, to predict three-dimensional data values.

28   Ankles back in randomized controlled trial (ABrCt): Braces versus neuromuscular exercises for the secondary prevention of ankle sprains

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Introduction Ankle sprains are the most common sports and physical activity (PA) related injury. There is extensive evidence that there is a twofold increased risk for injury recurrence for at least one year post injury. Recurrences result in about 50% of all cases in chronic complaints requiring prolonged medical care. Therefore, ankle sprain recurrence prevention is essential. Evidence shows that despite different working pathways, braces and neuromuscular training (NMT) are equally effective in reducing ankle sprain recurrence risk. We aimed to evaluate the preventive effectiveness of the combined use of braces and neuromuscular training (NMT) against the individual use of either braces or NMT alone.

Methods: This study was designed as a three-way randomized controlled trial with one year follow-up. Adult active sports participants who had sustained a lateral ankle sprain within the preceding two months were eligible for inclusion. After participants finished ankle sprain treatment by means of usual care, they were randomized to one of three study groups. Participants in group 1 received an eight week NMT program; participants in group 2 received a sports brace to be worn during all sports activities for the duration of one year; and participants in group 3 received a combination of the NMT program and a sports brace to be worn during all sports activities for the duration of eight weeks. The primary outcome measure was injury rate of ankle sprain recurrences, which was registered prospectively through monthly follow-ups.

Results: 384 athletes with an ankle sprain were included and randomly assigned to the three intervention groups. Injury rate of ankle sprain recurrences was 29% for the NMT group, 18% for the brace group and 20% for the combination group. The OR for having a recurrent injury was 1,96 (95% BI 0,85–3,22) for the NMT group compared to the brace group and 1,64 (95% BI 0,67–2,32) for the NMT group compared to the combination group.

Discussion: The evidence on NMT indicating this to be a cost effective preventive measure surpasses the evidence for preventive bracing. However, current findings indicate braces to be at least equally effective, and potentially superior to NMT. The accumulating evidence on the effectiveness of bracing supports the use of bracing as a (cost) effective secondary preventive measure for ankle sprains. Compliance to the different interventions was good yet not optimal. Therefore we advise future research to focus on the implementation of the effective preventive measures for ankle sprains.

29   IL-15 expression in skeletal muscle by resistance exercise training in type 2 diabetic rats

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Introduction: Interleukin-15 (IL-15) is reported as a myokine that potentially regulates body composition and glucose metabolism. We investigated the effect of 8 weeks of resistance exercise training on endogenous IL-15 expression in skeletal muscle and glucose tolerance with concomitant changes of body composition in type 2 diabetic rats.

Methods: 6 week-old Male ZDF (Zucker diabetic fatty) and ZLC (ZDF Lean Control) rats were randomly divided into 4 groups: sedentary ZDF (Con-ZDF), exercised ZDF (Ex-ZDF), sedentary ZLC (Con-ZLC), and exercised ZLC (Ex-ZLC). Ex-ZDF and Ex-ZLC rats were trained (once every 3 days for 8 weeks) to climb a 1.1-m vertical (80° incline) ladder with weights secured to their tail for progressive workload resistance exercise (the training was started at 50% or 70% of maximal weight of the last trial). Body weight, grip strength and intraperitoneal glucose tolerance test (IPGTT) were evaluated at every week. Body composition was analyzed by PET-CT (Positron Emission Tomography – Computed Tomography) and expression of IL-15 was measured using ELISA in extracted soleus muscle and tibialis anterior muscle.

Results: After 8 weeks of resistance training, substantial reduction of the body weight was observed in Ex-ZDF compared to Con-ZDF. Grip strength was also significantly increased in Ex-ZDF compared to Con-ZDF after 8 weeks of regular strength exercise indicating the efficacy of resistance training. Glucose tolerance (IPGTT) was significantly improved in Ex-ZDF ($p<0.05$) compared to Con-ZDF showing more delayed drop in blood glucose level between 90 min and 120 min. Concurrently, the expression of IL-15 was significantly increased ($p<0.01$) after training especially in soleus muscle of Ex-ZDF compared to Con-ZDF and also there was a tendency of increase in IL-15 expression in tibialis anterior muscle in Ex-ZDF as well. Accordingly, PET-CT scan showed that muscle quality tended to be higher in Ex-ZDF than Con-ZDF while no significant difference between Con-ZLC and Ex-ZLC.

Discussion: 8 weeks of progressive resistance exercise significantly improved glucose tolerance with the concomitant increase of IL-15 expression in hind-limb muscles suggesting that increased level of IL-15 in skeletal muscle by resistance exercise might be a potential mediator in glucose regulation of type 2 diabetes. Further study is needed to elucidate the mechanisms by which how increased IL-15 expression in skeletal muscle by resistance exercise exerts a favorable influence on impaired glucose metabolism in type 2 diabetes mellitus.

30 | Comparison between RPE- and accelerometer-based training loads during semi-professional basketball training

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Introduction: To date, internal measures have largely been used to quantify training load (TL) in basketball players. Specifically, internal TLs calculated using player ratings of perceived exertion (RPE) have been reported to strongly relate with those using heart rate (HR) responses. However, the relationship between RPE- and HR-based TLs has been shown to vary with different training types in other team sports. Further, various limitations have been reported when using HR to evaluate high-intensity intermittent work. As such, quantification of RPE-based TLs relative to external measures across different training types warrants investigation in basketball players. Thus, the purpose of this study was to explore the relationship between TL calculations derived from RPE and accelerometer measures across different types of basketball training.

Methods: Eight state-level Australian male basketball players (mean±SEM, age: 27.3±2.6 yr; stature: 189.4±2.3 cm; body mass: 94.8±3.5 kg) were monitored during basketball-specific off-court interval training and on-court conditioning sessions across the preparatory phase of the annual plan. Approximately 30 min following each session, players reported their perceived intensity (Borg CR-10 scale) of the overall session to calculate session-RPE TL (RPE x duration (min)). Additionally, triaxial accelerometers were secured to players on the posterior surface of the torso at the sternal level via an elastic strap, and sampled at 100 Hz across the entire training session. Accelerometer-based TL was determined using previously formulated vector magnitude calculations accumulated over the length of the session. Mean session TLs were calculated using both RPE- and accelerometer-based calculations for each training type. Pearson correlation analysis was conducted to determine the relationship between methodologies.

Results: Moderate to strong correlations were observed between RPE- and accelerometer-based TLs (in arbitrary units) during off-court (n=25; RPE: 262±9; accelerometer: 4772±39; r=0.71, p<0.001) and on-court training sessions (n=14; RPE: 365±7; accelerometer: 5157±30; r=0.57, p<0.05).

Discussion: The present data supports the use of RPE-based TLs in comparison with accelerometer-based methods in basketball players. Stronger correlations were observed between methods during off-court sessions, possibly due to a dissociative increase in RPE during on-court drills from greater static exertion, upper-body activity, and directional changes. The monitoring of TLs using player RPE alone or in conjunction with accelerometers might allow coaching and training staff to implement more effective training plans to optimise physiological adaptation and avoid overtraining in basketball players.

31 | Determinants of repeated sprint ability and the effects of maturation status in elite-youth soccer players: preliminary data

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Introduction: Repeated sprint-ability (RSA) is a construct that is considered an important attribute for team-sports players. The physical determinants of RSA remain contested, and its performance has been associated with both sprint performance and endurance capacity. Previous research has observed improvements in RSA performance with increasing chronological age in elite-youth soccer players. However, the role of maturation in the development of RSA has received limited attention. Given the evolving nature of physical capacities and physiological function with maturation, the determinants of RSA may also change, and the interpretation of RSA data might have implications for current talent identification practices in team sports.

Methods: 298 soccer players (U9–U18) from the youth development programs of 13 English professional soccer squads undertook a standardised battery of physical tests, together with anthropometrical measures to determine their stage of somatic maturation. Players' endurance (Multi-stage fitness Test [MSFT]), sprint (20m), and RSA (10 x 20m) performances were examined at the start of the 2011/12 season. Players estimated age at peak height velocity (APHV) was used to categorise maturation status into 5 groups: 1) -3.5 to -2.5 years pre-APHV (n=67); 2) -2.0 to -1.0 years pre-APHV (n=59); 3) -0.5 to +0.5 years circa-APHV (n=46); 4) +1.0 to +2.0 years post-APHV (n=65); and 5) +2.5 to +3.5 years post-APHV (n=61).

Results: One-way ANOVA with Tukey *post hoc* demonstrated significant increases in RSA with advancing somatic maturity status (1: 37.3±2.1 > 2: 35.0±2.0 > 3: 32.9±1.9 > 4: 31.3±1.9=5: 31.0±1.2 s), however there were no differences observed between the two post-APHV groups. Pearsons correlation co-efficient showed very-large associations between RSA and Sprint performance in all maturation stages (1: r=0.81; 2: r=0.85; 3: r=0.92; 4: r=0.89; 5: r=0.72). MSFT performance and RSA showed differing levels of association across maturation groups (1: r=0.54; 2: r=0.64; 3: r=0.21; 4: r=0.59; 5: r=0.08).

Discussion: The increases in RSA with maturation plateau 2 years post-APHV. The large associations between RSA and MSFT in the pre-adolescent players might reflect their greater reliance upon aerobic-energy pathways. The increased anaerobic energy production in adolescent players likely explains the very large and trivial RSA correlations with sprint and MSFT performance, respectively. Interpretation of RSA for talent identification purposes in young team-sports players should take maturation status into consideration.

32 | Influence of exercise intensity on endogenous oxidative stress and antioxidant capacity

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Introduction: Regular physical activity and exercise are commonly used as an effective treatment for numerous diseases and general poor health. While the health benefits of engaging in regular physical activity are well known, an ideology gaining momentum in recent years has been that certain intensities may elicit a negative physiological effect through exercise induced oxidative stress (EIOS). While previous research has paved the way to understanding EIOS stress at a superficial level, the relationship between exercise sub-components such as intensity and EIOS remain far more elusive. Therefore, the aim of the current study was to examine the influence of exercise intensity on EIOS including antioxidant capacity.

Methods: Non-smoking, untrained healthy adult males (n=14) participated in two exercise sessions using an electronically braked cycle ergometer. The first session consisted of a graded exercise test to determine maximal power output and oxygen consumption (VO_2max). One week later,

participants undertook 5 minute cycling bouts at 40% VO_2max, 55% VO_2max, 70% VO_2max, 85% VO_2max and 100% VO_2max, with a passive 12 minute rest between stages. Measures of EIOS including biological antioxidant capacity (BAP) and reactive oxygen metabolites (dROM), and heart rate, VO_2, blood lactate and physical exertion were assessed at rest and immediately following each exercise stage. Significant (p<0.05) comparisons between exercise bouts were compared using repeated measures ANOVA and post-hoc pairwise comparisons with a Bonferroni correction.

Results: Increasing exercise intensity significantly augmented heart rate (p<0.001), VO_2 (p<0.001), blood lactate (p<0.001) and physical exertion (p<0.001) with no significant effect on dROM levels compared to resting values. In contrast, increasing exercise intensity resulted in a significantly greater BAP at 70% (p=0.009), 85% (p=0.005) and 100% (p=0.000) of VO_2max compared to resting levels.

Discussion: The current results *indicate* that exercise intensity significantly affects oxidative function with brief, moderate to high intensity exercise leading to a significant increase in the endogenous antioxidant defense system, possibly to counteract the EIOS. Subsequently, regular moderate to high intensity exercise may produce long term benefits via enhancement of the endogenous antioxidant defense system, possibly through the *upregulation* of endogenous antioxidant *enzymes. Further,* 5 minute *bouts* of increasing exercise *intensity may* be an *effective* method for accumulating the recommended daily amount of physical activity in the general population without *significant* EIOS.

33 — Effects of different uphill interval-training programs on running economy and performance

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Introduction: Uphill running is a movement specific form of resistance training used by runners to enhance performance. However, the optimum parameters for prescribing intervals are unknown. We have therefore used a dose-response design to investigate the effects of various uphill interval-training programs on physiological and performance measures in well-trained distance runners.

Methods: Twenty runners (15 M, 5 F) performed an incremental treadmill test to determine running economy and maximal aerobic capacity, a series of jumps on a force plate to determine muscle power characteristics, and a 5-km time-trial. Runners were then randomly assigned to one of five intensities of uphill interval-training ranging from 20x10-s intervals at 120% of VO_2max velocity at an 18% gradient through to 2x20-min intervals at 80% of VO_2max velocity at a 4% gradient. After 6 wk all laboratory tests were repeated. The percent improvement for all measures was modeled as a quadratic function of the rank order of the intensity of training. Uncertainty was estimated as 90% confidence limits (CL) using bootstrapping.

Results: For most measures the quadratic models predicted optimal training near the middle of the five training intensities (~8 x 2-min intervals at 95% of VO_2max velocity), with CL of up to one training intensity on either side. At the optimum the improvements were: VO_2max 4.1% (CL±2.3%); VO_2max velocity 2.1% (CL±1.4%); fractional utilization of VO_2max at 16 km.h^{-1} -2.1% (CL±1.7%); and countermovement-jump peak force 29% (CL±8%). Improvement in running economy at 16 km.h^{-1} was optimal at the highest intensity: 1.6% (CL±1.8%). There was no clear optimum for 5 km time trial, and the mean improvement over all intensities was 1.9% (CL±0.6%). There were no clear correlations between changes in muscle power measures and changes in physiological or performance measures.

Discussion: Uphill interval training performed near 95% VO_2max velocity produced the greatest improvements in most physiological measures related to endurance performance. Running economy improved most at the highest intensity, which is consistent with anecdotal reports of the effects of uphill sprinting. Until more data are obtained, runners can assume that any form of high-intensity uphill interval training will benefit 5-km time-trial performance.

34 — Protective cardiac gene expression of voluntary wheel-running mice

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Introduction: This study utilises the voluntary wheel-running model, which has been shown to have numerous biological benefits over forced modes such as treadmill running or swimming. Although adaptation indicators such as physiological hypertrophy are not as pronounced, past studies indicate greater longevity and greater psychological wellbeing.

Methods: 8-week old C57Bl/6 male mice (n=6) were individually housed with a running wheel interfaced with a digital odometer for 7-days (7EX), whilst 'time-zero' sedentary controls (n=6) were placed in an identical environment for a 2-day acclimation period with the running wheel locked (2SED). Animals were sacrificed at their respective time-points, and RNA was extracted from whole cardiac tissue. We investigated the whole-genome transcriptomic effects on cardiac tissue of an acute bout of this unique and relatively low-stress activity via microarray analysis (Illumina BeadArray platform, >45,000 probe sets, covering >34,000 genes). Select gene results were validated using qRT-PCR.

Results: During the 7-days, 7EX mice increased running from 2.1±0.2 to 5.3±0.3 km/day (mean speed 38±2 m/min) and there was no difference in body weight/heart weight ratio to 2SED group. Activity outside the running wheel and in the SED2 cages was not recorded. Bioinformatic and statistical analysis of expression data (SAM, Ingenuity Pathway Analysis) identified 142 significantly expressed genes (≥1.3-fold expression change, ≤5% FDR), with the most significant networks involved in cell-mediated immune response (particularly interferon-dependent), cellular organisation, morphology, and signalling, and cardiovascular system development and function. Interestingly, of these significantly altered genes, a majority (92%) was repressed after 7-days running. 3 of the 8 most repressed transcripts being IFN-inducible (Ifi27l2, Ifitm1, Ifitm2) with functions in inflammation and pro-apoptotic pathways. Out of the 14 upregulated transcripts, 3 encoded inter-related sarcomeric proteins titin, actinin and myomesin-2, while transcripts for protective actin-stabilizing ND1-L and activator of mitochondrial biogenesis ALAS1 were also induced.

Discussion: The analysis hints at involvement of an immune/anti-inflammatory response to voluntary activity together with logical shifts in factors modifying growth, structure and function of cardiac cells. Overall, our results show that protective gene transcription occurs in a relatively short, low-stress mode of physical activity. Our previous gene studies on opioid-treated mice show similar gene expression signatures that may also indicate that exercise-induced cardiac protection may stem from the involvement of opioid G-protein coupled receptors. Current work aims to determine the temporal nature of protective effects, the importance of the opioid system, and comparisons to forced activity modes.

35   Functional performance deficits associated with ligamentous instability at the ankle

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Introduction: Among those individuals who develop chronic ankle instability (CAI) following an ankle injury, there is an association with ligament laxity. Greater knowledge of the relationship between mechanical deficits and performance deficits after ligament injury may help to optimise rehabilitation and injury prevention in clinical patient groups with either acute or chronic ankle problems. The aim of this study was to investigate whether ankle ligament laxity in sports participants is associated with deficits in functional performance in tests that incorporate high degrees of ankle function. We hypothesized that, despite otherwise healthy sports participation, having anterolateral ankle ligament laxity would be associated with deficits in performance.

Methods: Eighty-six volunteers from among sports participants at a military academy were screened for injury history, sports participation and musculoskeletal testing performance. The lower limb screening included tests of ankle ligament laxity, dorsiflexion range of movement, single leg hop-for-distance, hexagon agility hopping test, hop-and-hold landing stability test, and ankle proprioception. We compared healthy ankles with injured ankles independently, and also healthy vs lax ankles within the same individual.

Results: A MANOVA demonstrated a significant difference between lax and stable ankles on the screening tests when they were examined together (F=3.52, df=4, 167, P=.009, Wilks' Lambda=0.92). Independent t-tests showed worse performance of the lax ankles on the hop-for-distance (p=.001), hexagon hop (p=.039) and the proprioception tests (p=.033). Comparing the stable and lax ankles in the same individual, paired t-tests showed significantly lower hop counts for the lax ankles on the hexagon hop test (p=<.001).

Discussion: Ankle ligament laxity is associated with persisting deficits in explosive leg power, agility and proprioception. The discovery of these deficits by using testing at a higher intensity level indicates that there is a role for gross tests of functional performance that simulate the levels of intensity achieved in sport. These deficits require increased clinical attention to achieve rehabilitation to full sporting intensity. To enable a more refined targeting of deficits associated with reduced performance, future research is needed to augment these tests with laboratory tests. In the interim, attention to maximising sport-related performance in the late stages of rehabilitation is suggested as an essential addition to clinical management of these injuries.

36   From research to practice: Understanding the implementation context from the end-user's perspective

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Introduction: Translating sports injury prevention research evidence into sustained changes in safety policy and practice in the community setting is a major challenge for community sport. It has been argued that one reason sports injury prevention researchers have not been particularly successful in translating their research into practice is because of a lack of full understanding about the implementation context. The aim of this study was to develop an in-depth understanding of the implementation context for an evidence-based lower limb injury prevention exercise program (FootyFirst) for community Australian football clubs, from the end-user's perspective.

Methods: The experience of the research team; expert consultations with AFL sports scientists, sport physicians and physiotherapists; and focus groups with potential end-users (administrators, coaches and players) were used to explore the general community football club implementation context for FootyFirst. To gain insight into the specific implementation context for clubs in the Geelong region of Victoria, Australia, a range of additional sources were used including: i) A local implementation advisory group; ii) individual feedback from a strength and conditioning coach with intimate knowledge of local clubs; and iii) interviews with six local community coaches with different implementation intentions complemented by an observation of their pre-season practice sessions.

Results: Based on the general and specific feedback, the following context-specific FootyFirst implementation activities were identified: adaptation and modification of FootyFirst program content and resource materials; endorsement of FootyFirst by respected opinion leaders in the field; a local FootyFirst launch with high-profile guest speakers; development of FootyFirst implementation support resources (a coaches manual, CD-ROM, posters and on-line videos); FootyFirst training for coaches and a FootyFirst Mentoring program to support coaches to implement FootyFirst. Prior to the start of the 2012 season, 17 of the 22 community football clubs in the Geelong region had agreed to implement FootyFirst.

Discussion: The ultimate end-users of a sports injury prevention program will interpret and implement the program in the context of their everyday experience and local environments. If researchers truly want their work to make a difference, it is vital that they have an in-depth understanding of the specific context in which an intervention will be implemented. The NoGAPS study is an example of how it is possible to develop such an understanding and how to engage with local community stakeholders to support and encourage community level implementation of an evidence-based injury prevention program.

37   Bridging the gap between research evidence and real world implementation: Developing the FootyFirst program

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Introduction: There is an ever-increasing impetus to widely implement evidence-based treatment and/or injury prevention methods. However, navigating the research literature to evaluate the evidence can be difficult, and bridging the gap between the research environment and the real-world implementation context can be challenging. The aim of this study was to develop an evidence-based lower limb injury prevention exercise program for implementation in community Australian football.

Methods: A systematic review of the literature was undertaken to identify randomised, quasi-randomised, cohort, case control and cross-sectional studies conducted with sporting populations, with the primary aims of injury reduction, or risk factor identification and modification, for lower limb injuries. Compliance, cost, adverse effects, uptake and feasibility were all considered in the review of the literature. The results of this review were used to develop a draft exercise-based program to prevent hamstring, hip and groin, knee and ankle injuries, which could be implemented

in community Australian football. The draft program, called FootyFirst, was presented to key stakeholders in Australian football for comment and feedback through a Delphi process. FootyFirst was then tested in the field for feasibility.

Results: The evidence-base for lower limb injury prevention strategies was predominantly restricted to studies addressing injury aetiology and mechanisms. Direct extrapolation of research findings to program development was difficult due to differences in the context and research populations studied compared to our target population, insufficient information about dosage and exercise progression, and low-level evidence only available for some areas (e.g. groin). The clinical, neuromuscular, biomechanical and exercise science expertise of the research team were drawn from to develop a program with contextual relevance but still based on the evidence available. An important example was determining the minimal effective dosage of each exercise for injury prevention purposes, to minimise the time commitment required by clubs and players. Three rounds of the Delphi process were required before consensus of the program content was achieved. The program was tested in the field and further modifications and refinements made to ensure that it could be completed in an acceptable time and be implemented at the community-level by coaches and trainers.

Discussion: Developing a comprehensive program with a strong foundation in the published research evidence was challenging, requiring many modifications and extensive consultation to develop a program with face validity and a strong probability of uptake. The effectiveness FootyFirst is currently being evaluated.

38   A systematic review on the effectiveness of community and school-based injury prevention programs on risk behavior and injury risk in children

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Introduction: Next to the health enhancing effects of physical activity (PA), potential negative outcomes in terms of injury should not be underestimated. Especially in children in whom it was found that injury also affects continued participation in PA. Injury prevention has been mostly applied in the sports setting, but arguably in children prevention strategies are better suited outside the sports setting. This review was conducted to evaluate the effectiveness of PA related injury prevention strategies in the community or school-setting.

Methods: A systematic computerized search was performed using five databases (CINAHL, Cochrane, EMBASE, PubMed and Sportdiscus). Search terms used were a combination of 'age' and 'Injury' and 'prevention' and 'physical activity'. Methodological quality of included studies was scored by two independent reviewers according to the Downs and Black checklist.

Results: The electronic search resulted in a total of 5,377 records, of which 11 were included in the review. Four out of the 11 studies had a methodological quality score above 70%, and were thus considered to be of high quality. The majority of the studies (n=8) evaluated an intervention on the use of safety devices. Two focused on pedestrian safety and one study focused on physical activity related injuries. Overall interventions reported on the short term modest positive results. For safety device use, short term effects of school- and community-based interventions are promising for 8 to 12 year olds. Results regarding sustainability of the effect are inconsistent. A mediating effect was found for the way of distributing the safety devices. Not only financial, but also non-financial barriers seem to prevent participants from purchasing a safety device.

Discussion: Little research has evaluated the effectiveness of physical activity related injury prevention on injury incidence rates. Also, more research is needed with respect to the effectiveness of school- and community-based interventions on the long term, as most studies report a follow-up of less than six months. Methodologically, research on prevention programs has improved over the last 10 years: participants and interventions are described more clearly, and more studies report using a (cluster) randomized controlled trial design. Future research in school and community-based prevention studies should take into account the compliance of the providers and participants to the intervention and include proper statistical methods including adjusting for loss to follow-up and cluster effects.

39   What is the reliability and validity of visual assessments made for injury risk assessment?

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Introduction: In the clinical and sports settings, the most frequent assessments made for injury risk are those which include no high-tech equipment, and are essentially 'eye-ball-ometry'. Despite this, there has been relatively minimal research into the reliability and validity of such assessments. Due to the costing and time commitments needed to use the risk assessment software and equipment, visual assessments will continue to be the mainstream tools of overuse injury risk assessment. It is therefore important that we start to build a research base for our visual assessments and their psychometric properties. The purpose of the current three year project is to investigate the psychometric properties of four of the (arguably) most commonly used risk assessment tools for lower limb and lower back injury: the gait assessment (or 'walk test'), the single legged stance test, the forefoot propulsion test and the assessment of lower leg alignment. The specific research questions are:

- Do multiple assessments of these tests show consistency between practitioners?
- Do multiple assessments made by the same practitioner show consistency?
- Do the visual assessments correlate with the assessments made using the latest software and equipment: Foot scans, force plates and Gait analysis labs?

Methods: The twenty participants were selected based on the inclusion criteria that they were currently injury free and had been for at least 3 months prior. The fifteen operators were selected from the University of Otago Physiotherapy Clinics Postgraduate students and practising physiotherapists. The four tests were independently assessed by the fifteen operators on six separate occasions. While these four tests were being assessed, software based equipment was also capturing movement data. This provided the data to assist in the answering of the three research questions.

Results: It was found that the four chosen tests had a wide range of reliability and validity. Some tests scored very highly and are thus justified for continued use. Other test results indicate that an alternative should be investigated, or the methodology revised.

Discussion: This test is the first of potentially many reliability and validity investigations that are badly needed within the practical injury prevention literature. The results show that some of our testing processes are very strong, but others are highly questionable. This knowledge must be developed further to justify their continued use.

40 Improving the translation of sport injury prevention interventions: the Australian Rugby Union Mayday procedure

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Introduction: Although the "Mayday" safety procedure (MSP) is included in the Australian Rugby Union (ARU) Medical and Safety Recommendations and is part of the compulsory SmartRugby training for coaches, previous research demonstrated that translating the MSP into consistent, high quality knowledge and practice among community rugby coaches in New South Wales (NSW) (Australia) was challenging. This study investigated if the translation of the MSP could be enhanced by implementing a theory and evidence-informed, context-specific diffusion plan.
Methods: A before and after non-randomised controlled trial study design was used. All registered coaches of senior community rugby teams in five zones/associations in the north-eastern NSW were invited to complete an online questionnaire at the end of the 2010 (baseline n=179) and again at the end of the 2011 (follow-up n=146) rugby season. The questionnaire was designed around the RE-AIM framework and assessed MSP: reach; perceived effectiveness; adoption, implementation and maintenance. During the 2011 season, coaches of teams in one zone (intervention coaches) were exposed to a range of theory and evidence-informed and context-specific MSP diffusion strategies planned following Step 5 of the Intervention Mapping protocol. Coaches in the other four zones (control coaches) were exposed to usual practice MSP diffusion strategies. Generalised linear modelling was used to assess and compare changes in responses for control and intervention coaches from baseline to follow-up.
Results: Seventy (39% response rate) and 88 (60% response rate) coaches participated at baseline and follow-up respectively. MSP reach was high in both control and intervention coaches at both baseline and follow-up with nearly all coaches in both groups reporting that they were aware of the MSP and had attended MSP training. However, the proportion of intervention coaches adequately able to describe the key MPS steps for players increased from baseline to follow-up as did most of the other measures of MSP adoption, implementation and maintenance. A greater proportion of intervention coaches reported that there was a zone MSP policy; and that they provided frequent and high quality MSP training for their players compared to control coaches at follow-up.
Conclusion: The findings of this study suggest that the translation of the ARU MSP policy from coach awareness and attendance at training to frequent and effective MSP training of community players by their coaches was enhance by the development and implementation of an evidence and theory-informed context-specific diffusion plan.

41 Prevention of fall-related injuries in 7–12 year old children: A cluster randomized controlled trial

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Introduction: To counteract the recently observed increase in fall-related injuries in Dutch 8 to 12 year old children, an educational program to improve fall skills was developed. The effectiveness of this educational program in decreasing the incidence and severity of fall-related injuries was studied during one school-year.
Methods: A cluster randomized controlled trial was conducted in 33 primary schools (n=xxx children). The control group continued the regular physical education (PE) curriculum. The intervention group received an eight week educational program embedded in the PE classes, based upon basic judo techniques. At baseline (October 2009) and follow-up (May 2010), a questionnaire was completed to asses habitual physical activity (PA) levels, from which PA exposure was estimated. Fall-related injuries were registered continuously during a school year by the PE teacher. Differences between groups were analyzed using a generalized linear mixed model, adjusting for cluster effects and confounding.
Results: After receiving the intervention, children showed a reduced incidence density (ID) of fall-related injuries as compared to children that did not receive the program (injury ID intervention group 0.14/1,000 hrs [95% CI 0.09–0.18] vs control group 0.26/1,000 hrs [95% CI 0.21–0.32]). Due to large cluster effects the difference in injury incidence was not significant. Including habitual physical activity into the model revealed a trend towards the intervention being effective in decreasing falling-related injury ID, but only in the least active children. For injury severity, no differences were found between study groups.
Discussion: The present study is the first to target fall-related injuries in a school based setting. Our finding that the least active children might benefit most from this type of injury prevention is in line with findings of previous school based injury prevention studies, in which larger effects were found for children with low habitual physical activity levels. This is arguably due to the increased injury risk in the lower active children. While injury risk in this specific group of children is high due to reasons yet to be established, minimal preventive effects of a school-based injury prevention approach may have a large societal impact.

42 Clustering patterns of physical activity and sedentary behavior in the French population

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Introduction: Sedentariness and physical activity are two different constructs with independent effects on health. Individuals can both achieve high levels of physical activity and exhibit high level of sedentary behavior. Some determinants of these behaviours have been identified. However, studies on the co-occurrence of physical activity and sedentary behaviors and their association with sociodemographic characteristics are scarce. The aim of the present study was to identify and characterize clusters of physical activity and sedentary behaviors among the French adult population.
Methods: Data were collected from the Nutrition Health Barometer conducted in France in 2008 using computer-assisted telephone interview. Physical activity and sedentariness were assessed using the French version of the Global Physical Activity Questionnaire (GPAQ) administered to a sample of 3847 subjects aged 12 to 75 years. Cluster analysis was conducted to identify patterns of physical activity and sedentariness. Differences between clusters were examined using polytomous logistic regression analysis.

Results: The studied sample included 3294 men and women for whom all data on the relevant behaviors have been collected. Five stable and meaningful clusters were identified and labeled as 1) "low physical activity, low sedentary activity" (41%), 2) "moderate leisure-time physical activity (LTPA), sedentary activity" (22%), 3) "intense LTPA, high sedentary activity, low travel to and from places" (15%), 4) "moderate physical activity at work" (17%) and 5) "intense physical activity at work and LTPA" (5%). Sociodemographics differ by cluster with a higher proportion of physically demanding work and smoking and lower education level in cluster 4 and 5 compared to cluster 1 (reference). In cluster 4 and 5, 87.5% and 100% of the subjects respectively, were classified in the high GPAQ physical activity level. The highest proportion of low physical activity level was observed in cluster 1, 2 and 3. In this last cluster, characterized by a higher education level, higher socio-economic status, more urban and working citizens, LTPA level is one of the highest and time spent sitting is the highest.

Discussion: Physical activity at work is the domain that contributes most to achieving the recommendations for physical activity in terms of quantity and intensity. However, physical activity at work may not be associated with health benefit as highlighted by social inequalities in health. These results emphasize the importance to consider physical activity by domain and not only overall physical activity. Sociodemographic characteristics of the cluster are of importance for designing interventions to promote physical activity.

43 Patterns of physical activity in an adult population: A latent class analysis approach*

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Introduction: Physical activity (PA) is associated with beneficial health effects and may be accumulated in various domains. PA patterns vary between groups of individuals and the influence of accumulation of PA on health-outcomes is not fully established. We aimed to identify patterns of PA in a healthy Danish population by using a latent class analysis approach.

Methods: We obtained measures of PA by 7-day direct assessment of heart rate and movement and by self-report questionnaire in 392 participants (30–60 years) from the Danish 'Health2008' study. We defined 4 binary PA variables: 1) overall PA energy expenditure ≥35.23 kJ/min (PAEE); 2) active commuting ≥0.25 hrs/day; 3) sitting time at work ≥4 hrs/day; 4) time spent in moderate-to-vigorous PA ≥150 min/week (MVPA). These were used to derive latent classes of PA patterns. The class-specific 24-hour PAEE trajectories were plotted and characteristics of the latent classes were described.

Results: We identified three latent classes: 'low-active occupational sitters', 'moderately-active commuters', and 'active energy-spenders'. In comparison to 'moderately-active commuters', and 'active energy-spenders', 'low-active occupational sitters' were more likely to be women (78 vs 64 and 34%, $p<0.001$), at a higher age (48.3 vs 47.9 and 44.2 years, $p<0.001$), to have lower overall PAEE (27.1 vs 37.7 and 40.3 kJ/min, $p<0.001$) and fitness level (VO$_2$max: 28.8 vs 32.7 and 32.2 mlO2/kg/min, $p<0.001$); and to have higher sleeping heart rate (58.2 vs 54.8 and 54.6 beats/min, $p<0.001$) and proportion of time spent with sedentary behavior (6.5 vs 5.0 and 4.0 hrs/day, $p<0.001$). 'Moderately-active commuters' were characterized by having the highest amount of active commuting (0.5 vs 0.1 and 0.0 hrs/day, $p<0.001$) and 'active energy-spenders' were more likely to be men (66 vs 23 and 36%, $p<0.001$) and to have a high level of overall PAEE. Despite different accumulation of PA, the class-specific 24-hour PAEE trajectories were similar, albeit translated to different PAEE levels.

Discussion: By using the latent class analysis approach we were able to identify sub-groups of individuals with similar patterns of PA accumulation within a heterogeneous sample of adult men and women. Identification of the characteristics of the individuals in the different latent classes may provide us with the ability to address physical activity interventions to the right recipients.

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44 Seasonal variation in physical activity, sedentary behaviour and sleep in UK adults

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Introduction: Physical activity (PA), sedentary behaviour (SB) and sleep are all factors which have been shown to be associated with health. Seasonality is often overlooked as a determinant of these behaviours; therefore the aim of this longitudinal study is to identify any seasonal variations in these 3 modifiable lifestyle behaviours in a sample of UK adults.

Methods: PA and SB were measured using an ActiGraph GT1M accelerometer over 7 consecutive days during each season of the year in 46 working-aged adults (72% female, BMI: 25.5±4.8 kg/m²). Time spent in moderate-vigorous intensity PA (MVPA) was classified as >1951 counts/minute and SB was defined as <100 counts/minute. During each monitoring period participants also completed a daily sleep diary. Repeated-measures ANOVAs, with Bonferroni-corrected post hoc comparisons, were used to identify any seasonal differences in mean minutes/day spent in light intensity PA, MVPA, SB, sleep duration and time in bed.

Results: Mean minutes/day spent in light intensity PA were significantly higher in summer (305.5±70.7) and spring (301.5±70.5) in comparison to winter (256.4±61.6) and autumn (277.4±71.9) ($p<0.008$). Conversely, mean minutes/day spent sedentary were significantly higher in winter (690.7±76.5) when compared to summer (658.2±78.2), spring (654.9±77.0) and autumn (672.9±79.9) ($p<0.008$). Participants reported spending significantly longer in bed during winter (517.2±58.5) in comparison to summer (502.1±60.7) and spring (498.4±61.1). There were no significant seasonal changes in time spent in MVPA (summer: 39.7±23.0, autumn: 39.4±21.0, winter:39.7±23.1, spring:43.3±23.1) or sleep duration (summer: 475.5±78.0, autumn: 484.7±67.5, winter: 481.9±66.2, spring: 486.1±69.9).

Conclusions: This study demonstrates that seasonal variation in light intensity PA, SB and time in bed occurred in our sample of working-aged adults. Light intensity PA declined over the winter months, whilst SB increased during this season. This escalation in sedentary time is not only characterised by an increase in SB during the day, but an increase in time in bed at night also. Reductions in PA levels and increased time spent sedentary during the winter months could have implications in terms of positive energy imbalance during this time of the year. The present findings support the concept that health promotion campaigns need to encourage long term participation in PA and limit sedentary time all year round. Strategies for overcoming barriers to PA under unfavourable environmental conditions will be needed for this to be achieved.

45 Physical activity patterns across weekdays and weekend based on accelerometer data: A study in a diverse ethnic minority community in Copenhagen, Denmark

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Introduction: Physical activity (PA) levels decline as children grow older and especially the time between 12–14 years is crucial. To be able to target interventions to promote PA among children more knowledge about objectively measured PA patterns is important, especially among ethnic groups as these groups are less well investigated. This study investigated the physical activity level during weekdays, weekend days and during different dayparts among children from the When Cities Move Children study.

Methods: In the baseline study, carried out in 2010–2011, 623 children (10–16yrs) enrolled at four schools in a diverse ethnic minority community in Copenhagen, Denmark, were asked to wear an accelerometer (ActiGraph GT3X) and a GPS (Qstarz BT-Q1000X) for a full week to determine their level of PA and activity pattern. Only accelerometer data is used for this study. Evenson cut-points were used to identify time in moderate to vigorous activity (MVPA). Acceptance criteria were defined as minimum three weekdays and one weekend day of minimum 8 hours valid wear time of accelerometer time (non-wear: 60 minutes of consecutive zeroes). Daily mean MVPA were divided into weekend days and weekdays and weekdays were further divided into mornings, school and leisure time.

Results: A total of 516 participants provided accelerometer data and 291 (130 boys) had a full valid week and were included in the analyses. Boys accumulate significantly more daily MVPA time than girls (boys: 64b, Girls: 46, p<0.001) but there are no gender differences in the physical activity pattern: Both boys and girls spends more minutes in MVPA during weekdays (boys: 70, girls: 51) compared to weekend days (boys: 47, girls: 31). The majority of MVPA during a weekday is accumulated during leisure time (56.5% of total MVPA), less during school hours (37%) and least during mornings (6.5%). This corresponds with the actual proportion of a child's day as 59.5% of a day constitutes of leisure time, 36% of time in school and 4.5% of morning time.

Discussion: Using accelerometers to measure physical activity makes is possible to examine PA patterns in a precise and reliable way leading to new evidence on how children's PA is accumulated during a week. This study shows that weekend days among children are used to rest and suggests that the school is an important setting for PA as more than 1/3 of MVPA is accumulated here. However the most time in MVPA is during leisure time.

46 Objectively measured physical activity in adults from Cuernavaca, Mexico

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Introduction: Obesity and chronic diseases have increased in Mexico over the past decades, with 70% of Mexican adults now overweight or obese. Diet and physical activity (PA) are known determinants for these conditions. In Mexico many studies have carefully measured dietary intake, but few efforts have been made to measure population levels of PA. Our study is part of the International Physical Activity Environment Network Study, and aims to describe the objectively measured PA patterns of adults from a mid-size Mexican City (Cuernavaca).

Methods: A stratified, clustered sample of 674 healthy adults (20 to 65 years) from Cuernavaca, Mexico, was selected. Participants wore Actigraph GT3X accelerometers for 7 days. Basic demographic information was collected through a survey. Weight and height were measured objectively. Accelerometry data was scored using Freedson's equation, and minutes of MVPA per week were obtained; a minimum of 5 days with 10 hours of wear-time per day were used to classify valid days. PA was classified as "very low" (<75 MVPA mins/week), "low" (75–150 MVPA mins/week) and "adequate" (>=150 MVPA mins/week). Chi-squared tests were performed to examine the associations of sex, SES and nutritional status with levels of PA.

Results: Our final sample for analysis included 670 adults, 301 (44.9%) males, 210 (31.3%) obese, and a mean age of 42.0 years. MVPA mins/week were not normally distributed, and had a median of 178.5 MVPA mins/week. 123 (18.4%) and 154 (23.0%) had very low and low levels of PA, respectively, with a total of 277 (41.3%) not meeting the international recommendation of 150 MVPA mins/week. Men had significantly higher activity levels than women (p<0.0001). SES was associated with PA levels (p<0.045), with higher PA levels found among low SES. Non-obese men had significantly higher PA levels than their obese counterparts (p<0.049), while no association was observed for women (p<0.90).

Discussion: This is the first study to report objectively measured PA for a Mexican adult population. We found that 4 out of 10 adults don't meet PA recommendations. Further studies are required to understand the etiology behind the differences of PA levels among Mexicans by sex, SES levels, and nutritional status. The understanding of these associations and the systematic measurement of PA at the population level in Mexico is essential for adequately targeting and designing PA promotion programs.

47 Physical activity and sitting time measured in Spanish university students

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Introduction: It has been observed that time spent at university in undergraduate study is often associated with a decline in physical activity (PA) levels. This study examined PA and sitting time, according to gender and course studied amongst Vigo university students in Spain.

Methods: 609 (63.4% female) undergraduate students self-reported their PA levels and sitting time using the IPAQ Short. Students were grouped according to their topic of study as follows: degrees related to Health (Group A, N=194), Education (Group B, N=187) and non-Health or Education related degrees (Group C, N=228). Physical activity data were converted into MET-minutes/week and sitting time data were reported as minutes/day, as recommended by the questionnaire scoring guide. A t-test and a two-way ANOVA with post hoc tests were used to examine any differences between PA and sitting time reported between genders and between students categorised into the three subject groups.

Results: Student's studying health related degrees reported accumulating significantly more PA (1910 METS-minutes/week) than students studying education-related degrees (1335 METS-minutes/week) and students studying non-health and education related degrees (1495 MET-minutes/week) (p<0.05). Male students from group A (health related degrees) reported the highest median MET minutes/week value of 2500. However, females from this group reported the same median MET minutes/week value as females from group C (800 METS-minutes/week). Men from group C and women from group B reported the lowest median PA levels, 750 and 700 MET-minutes/week, respectively. There were significant differences in self-reported sitting times between groups, with students studying health-related degrees reporting less minutes/day of sitting time (median minutes: 231) in comparison to students studying education, and non-health and education related degrees (median minutes: 250 and 285 respectively, p<0.05). There were no significant gender differences in terms of self-reported sitting times.

Discussion: University students show low levels of PA and high levels of sitting time. Academic training seems to have a little influence on student's behaviour and this is particularly evident amongst females studying health-related degrees. There is a need to foster gender-sensitive strategies to promote a healthier and more active lifestyle amongst university students.

48 The relationship between physical activity and sedentary behaviour in adults: A systematic review

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Purpose: To ascertain, through a systematic review, the associations between sedentary behaviour (SB) and physical activity (PA) among adults.

Methods: Studies published in English up to and including November 2011 were located from computerized (PubMed, Science Direct, Cochrane Library and Web of Knowledge) and manual searches. Observational or baseline intervention studies reporting on at least one measure of SB and an association with at least one measure of PA, with adults aged 19–60 years, were included.

Results: 57 studies met the inclusion criteria and were analysed. 18 studies examined associations between SB and PA prospectively, and 39 studies were cross-sectional. 13 studies used objective measures to assess SB and PA and the remaining used self-reported, usually in the form of questionnaires. 22 studies showed that TV viewing time was negatively associated with PA, and 4 studies found no association. 8 studies showed that general screen time was associated with lower levels of physical activity. 7 studies showed that occupational sedentary time was associated with lower levels of walking. 6 studies showed that PA was associated with lower levels of sitting time, and 1 study finding no association. 14 studies found a negative association between PA and lower overall SB, and 1 paper found no association between these behaviors.

Conclusions: Time spent in sedentary behaviors appears to be associated with lower levels of physical activity in adults. However, the strength of association varies from small to moderate. Whether this reflects a true displacement of behaviors is not known.

49 Associations between sitting time and health-related quality of life and psychosocial health among older men

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Introduction: Population based objective assessments (i.e. accelerometers) indicate that older men (>60 years) have the highest levels of sedentary time with approximately 60% of their waking time engaged in sedentary behavior. Sedentary time has been linked to mortality, type 2 diabetes, and cardio-metabolic markers. No studies have evaluated sedentary time and multidimensional HRQoL among older men. The purpose of this study was to determine associations of total sitting time with health-related quality of life (HRQoL) among older men.

Methods: Using a cross-sectional design, older aged men 55 years of age and older from Alberta, Canada completed a mailed survey that assessed HRQoL (RAND-12). Sitting time was assessed using five items validated by Marshall et al. (2010). Participants were asked to estimate how much time they spent sitting each day in the following situations; a) while traveling to and from places, b) while at work, c) while watching television, d) while using a computer at home, and e) at leisure not including television, separately for weekday and weekend. The primary model assessed the association between total sitting time as the independent variable of interest and our dependent variables of interest (physical, mental, and global health component scores of the RAND12).

Results: Participants (N=375) averaged 9.3 hours (SD=7) of sitting time (or 557 minutes) for weekday and 8.3 hours (SD=5.2) of sitting time (or 511.6 minutes) for weekend. Quartile (Q) cut-points for weekday total sitting time were <380 (Q1), 380 to <500 (Q2), 500 to <630 (Q3), and >=630 (Q4) minutes. Cut-points for weekend total sitting time were <350 (Q1), 350 to <480 (Q2), 480 to <600 (Q3), and >=600 (Q4) minutes. For weekday, all three adjusted HRQoL models (i.e. physical, mental, and global health) indicated no significant differences in HRQoL indices across weekday sitting time quartiles (all p's>.32). For weekend, all three adjusted models indicated significant associations. Differences were observed when comparing Q1 and Q4 on physical (M_{diff}=2.3, p=0.05), mental (M_{diff}=3.4, p<0.05), and global health (M_{diff}=2.8, p<0.05).

Discussion: While weekday sitting time was not significantly associated with HRQoL domains, weekend sitting time was associated with HRQoL domains when comparing the lowest and highest quartiles. In this sample, older men who reported less time sitting on the weekend also reported more optimal HRQoL indices.

50 Physical activity levels amongst inpatients with Post Traumatic Stress Disorder: Is self-report a valid measure?

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Introduction: The physical health of people with a mental illness is often compromised, and those with mental health conditions such as Post Traumatic Stress Disorder (PTSD) are often less likely to be physically active then the general population. Hence, it is important to accurately assess physical activity among inpatients being treated for PTSD. This study aimed to determine the construct validity of the International Physical Activity Questionnaire (IPAQ-short form) for use in PTSD inpatients.
Methods: Inpatients of the adult-trauma program at St John of God Hospital in Sydney (Australia) were recruited over a twelve-month period (n=59, 85% male; 49% police officers). Participants wore an Actigraph accelerometer for 7 days, at the end of which participants self completed the IPAQ-short predominantly. Analyses determined the construct validity of the IPAQ against the accelerometer using the Spearman rho correlation coefficients.
Results: The Spearman correlation between total physical activity based on the IPAQ and moderate to vigorous physical activity from the questionnaire was 0.462. Compliance with wearing the accelerometer was lower than usual, 20/59 participants (33.89%) recorded 3 or less valid days out of a total of 7, whilst only 8/59 (13.56%) had the maximum 7 valid days. The IPAQ was completed somewhat better, 7/59 (11.86%) were incomplete primarily due to sudden or early discharge, and 8/59 (13.56%) reported values considered erroneously high, which had to be capped as per the IPAQ scoring manual. When stratifying by severity of illness, based on the Health of the Nation Outcome Scale (HoNOS), the Spearman correlation was 0.591 for those with a greater illness severity (HoNOS total $\geq$21; n=20), and 0.377 for those with lower severity scores (HoNOS total $\leq$20; n=16).
Discussion: The IPAQ short form self-report questionnaire has acceptable construct validity for estimating physical activity participation of inpatients with PTSD. Poor compliance with wearing an objective activity monitor in this population might make the use of supervised self-report questionnaires or interviews more suitable for the assessment of physical activity.

51 Recommended physical activity and depression in Japanese adults

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Background: Depression, a common mental illness, has a high global incidence. Regular physical activity at recommended levels is inversely associated with depression. Therefore, the promotion of engaging physical activity should be a priority for depression prevention. However, this association has not yet been studied in the Japanese population. The present study examines the association between recommended physical activity criteria and depression, and depression score differences between physical activity groups and socio-demographic variables among Japanese adults.
Methods: Socio-demographic data (gender, age, educational level, employment status, marital status, living conditions, and household income), the Japanese short version of the International Physical Activity Questionnaire, and the Center for Epidemiologic Studies Depression Scale were used to estimate the participants' physical activity and depression levels, respectively, via an Internet-based survey. A representative sample of 3,000 Japanese adults answered the survey, stratified by gender and age. The present study followed current Japanese exercise guidelines to categorize respondents as "meeting" or "not meeting" the recommended criteria of 23 metabolic equivalent (MET)-hours per week. Analysis of covariance and two-way univariate analysis of covariance were performed.
Results: Respondents not meeting the recommendations for physical activity had significantly higher depression scores than those meeting the recommendations ($F(1, 1349)=6.82$, $P=0.009$ in men and $F(1, 1387)=8.37$, $P=0.004$ in women). Individuals not meeting the recommended criteria had significantly higher depression scores than those meeting the criteria across the following variables: age, marital status, living conditions, and household income in men; and age, marital status, education level, employment status, and household income in women. Men who were unmarried and had low household income levels and women who were young, unmarried, and had lower household income levels had higher depression scores.
Discussion: In summary, respondents not meeting the recommendations for physical activity had higher depression scores than those meeting the recommendations among different socio-demographic factors, especially in young adults, the unmarried, and individuals with low household incomes. The present study offers new evidence on the relationship between physical activity and depression in Japan and helps to fill a large gap in the data from non-Western countries. Since no other study of the Japanese population has been conducted on this topic, the findings of the present study will be important for the future development of intervention strategies for population-based health promotion and will contribute to the promotion of physical activity.

52 A comparison of physical activity context preferences between adults with psychological distress and those without

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Introduction: Physical activity can promote well-being and assist in the management of psychological symptoms. To support the development of physical activity opportunities, the aim of this study was to compare physical activity context preferences between mid-aged adults with psychological distress and those without.
Methods: This cross-sectional analysis used data from a population-based mail survey with 7670 adults aged 42–67 years conducted in Brisbane, Australia (the HABITAT study). Psychological distress was assessed using the Kessler6, and respondents were categorized as no distress (0–7) or some distress (8–24). Participants indicated the extent to which they agreed or disagreed with a preference for each of 14 physical activity contexts; responses were collapsed into categories of disagree, no preference, or agree. Data were analyzed using multi-level multinomial logistic regression, with adjustment for physical activity level, sex, age, household composition, education, employment status, income, general health, and body mass index. Disagreement with the activity context preference was considered as the reference category. Adjusted odds ratios and 95% confidence intervals are reported.

Results: Approximately 12% (n=909) of respondents were categorized as experiencing some psychological distress. Over 70% of distressed respondents preferred activities that can be done alone, can be done close to home, and activities that involve little or no cost. Approximately 60% of distressed respondents had a preference for activities done outdoors and activities that are not just about exercise, and a preference *against* activities that involve competition. Distressed respondents had higher odds (vs no distress) to agree with a preference for supervised activities (1.64; 1.32–2.03), activities done with people of the same sex (1.41; 1.12–1.78), and activities done at a fixed time with scheduled sessions (1.32; 1.08–1.62). Distressed respondents also had a *lower* odds to agree with a preference for vigorous activities (0.80; 0.64–0.99) and activities that are not just about exercise (0.77; 0.60–0.99). There were no significant associations between distress and preferences for activities that can be done alone, are done with people the same age, are done outdoors, are done close to home, are low cost, are with a set routine or format, are team-based, involve competition, or that require skill and practice.

Discussion: Mid-aged adults with psychological distress prefer different physical activity contexts than those without distress. Understanding how, where and with whom people prefer to do physical activity can be used to tailor and promote physical activity opportunities.

53 Physical activity is less fun than sex, but better than work

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Introduction: The context and attributes of physical activity (such as enjoyment, intensity, environment and timing) can modify its health-related benefits. This study examined adults' enjoyment of physical activity.

Methods: 127 adults (70 F, 35±14 y) completed a computerised use-of-time recall of one 24 h period. For each activity recalled, they were asked how much they enjoyed it on a scale ranging from 0 ("I hated it") to 10 ("I loved it").

Results: Participants recalled 4525 activity instances, of which 811 were moderate to vigorous physical activity (MVPA). The mean (SD) enjoyment rating for MVPA was 6.3 (1.8) units, below the average rating for all activities of 6.6 (1.7), and considerably below the ratings for sex (9.3), social activities (7.9), eating (7.5) and sleeping (7.4), but above work-related activities (6.0) and household chores (5.4). Enjoyment of MVPA varied with domain, personal characteristics, intensity, companions and time of day. Among domains of MVPA, playing with children and animals (8.7), and sport and exercise (7.8) ranked well above active transport (5.6). Higher enjoyment ratings were associated with greater age and higher exercise intensity (p<0.0001). Physical activity was enjoyed more when done with partners, friends and children (6.8–7.1) than alone (6.2; p=0.04). On weekdays, physical activity was enjoyed least around the hours of 0800 and 1600, and most around 2000. On weekends, enjoyment of physical activity plateaued from 1000 to 1800.

Discussion: The enjoyment of physical activity is heavily influenced by its nature and context. This is consistent with studies which have shown that physical activity in certain contexts is not associated with better psychological outcomes.

54 Association between physical activity and duplication of cognitive decline, depressive symptom and homebound in community-dwelling Japanese elderly: The Dazaifu Study

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Purpose: It is unclear about physical activity who have declined cognitive function, depression and/or homebound in Japanese elderly. The present study assessed prevalence of each problem in community-dwelling elderly, and investigated profiles focused on physical activity in the subjects who had these problems by a cross-sectional design.

Methods: Subjects were 737 out of 2171 (34%) self-support residents who were over 65 years old in Dazaifu City, Fukuoka Prefecture, Japan. Physical activity, depressive symptoms and cognitive function assessed using a triaxial accelerometer (Active Style Pro HJA350IT, Omron, Japan), the Japanese version of CES-D scale and a cognitive test for Japanese (Five-cog test), respectively. The personal profiles for status of going outside and communication with other person, social support (receive and provide), monthly income and years of education were assessed using a questionnaire. Depressive symptoms was judged using the cutoff-points (above 16 points) for CES-D score or use of antidepressant, and the subjects of total rank below 14 in Five-cog test were regarded as having aging-associated cognitive decline (AACD) proposed by International Psychogeriatric Association. The subjects answered "hardly ever" for at least one question asking about going outside and communication with other person were defined as homebound. The subjects divided into three groups according to numbers of the problems (nothing: NP, single problem: SP, more than two problems: DP), and then comparison of the profiles were performed among the groups. Further, factors associated with the duplication of the problems were investigated using a logistic regression analysis.

Results: The AACD was found in approximately 30% of the subjects, 10% of subjects were depressive symptom or homebound. Approximately 10% of the subjects duplicated at least two problems. All duplicated cases included AACD, whereas the only combination of depressive symptom and homebound was not found. The amount of walking activity (METs/h), income and social support in DP group were significantly lower than in the NP- or SP group. Any difference in walking activity level was not observed between the NP- and SP group. Odds-ratio of walking activity adjusted for income and social support was significantly lower in the DP group than in the NP+SP group.

Conclusion: Decreased walking activity was associated with duplication of the care-related problems independent of income and social support in community-dwelling Japanese elderly. Prospective study will be needed in future.

55 Concurrent and prospective associations between sitting time, physical activity and depression in mid-aged Australian women

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Introduction: Physical activity (PA) can provide protective effects against depression, the relationship between sitting time and depression remains unclear. The aim of this study was to examine the concurrent and 9-year prospective associations between sitting time, PA and depression in mid-aged Australian women.

Methods: Data were from 8,950 women, aged 50–55 in 2001, who completed surveys for the Australian Longitudinal Study on Women's Health in 2001, 2004, 2007 and 2010. Depression was assessed using the 10-item Center for Epidemiological Studies Depression questionnaire (CES-D, score ≥10 indicative of depression). A single question was used to measure hours/day spent sitting for work, leisure and travel. PA was assessed using adapted Active Australia questionnaire items about time spent walking and in moderate and vigorous activity; a PA score in MET.minutes/week was calculated and categorised. Associations between sitting (≤4 hrs/day, >4–7 hrs/day, >7 hrs/day) and PA (none, insufficient, meeting guidelines) with depression (yes/no) were examined in concurrent and lagged mixed effect logistic models, adjusted for sociodemographic and health characteristics. As significant interactions between PA and sitting were found in some models, two models were computed to enhance comparability between results: a model including PA and sitting separately, and a model including a composite variable with the 9 combinations of PA and sitting.

Results: In concurrent models, women doing insufficient or no PA were up to twice as likely to be depressed, and women sitting >4 hrs/day were up to one and a half times as likely to be depressed, compared with women meeting PA guidelines and women sitting ≤4 hrs/day, respectively. Models that explored combinations of PA and sitting showed that the risk of depression increased gradually, up to a tripled risk, in those doing no PA and sitting >7 hrs/day. In prospective models, women doing no PA were 25% more likely to be depressed at the next survey 3 years later, compared with women meeting guidelines, but sitting was not prospectively associated with depression. Models of combined effects confirmed that only women doing no PA had a significantly increased risk of depression.

Discussion: Mid-aged Australian women not meeting PA guidelines and women who sit >4 hrs/day are more likely to be depressed. However, only women doing no PA have a greater risk of depression 3 years later. Based on these results, interventions in this population should focus on increasing PA in those who are physically inactive, in order to prevent future depression.

56 Mediators of the relationship between sedentary behaviour and depressive symptoms amongst disadvantaged women

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Introduction: The association between sedentary behaviour (e.g. time spent sitting watching TV/using the computer) and physical health has been well documented, with increasing research focussing on the relationship between sedentary behaviour and poor mental health (e.g. depression). However, very little is known about the underlying factors that may explain the link between sedentary behaviour and risk of depression. The purpose of this study was to investigate the contribution of selected intrapersonal and social factors in mediating the relationship between sedentary behaviour and depressive symptoms among women.

Methods: Cross-sectional survey data were provided by 4,065 women (aged 18–45). Women self-reported their sedentary behaviour (sitting time and screen time), depressive symptoms (CES-D 10), as well as a number of potential intrapersonal (weight status, leisure-time physical activity) and social (social cohesion, interpersonal trust, club membership) factors.

Results: Multiple mediating analyses showed that women's weight status, leisure-time physical activity and social cohesion partly explained the relationship between sitting time and increased risk of depression. Further, women's weight status, social cohesion and interpersonal trust were shown to partly explain the relationship between screen time and increased risk of depression.

Discussion: Acknowledging the cross-sectional nature of this study, these findings provide insights into explaining the link between sedentary behaviour and risk of depression. Specifically, findings suggest that there may be a number of underlying mechanisms at play to explain the increased risk of depression associated with greater time spent engaged in sedentary behaviour. The information may benefit the development of interventions targeting reductions in sedentary behaviour amongst women with depressive symptoms.

57 Characteristics of physical activity interventions for adults with mental illness: A review

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Introduction: Information on the characteristics of physical activity intervention studies can be used to suggest future directions in this area. The aim of this study was to examine the characteristics of physical activity intervention studies with adults with mental illness.

Methods: A literature search was conducted to identify journal articles published up to February 2012 that described physical activity intervention studies with measured psychological outcomes in adults (18–70 y) with mental illness. Studies were excluded if the sample was restricted to participants with eating disorders, or if data collection was retrospective, qualitative, or focused on acute effects of exercise. Data were extracted on sample and intervention characteristics.

Results: 24 unique studies met the inclusion criteria (18 RCTs, 6 pre/post). Study samples were comprised of outpatients only (n=8), community-based participants (n=8), inpatients only (n=4), or a combination (n=4). 17 studies constrained the sample to a particular diagnosis e.g. depression (n=9), a specific anxiety disorder (n=5), or schizophrenia (n=3); 7 studies included people across a range of diagnoses. Sample sizes ranged between 9 and 108 (mean=43; SD=31). Most interventions used aerobic exercise (n=9), walking only (n=4), or yoga (n=3), 10 allowed some choice in the exercise program. While not always identified, common exercise settings were hospital premises (n=8), or community gyms (n=5). Intervention duration ranged from 1–20 weeks, with the number of supervised sessions ranging from 1–7 per week. Activity programs tended to be supervised by e.g. an experienced instructor (n=10), mental health professional (n=4), or study personnel (n=4). Additional unsupervised exercise

was required in 7 studies. 16 studies involved exercise in groups. Additional intervention program components included activity counselling (n=4), health seminars (n=2), individual exercise tailoring (n=2), providing exercise apparel (n=2), pairing with a staff exercise buddy (n=1), using family members to prompt exercise (n=1), and exercise monitoring by carers (n=1) or a psychologist (n=1). Incentives were used in 4 studies and included food vouchers, money or course credit. Attrition rates ranged from 0–44% (mean=17%; SD=12%). Reported rates of adherence ranged from 47% to 100% (mean=76%; SD=40%).

Discussion: Most studies were group based aerobic physical activity interventions, with people with the same type of mental illness, in a hospital based or gym setting. Few studies have tailored program characteristics to participant preferences, offered programs with more physical activity options, or worked with heterogeneous patient groups.

58 Impact of APOE e4 on the association of physical activity and cognition in older adults with memory complaints

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Introduction: We have previously demonstrated that a 6-month home-based physical activity (PA) program improves cognitive function in older adults with memory complaints. Post-hoc analysis revealed that APOE e4 non-carriers benefitted more from the intervention than carriers.

Aim: To investigate whether APOE e4 modifies the cross-sectional association between PA and cognitive scores.

Methods: Dementia-free participants with memory complaints (N=170) were recruited from memory clinics and the community to participate in a randomized controlled trial of PA. A pedometer worn for 7-days measured PA at baseline. We assessed memory and cognitive function with a battery of neuropsychological tests. APOE e4 genotype was determined using standard procedures. Demographic, lifestyle, medical, physical and psychological characteristics were determined. We examined the relationship between baseline cognitive measures and PA stratified according to the presence of the APOE e4 allele taking into account other measured factors in multiple regression models.

Results: Mean age was 68.5 (±SD 8.6) years; 29% were doing 10,000 or more steps/day and 51% were women. Lower age (P<0.01) higher education (P<0.01) higher PA (P<0.01) and lower waist/hip ratio (P<0.05) were associated with higher memory scores (word list immediate recall from the Cognitive battery of the Consortium to Establish Register for Alzheimer's disease). Higher education (P<0.01) higher PA (P<0.001) and being an APOE e4 allele non-carrier (P<0.05) were associated with a better cognitive and functional level (CDR sum of boxes, Clinical Dementia Rating). Lower age (P<0.001), no family history of neurological conditions (P<0.05) and higher PA level were associated with a higher score on a global measure of cognition (Mini Mental State Examination–MMSE). This model showed a significant interaction of PA and APOE e4 (P<0.05) with the PA effect for APOE e4 allele non-carriers being three-fold that of carriers.

Discussion: Higher level of PA was consistently associated with better cognitive and functional level. The APOE e4 genotype attenuated the effect of PA on cognition and function suggesting that genetic factors might impact on the beneficial effects of PA. Identifying those who are likely to benefit the most from PA interventions may enhance the effectiveness of interventions. It will also enable more targeted combined interventions to be designed for those individuals less likely to achieve the benefits of PA alone.

59 Dose-response relationship between cardiorespiratory fitness and morbidity/mortality: a systematic review and meta-analysis

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Introduction: A low level of cardiorespiratory fitness is associated with higher risk of several types of morbidity and mortality. In 2006, Japan's Ministry of Health, Labour and Welfare published "Exercise and Physical Activity Reference for Health Promotion 2006". This report showed reference values and ranges of maximal oxygen uptake for health promotion. However, there are few epidemiological studies that have investigated the relationship between these values and ranges in relation to morbidity and mortality. Thus, we performed a systematic review and meta-analysis to assess the dose-response relationship between cardiorespiratory fitness and several types of morbidity as well as all-cause mortality risk reduction for men under 60 years of age in the general population. Furthermore, we evaluated the reference values and ranges using the pooled dose-response regression equation.

Methods: We did electronic searches in the PubMed and the ICHUSI, which is the largest medical database in Japan, and manual searching of reference lists until March 2011. We searched for papers to identify prospective cohort studies investigating cardiorespiratory fitness and non-communicable diseases (NCD--obesity, metabolic syndrome, hypertension, dyslipidemia, diabetes, stroke, heart disease, cancer, osteoporosis, dementia et al.) morbidity and all-cause mortality among males. We used meta-regression analysis for trend estimation to derive pooled dose-response estimates, and random-effects meta-analysis to estimate risk reduction in each cardiorespiratory fitness category.

Results: Thirty one cohort studies were included in the overall analysis, which incorporated 428,279 participants free of NCD at baseline. The pooled linear regression equation was $\log y=-0.05615 -0.03154$ METs (P<0.001). This equation indicates that 1 MET increment of cardiorespiratory fitness is associated with a 3.1% lower risk of NCD morbidity and mortality. In categorical analyses, individuals who had 10.9 METs (nearly reference value of 2006 guidelines for 40 to 49 years old males) had a 34% lower risk of NCD morbidity and mortality (relative risk, 0.66; 95% confidence interval, 0.62 to 0.70) compared with lowest fitness value (8.2 METs).

Discussion: These results show that there is a significant dose-response relationship between cardiorespiratory fitness and morbidity/mortality among men. Men in the upper range of the reference values of maximal oxygen uptake for health promotion have a lower relative risk.

60 Low dose physical activity attenuates cardiovascular disease mortality in men and women with clustered metabolic risk factors

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Introduction: Physical activity may ameliorate the health hazards of metabolic disorders but evidence is inconclusive, and estimates of the minimal threshold for protection remain unknown.

Methods: The sample comprised 23,747 men and women (aged 54.1±[SD 12.7 yrs], 45.2% men) without known history of CVD at baseline who were drawn from the Health Survey for England and the Scottish Health Survey. Based on blood pressure, HDL-cholesterol, diabetes, waist circumference, and low grade inflammation (C-reactive protein ≥3mg/l), participants were classified as metabolically healthy (0 or 1 metabolic abnormality) or unhealthy (≥2 metabolic abnormalities). Self-reported weekly frequency of physical activity of moderate to vigorous intensity (including but not limited to walking for any purpose, cycling for any purpose, team sports, racquet sports, fitness club/gym-based activities, aerobics, dancing, golf, and running) was assessed at baseline. Cox proportional hazards models were used to examine the association of clustered metabolic risk and physical activity with mortality, controlling for age, sex, smoking, socioeconomic group, CVD medication, and self- rated health.

Results: Over 7.0±3.0 years follow up there were 2264 all-cause and 717 CVD deaths, respectively. A physical activity threshold of at least one session per week (lasting for at least 30 minutes for walking or for at least 15 minutes for cycling and other sports/exercise modes) was found to provide protection against mortality, for example metabolically unhealthy participants reporting one to two sessions of activity per week had a 49% (95% CI, 15–70%) reduced risk of CVD death and a 33% (95% CI, 13–48%) reduced risk of all-cause mortality after adjustment for covariates. Compared with active/metabolically healthy, the active with clustered metabolic abnormalities were not at elevated risk of CVD (Hazard ratio [HR]=0.82, 95% CI, 0.54–1.26) or all-cause mortality (HR=1.11, 95% CI, 0.89–1.39), although their inactive counterparts were at elevated risk of CVD (Hazard ratio [HR]=1.41, 95% CI, 1.05–1.91) and all-cause mortality (HR=1.50, 95% CI, 1.27–1.78).

Discussion: At minimum, a weekly bout of moderate-intensity walking lasting for at least 30 minutes or moderate to vigorous cycling and other sports and exercise modes lasting for at least 15 minutes is protective in men and women with clustered metabolic abnormalities.

61 The impact of cycling on cardiovascular disease: 8 year follow-up of the population-based EPIC-Norfolk cohort

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Introduction: Cycling, particularly for transport, is promoted as a way of increasing regular physical activity among adults while providing environmental benefits. Longitudinal studies have demonstrated specific associations between commuter cycling and reduced all-cause and cardiovascular disease (CVD) mortality. However, these associations have been reported only for the highest exposure groups reporting substantial volumes of cycling (>180 min/wk). We therefore examined the associations between CVD and lower volumes of total, and domain specific, cycling in a population of UK adults.

Methods: Population-based prospective cohort study (EPIC-Norfolk). Participants aged 40–79 years recruited from general practices attended a health examination between January 1998 and October 2000 and completed a validated physical activity questionnaire (EPAQ2). They were followed until 31st March 2008 for CVD events, defined as either hospital admission or death due to stroke, coronary heart disease or other vascular disease. Using a Cox proportional hazards model we examined the association between measures of commuting, all utility (commuting and other travel) and recreational cycling (none, 0 to 60 min/wk, ≥60 min/wk) and any CVD event. Models were first adjusted for age, sex and education level and then further adjusted for smoking status, anti-hypertensive and lipid lowering medication, family history and all other physical activity. These analyses were based on 13,192 participants with complete data.

Results: 3,295 (25%) participants experienced CVD events over an average follow-up of 7.7 years (SD=2.4). Rates of utility cycling were low: 19.9% (n=2625) reported between 0 and 60 min/wk and a further 10.4% (n=1371) reported more than 60 min/wk. Associations between CVD and utility, recreational and total cycling were significant in minimally adjusted models: cycling for up to 60 min/wk was associated with an 11% reduction in risk (95% CI 0.81 to 0.98) and cycling for ≥60 min/wk with a 15% reduction in risk (95% CI 0.75 to 0.97) of any CVD event. After adjustment for lifestyle factors only recreational cycling (≥60 min/wk) remained significantly associated with a reduced risk (HR 0.83, 95% CI 0.70 to 0.99).

Conclusion: In this population with low levels of cycling, there was a trend towards a lower risk of CVD with increasing levels of cycling. Our findings provide tentative support for a dose-response relationship between cycling and CVD. They suggest that a protective effect may be obtained from a lower weekly duration of cycling than previously reported and that recreational cycling may have a greater effect than utility cycling.

62 Dose response relationships between physical activity, walking and health-related quality of life in mid-age and older women

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Introduction: Although leisure-time physical activity (LTPA) is associated with health-related quality of life (HRQL), the nature of the dose-response relationship remains unclear. The aims of this study were to 1) examine the concurrent and 6-year prospective dose-response relationships between both LTPA and walking with physical and mental HRQL in mid-age and older women and 2) describe the nature of these dose-response relationships.
Methods: Participants were 10,698 women born in 1946–1951 and 7,646 born in 1921–1926, who completed three mailed surveys for the Australian Longitudinal Study on Women's Health. They reported their weekly minutes of walking, moderate LTPA, and vigorous LTPA, and a summary LTPA score was computed that accounted for differences in energy expenditure between the three LTPA types. HRQL was measured with the Medical Outcomes Study Short-Form 36 Health Status Survey (SF-36). Physical and Mental HRQL Component Summary scales served as overall outcome measures of physical and social/emotional HRQL. Effects on physical functioning, mental health and vitality SF-36 subscales were examined separately. Multivariable linear mixed models, adjusted for socio-demographic and health-related variables, were used to examine associations between LTPA level (none, very low, low, intermediate, sufficient, high, and very high) and SF-36 scores. For women who reported walking as their only LTPA, the same modelling was used to examine associations between walking and SF-36 scores.
Results: Curvilinear trends were observed between LTPA and walking with SF-36 scores. In most concurrent models, HRQL scores increased significantly with increasing LTPA and walking, in both cohorts, with increases less marked above sufficient activity levels. The strongest associations were observed for physical functioning and vitality. Prospectively, associations were attenuated, although significant and meaningful improvements in physical functioning and vitality were observed across most LTPA and walking categories, with gains levelling beyond the sufficient level. Overall, stronger associations with physical HRQL were noted for older women than mid-age women, with older women enjoying more physical HRQL benefits from just walking than their mid-age counterparts.
Discussion: For women in their 50s–80s without clinical depression, greater amounts of LTPA are associated with better current and future HRQL, particularly physical functioning and vitality. Even if walking is their only activity, women, particularly those in their 70s–80s, have better HRQL. Our study extends previous work by demonstrating curvilinear trends for both LTPA and walking in two age cohorts of women and documenting that even lower levels of LTPA than currently recommended offer health benefits.

63 Non-exercise physical activity, the metabolic syndrome, cardiovascular event and all-cause mortality in Swedish older adults

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Introduction: There is clear evidence for the health benefits of regular exercise. Meanwhile, sedentary behavior resulting in limited light-intensity non-exercise physical activity (NEPA) is increasing and has recently been recognized to increase the risk for several common public health diseases and mortality. Though, in Sweden, cross-sectional as well as prospective evidence for beneficial effects on health and longevity in older adults by maintaining an active everyday life, regardless of regularly exercising or not, is limited.
Methods: Every third 60 year old man and woman in the Stockholm County, Sweden, was invited to participate in the study. Four thousand two hundred and thirty-two individuals (2039 men, 2193 women), 77%, participated and underwent physical examination and laboratory test, and completed a questionnaire. A NEPA index was derived from the questionnaire, and subsequently divided into sex-specific tertiles (low, moderate and high levels of NEPA). Exercise was dichotomized into regular, weekly physical activity on at least moderate intensity or not. Prevalence of the metabolic syndrome was established at baseline, and the individuals were followed prospectively for an average of 11.5 yr for the ascertainment of a CVD event and mortality status. 205 subjects were excluded from the analysis due to cardiovascular disease at baseline.
Results: At baseline, the adjusted odds ratio (OR) for having the metabolic syndrome was lower for moderate, 0.83 (95% CI: 0.65–1.07) in women and 0.90 (0.70–1.17) in men, and high, 0.68 (0.51–0.90) in women and 0.64 (0.48–0.85) in men, levels of NEPA, compared with low levels (reference). The prospective analysis revealed a reduced risk for CVD event in both moderate, OR 0.87 (0.70–1.09), and high, OR 0.72 (0.56–0.93), NEPA levels compared with low. For all-cause mortality, the OR was lower in moderate, 0.80 (0.62–1.03) and high, 0.74 (0.55–0.98), levels of NEPA.
Discussion: Moderate and high levels of NEPA, compared to low and regardless of regular exercise, were in a dose-response manner associated with a decreased risk of having the metabolic syndrome in older adults. Also, the risks for suffering a CVD event as well as mortality from all causes were reduced by attending moderate or high levels of NEPA. Promoting light-intensity non-exercise activity during the day as well as regular exercise are important for future health.

64 Dose response between physical activity and physiological outcomes: a randomised controlled trial*

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Introduction: While numerous studies have investigated the effect of physical activity (PA) on various health outcomes, few have been specifically designed to investigate the dose-response relationships, particularly in a free-living environment. The aim of this study was to investigate the dose-response relationships between PA and physiological variables in an ecologically valid setting.

Methods: Sedentary adults [n=108, age (mean±SD) 41.2±11.0 yr; body mass index 26.1±5.1 kg/m^2] were randomly assigned to a 6-week extensive (~300 min/wk) or moderate (~150 min/wk) exercise group or a control group. The program consisted of both instructor-led group classes using a wide variety of types of exercise (ranging from dance to kayaking), and individual self-directed exercise sessions. Physical activity level (PAL) and minutes spent in moderate to vigorous physical activity (MVPA) were measured using the Multimedia Activity Recall for Children and Adults, a 24-hour use of time recall. Weight, skinfolds (triceps, biceps, subscapular, iliac crest), resting metabolic rate (RMR) (indirect calorimetry via a ventilated hood), resting heart rate (RHR), blood pressure, fasting blood glucose, total serum cholesterol concentration and VO$_2$max (sub-maximal bicycle ergometer test) were measured at baseline and end intervention. Analyses were conducted using repeated measures ANOVA and effect sizes (Cohen's d) were calculated for each response variable according to group.

Results: Following the intervention, significant changes were seen in physical activity; PAL [mean change: control, moderate, extensive] 0.02, 0.20, 0.09, p=<0.001), MVPA (-6.0 minutes, 36 minutes, 35 minutes, p=0.002) and anthropometric variables; body weight (-0.1 kg, -0.6 kg, -1.1 kg, p=0.03), waist circumference (0.0 cm, -0.9 cm, -2.1 cm, p=0.03), hip circumference (0.1 cm, -1.1 cm, -1.6 cm, p=0.03) and VO$_2$max (0.8 ml.kg.min^{-1}, 4.1 ml.kg.min^{-1}, 5.4 ml.kg.min^{-1}, p=0.001). No significant changes were seen in other variables (sum of skinfolds, RMR, RHR, fasting blood glucose, total serum cholesterol concentration and blood pressure). Changes in PA variables were of moderate–large magnitude [PAL (Cohen's d: moderate, extensive) 0.60, 1.33; MVPA 0.60, 0.56], as was the change in VO$_2$max (0.58, 0.64). All other changes were of small magnitude (body weight -0.04, -0.07; waist circumference -0.07, -0.16; and hip circumference -0.09, -0.18).

Discussion: As expected, the extensive load led to larger changes in the physiological variables than the moderate load. However, responses appeared to be curvilinear suggesting that further gains for the extensive group were relatively small given the doubled exercise volume. This would provide some support for current PA guidelines recommending 150 min/wk of MVPA.

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65 Does total physical activity modify the association between working hours and all-cause mortality? The EPIC-Norfolk cohort

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Introduction: Several studies have shown detrimental effects of long working hours on various health outcomes including hypertension, cardiovascular disease and mortality, diabetes type 2 and psychosocial disorders. However, evidence of the association between long working hours and all-cause mortality is sparse and the potential modifying effect of physical activity (PA) is largely unknown. We hypothesized that PA may modify the association between working hours and all-cause mortality such that adverse health effects are less pronounced among active people.

Methods: We analyzed the association between worktime and all-cause mortality in a population-based cohort (European Prospective Investigation into Cancer and Nutrition, Norfolk-center, UK) of 11084 men and women aged mean (SD) 52.9 (6.4) years, who were employed and free from cardiovascular disease and cancer at baseline. PA was assessed using a 4-category index (inactive, moderately inactive, moderately active and active) validated against individually-calibrated heart rate and movement sensing. BMI, blood pressure and cholesterol were measured using standard procedures. Other covariates were self-reported. Weekly worktime was self-reported as a continuous variable and stratified into 4 categories: <35, 35–40 (reference), 40–55 and ≥55 h/week. Hazard ratios (HR) with 95% confidence intervals (95% CI) for all-cause mortality were estimated and adjusted for age, sex, PA-category, personal history of diabetes at baseline, family history of myocardial infarction, stroke and cancer, shift work, cigarette smoking, alcohol consumption, socioeconomic status, educational level, psychosocial job demands, BMI, systolic blood pressure, total cholesterol and daily energy intake.

Results: Median (IQR) follow-up time was 15.1 (14.0–16.3) years. There were 794 deaths (7.1 %). After adjustment for confounders, HR (95% CI) relative to the reference was as follows: 0.96 (0.76; 1.21) for <35 h/week; 1.02 (0.81; 1.28) for 40–45 h/week and 1.18 (0.89; 1.58) for ≥55 h/week, suggesting a linear trend (p=0.159). Interaction between PA-level and worktime-category was statistically non-significant (test for interaction: p=0.922) and stratified analyses by PA confirmed similar pattern of the association of interest in all PA-categories. An additional sensitivity analysis was conducted whereby deaths occuring in the first 2 years were excluded and the results remained unchanged.

Discussion: The findings indicate that long working hours may be associated with an increased risk of all-cause mortality, however the relationship was not statistically significant. PA does not appear to modify the effect of worktime on all-cause mortality. Despite no evidence of statistical significance in this study, PA should be promoted in occupationally active population as it confers substantial health benefits.

66 Sitting time and all cause mortality risk in 222,497 Australian adults

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Introduction: Prolonged sitting is considered to be a risk factor for several non communicable diseases independent of physical activity. However, research on sitting and health is still in its infancy and high quality evidence needs to be further accumulated. This study aimed to determine the independent relationship of sitting time to all-cause mortality in a sample of Australian adults aged 45 years and older.

Methods: We linked prospective questionnaire data from 222,497 individuals aged ≥45 years from the 45 and Up Study to mortality data from the New South Wales Registry of Births, Deaths and Marriages (Australia) for the period 1 January 2006 to 31 December 2010.

Cox proportional-hazards models examined all-cause mortality in relation to sitting time, adjusting for potential confounders, including sex, age, education, urban/rural residence, physical activity, body mass index, smoking status, self-rated health and disability.

Results: The mean follow-up time was 2.8 years, which resulted in 621,695 person-years of follow-up. During this period 5,405 deaths were registered. All-cause mortality hazard ratios (HR) were 1.02 (95% CI, 0.95–1.09), 1.15 (95% CI, 1.06–1.25), and 1.40 (95% CI, 1.27–1.55) for 4–8, 8–11, ≥11 hr/day of sitting, respectively, compared to less than 4hr/d of sitting, adjusting for physical activity and the other earlier mentioned confounders. Compared to an absolute all-cause mortality risk of 6.5 deaths per 1000 person years for participants with <4hr/day sitting and 150–299 min/wk of physical activity, the all-cause mortality risk was 13.6 deaths per 1000 person years for sitting ≥11hr/day and no weekly physical activity. The population attributable fraction for sitting was 6.9%. The association between sitting and all-cause mortality appeared consistent across the genders, age groups, BMI categories, physical activity levels, as well as across healthy people compared to people with pre-existing cardiovascular disease or diabetes.

Discussion: Prolonged sitting appears to be a risk factor for all-cause mortality, independent of physical activity. Public health programs should probably focus on reducing sitting time in addition to increasing physical activity levels.

67 The current level of sedentary behavior in Denmark. Is there scientific basis for recommending a reduction?

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Introduction: In a number of countries, health authorities have recently introduced official recommendations to reduce sedentary behavior in addition to already existing guidelines for promotion of physical activity. Council on Health and Disease Prevention (a privately funded Danish organization with the aim of providing knowledge-based information about disease-prevention) established a working group to investigate the scientific basis for introducing guidelines regarding sedentary behavior for children and adults in Denmark.

Methods: The scientific literature regarding correlates and health consequences of sedentary behavior was reviewed with emphasis on systematic reviews updated with published investigations through March 2012.

Results: The literature review showed that Danish adults have a high degree of sedentary behavior. Two surveys estimated, respectively, 3.3 and 6.1 hours/day of sedentary leisure time. Contrary to the first study, the latter included sitting during meals, visiting friends etc. Television viewing time has risen over the last few years and is currently reported at above 3 hours/day on average among adults. In addition, a large proportion (around 40%) of the workforce report having sedentary work. The knowledge about the amount of total sedentary time among Danish children is limited; however it is known that TV viewing, internet use and computer-game time has increased in recent years. Average TV viewing is reported to be 2.1 hours/day among 4–11 year olds and 2.3 hours/day among 12–19 year olds. We found moderate to strong evidence to support a longitudinal relationship between TV viewing and health outcomes in adults (e.g. heart disease and type 2 diabetes) and children (e.g. BMI and aerobic fitness). These associations were also present after adjustment for physical activity. However, the evidence that the 2 hours/day limit represents a particular threshold where any further reduction in viewing time only leads to negligible additional benefit is not convincing.

With regard to the association between non-specific sedentary time, and sedentary time at work and health outcomes, there is mounting evidence from cross-sectional and longitudinal studies showing associations between sedentary behavior and health outcomes, but also studies showing no associations. There is a lack of long term randomized trials to test whether reduction of sedentary behavior is feasible and effective.

Discussion: This review suggests, that a non-quantified recommendation to reduce sedentary behavior (in particular TV-viewing) in children and adults is supported by the scientific literature. Such a recommendation could be a worthwhile addition to the current Danish guidelines for physical activity of moderate to high intensities.

68 Creating an evidence based planning tool to predict physical activity and obesity impacts of community design alternatives

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Introduction: Evidence based decision support tools are needed to advise planners, health practitioners, and community stakeholders of the likely health impacts of alternative approaches to land development and transportation investment. Considerable evidence now documents relationships between residential density, land use mix, street connectivity, and retail floor area ratio (walkability) and transportation related physical activity and obesity. However, little work has included sidewalk coverage, topography, and traffic volume within these analyses, nor to convert results into format decision-makers can use.

Methods: California Health Interview Survey (CHIS) participants' (N=18183) in San Diego County provided physical activity, dietary, obesity, and demographic data which was matched to walkability, sidewalk presence and completeness, transit access, road characteristics, and crime data. Linear, logistical, and mixed methods models were used to evaluate relationships between these built environment features, physical activity, and obesity levels while adjusting for socio demographic characteristics. Models were developed for children, teens, and adults across a wide range of outcomes. Built environment measures are based on a 1 kilometer network area around participants' residence. Results were coded into the software "CommunityViz" planners use to evaluate environmental impacts of community design. The tool was then piloted within two health impact studies in San Diego.

Results: Minutes spent walking to school (N=947) was positively associated with density of middle schools, intersection density, transit access, sidewalk coverage and with gender, age, race, household/parents' education, employment, marital status, and income. A 10% increase in built environment factors=5% increase in minutes walking to school. Obesity (N=18183) was positively related with traffic volume, yet inversely with park area, steep slopes, retail FAR, intersection density, grocery store density, and sidewalk coverage. A 10% increase in built environment variables=1.08% decrease in % overweight/obese.

Discussion: Relationships between sidewalk coverage, topography, traffic volume and other factors' relation with physical activity and obesity are presented. Sensitivity testing conveyed the degree of change in physical activity and obesity associated with changes to modifiable environmental features. Results will likely inform land use and transportation decisions in San Diego and have been incorporated into planning tools in that region. A pilot is being conducted at present of the resulting tools which will be available for presentation at ICPAPH.

69 Developing a bikeability index to score the biking-friendliness of urban environments

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Introduction: Cycling for transport is a sustainable solution to reduce traffic congestions, counteract air pollution and improve public health. A growing body of evidence demonstrates that the built environment correlates with the cycling behavior. It is hypothesized that bicycle-friendly changes in urban design increase the level of cycling. The purpose of the study was to develop a bikeability index for urban environments and to create a bikeability map for the city of Graz, to identify local biking-friendliness.

Methods: For 278 bike trips, recorded by Global Positioning System (GPS), we assessed differences in distance and environmental characteristics along the actual and the shortest possible routes to better understand the route choices of cyclists. The characteristics which statistically significantly differed between the actual and shortest routes (t-test and Wilcoxon test) were used to calculate an additive score for 100[m] x 100[m] cells. These scores were transformed into colors (red: not biking-friendly to green: very biking-friendly) and combined to a colored map using Geographic Information Systems (GIS).

Results: Five key environmental components were statistically consistently related with route choice: cycling facilities, cycle path separated from streets, green areas, main roads, and topography. Those components were combined to form the bikeability index. The final outcome is a high-resolution colored map indicating the degree of biking friendliness in different areas of Graz.

Discussion: The map for Graz shows that the conditions for cyclists vary considerably between neighborhoods. While the inner city and the areas along the river score high, zones in the outer city generally have lower scores for good bikeability. The bikeability index and its five components are a powerful tool to learn about cycling environments. The number of cycling-related environmental characteristics is reasonably small to create an informative index of bikeability, and the GIS-data of these components are widely available in order to produce the bikeability map in other regions. Mapping bikeability helps to visualize locations where a development of infrastructure for cycling is needed and it is the starting point in communities for planning the promotion of cycling.

70 Validity of the Microscale Audit of Pedestrian Streetscapes (MAPS)

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Introduction: Some macro-level built environment factors (e.g. street connectivity) are well-documented correlates of physical activity. Micro-level elements of the built environment may also influence physical activity but have been studied less. The MAPS tool was designed to measure these features such as street design, transit stop availability, sidewalks, crossing amenities and design, social features (e.g. graffiti) and neighborhood aesthetics. This construct validity study examined MAPS summary scores in relation to walking for transportation.

Methods: MAPS data were collected in neighborhoods around participants in 4 age groups: children (mean age=9.1; n=718), adolescents (mean age=14.1; n=877), adults (mean age=44.4; n=1631), and older adults (mean age=76.7; n=455) in 3 regions of the USA. MAPS was completed along a .25 mile route from participant homes toward the nearest non-residential destination. The 5 components of MAPS demonstrated good inter-rater reliability (ICC range 0.477 to 0.855; median ICC=0.708). Positive and negative subscales were constructed for each component and an overall score was the difference between the summed positive and summed negative scores. Walking for transportation was measured with age-appropriate surveys (ActiveWhere? survey for children and adolescents, GPAQ for adults, CHAMPS for older adults). Spearman's rank order correlations were computed between walking for transport and MAPS scores.

Results: Positive Destinations and Land Use was positively associated with walking for transport in all age groups (r_s range: 0.159–0.355; p<.01), as was positive Streetscape (r_s: 0.083–0.220; p<.01), positive Segments (r_s: 0.134–0.314; p<.01) and the Overall Score (r_s: 0.114–0.362; p<.01). Negative Segments was negatively associated with transport walking in all age groups (r_s: -0.075–-0.191; p<.01) as was negative Streetscape (r_s: -0.089–-0.202; p<.01). Positive Crossings was positively associated in children, adolescents and seniors (r_s: 0.079–0.227; p<.05) and negative Crossings was negatively associated in seniors only (r_s: -0.187; p<.01). Positive Aesthetics and Social features was not associated in any age group while negative Aesthetics and Social features was positively correlated (r_s: 0.104–0.129; p<.01) in adults and adolescents.

Discussion: All components of MAPS, except the Aesthetics and Social environment, demonstrated significant associations with walking for transportation in multiple age groups, although strength of the associations varied across age groups. Results generally support the construct validity of the MAPS tool and its scoring system. MAPS can identify several modifiable specific built environment features that are related to transportation walking.

71 Effect of neighbourhood space syntax on the frequency of walking in Edmonton, Canada

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Introduction: The walkability of a neighbourhood has traditionally been determined based on a combination of destinations (attractions), design (street layout), and density of the neighbourhood (e.g. the 3d measures of walkability). Recently, space syntax measures have been introduced to public health to assess walkability based on the spatial layout only. Our aim was to elucidate the effects of neighbourhood walkability on walking within the International Physical Activity and the Environment Network (IPEN) framework. Though other IPEN studies have conceptualized walkability based on the traditional 3d measures, we conceptualized neighbourhood walkability based on the space syntax measure of choice. Specifically, choice captures the potential of each street segment to be located on the shortcut between all segments and all other segments in a spatial layout.

Methods: The Fitscapes survey was conducted in February 2009 to assess physical activity, health, socio-demographics, and environmental

perceptions of adults living in Edmonton, Alberta. Frequency of walking was assessed as the number of days in which respondents walked for at least 10 minutes at a time in the previous week. A Geographic Information Systems database was created to assess neighbourhood walkability and socio-economic status (SES) across 234 neighbourhoods. Walkability was determined based on the average value for choice for all street segments in each neighbourhood, using street data provided by the City of Edmonton. SES was determined based on educational attainment information from the Canadian Census 2006. Then neighbourhoods were stratified by walkability and SES. Adult residents (n=1092) of 32 neighbourhoods were contacted using random-digit dialing. A two-way ANOVA was employed to estimate the effects of neighbourhood walkability and neighbourhood SES on the frequency of walking.

Results: A significant main effect of neighbourhood walkability was found [$F_{(1,1088)}$=9.56, p=0.002], although the effect size was small (partial η2=0.009). The main effect for neighbourhood SES [$F_{(1,1088)}$=1.29, p=0.256] and the interaction effect between neighbourhood walkability and neighbourhood SES [$F_{(1,1088)}$=0.182, p=0.670) did not reach statistical significance.

Discussion: Neighbourhood space syntax walkability has a small, but significant effect on walking frequency, indicating that space syntax is a promising instrument to employ in examining walking. Interventions should focus on individuals living in lower walkability neighbourhoods, to enhance walkability and to increase awareness about the benefits of walking. Our study may contribute to improving the conceptualization of urban form influences on physical activity in public health research, by employing a space syntax measure to assess walkability.

72 Walk score and poverty in American cities

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Introduction: Environmental factors are thought to impact obesity; for instance food deserts are urban areas with poor access to fresh foods. Similarly, environmental variance might explain differences in urban physical activity levels. Our prior work examined poverty, obesity and sedentariness in 3,139 Counties across the United States. Poverty, obesity and sedentariness track together. People living in the poorest counties report greater sedentariness, obesity, WIC access and chronic diseases such as diabetes. Since three quarters of Americans live in cities; we wondered whether cities with the greater rates of poverty had the poorest Walk Score (a geospatial algorithm of an area's attractiveness of walking; a high score is walk-favorable a low score reflects high car use).

Methods: We analyzed data from, 520 American cities (defined as a population >30,000 people) examining data from 103,405,474 people; a third of the US population. Data on income were available from 102,586,417 people. The Walk Score for all 520 cities was determined from Street Smart Walk Score algorithm derived from the Active Living Research (Robert Wood Johnson Foundation http://activelivingresearch.org/). We compared Walk Score and city demographics between the 100 cities with the lowest poverty prevalence (6.4±(SD) 1.7%) with the 100 cities of great poverty prevalence 27.4±4.1%.

Results: The cities with greatest poverty had, as expected, lowest median family income ($43,604±$10,097 vs $89,613±$19,058; for all 520 cities there was a log linear relationship between these variables r2=0.77). Importantly too, the poorer cities had greater populations (197,128±235,305 vs 109,952±58,375 people). There was no relationship between city population and Walk Score. Unexpectedly, the cities with greater poverty and lower income, have the most favorable Walk Score (50.1±12.2 points) compared to wealthier cities (Walk Score 44±12.2; P<0.001).

Discussion: Cities with high poverty do not appear to be unfavorable to walking. Thus, the known association between sedentariness, obesity and poverty may not relate to the walkability of the city.

73 Association of street connectivity and traffic speed with park usage and park-based physical activity

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Introduction: Parks are important venues for physical activity (PA), but few studies have considered how access-related issues influence residents' use of parks for PA. The purpose of this study was to examine associations between street connectivity and traffic speed with neighborhood residents' use of parks and park-based PA.

Methods: Data were collected via questionnaire (27.4% response rate) from adults (n=893) in randomly-selected households within ½ mile of 60 parks in Kansas City, Missouri. Based on responses to validated frequency and duration questions, self-reported park use within the past month and minutes of park-based PA in a usual week were both dichotomized as some vs none. Street connectivity (intersection density) was calculated as the number of intersections (3+ segments) per hectare within a 1km network buffer around each participant, and was divided into quartiles. Network analysis in ArcGIS 9.3 was used to determine whether participants had to travel on or cross a road with traffic speed greater than 35mph to reach their closest park. Logistic regression examined the association between intersection density (reference group=lowest quartile) and traffic speed (reference group=high) with park use (none/some) and park-based PA (none/some). All analyses controlled for participant's age, sex, income, BMI, and the size, distance to, and attractiveness of their closest park.

Results: Almost half of participants used parks (43.7%) and engaged in some park-based PA (44.9%). Over two-thirds (69.4%) had a road >35 mph on the route to their closest park and the mean number of intersections/hectare within 1km was 0.54. Compared to those in the lowest intersection density quartile, participants in the third and fourth quartiles were more likely to both use parks and to engage in PA in parks (ORs=1.86–2.73, all p<.05). Likewise, compared to those who had a high speed road on their way to their closest park, participants with slower traffic routes to parks were more likely to use parks (OR=1.43, 95% CI=1.08–1.87), but were not necessarily more likely to engage in park-based PA (OR=1.12, 95% CI=0.71–1.78).

Discussion: In addition to research demonstrating the importance of park proximity and internal park features, ensuring direct and safe access to parks through street network design and traffic calming strategies may be key to facilitating park visitation and active park use. Future research should consider other access issues (e.g. sidewalks, transit) and should examine these relationships among at-risk population sub-groups (e.g. children, older adults, persons with disabilities).

74   Does the relationship between dwelling density and physical activity change with different neighbourhood boundaries?

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Introduction: The delineation of neighbourhood boundaries is an important issue in health research. Administrative boundaries are often used because they are convenient and because they make it easy to include secondary data in the analyses. However, administrative boundaries are unlikely to accurately represent an individual's exposure to the environment and may lead to spurious associations. Although there is an established relationship between the built environment and physical activity, it is possible that better definitions of neighbourhood boundaries will allow a more accurate assessment of this relationship. This study investigates the impact of using different neighbourhood boundaries on the relationship between dwelling density – a commonly used built environment measure – and objectively measured physical activity.

Methods: Data was sourced from the New Zealand Health Research Council funded URBAN study of the neighbourhood built environment and physical activity. 2033 adults aged 20–65 were recruited from 24 high and 24 low walkable neighbourhoods in four New Zealand cities. Each participant wore an accelerometer for seven consecutive days. Geographic Information Systems were used to create six different neighbourhood boundaries: an administrative boundary, aggregated administrative boundaries (five contiguous census areas with similar walkability characteristics), and network buffers at a range of scales (500m, 800m, 1000m, 1500m) centred on participants' residential addresses. Dwelling density was calculated for participants using each neighbourhood boundary. The relationship between the built environment and physical activity measures were then modelled using a multi-level mixed effect regression model.

Results: A ten dwelling per hectare increase in dwelling density was associated with a 6% increase in total accelerometer counts when neighbourhoods were defined using the administrative unit ($p<0.05$). For the aggregated administrative units, and the 500m and 800m buffers, the increase was 7% ($p<0.05$). For neighbourhoods defined using 1000m and 1500m buffers, the association between dwelling density and accelerometer counts was not significant at the 95% level.

Discussion: The association between dwelling density and objectively measured physical activity varied with neighbourhood boundary definitions. Neighbourhoods defined at larger scales did not yield significant results. Choosing an appropriate neighbourhood boundary at an appropriate scale is important. Further research on the effect of neighbourhood boundaries is needed for different built environment and outcome measures and also for different population groups.

75   An objective index of walkability for the Sydney metropolitan region

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Introduction: Walkability describes the pedestrian friendliness of built environments and is most consistently associated with walking for utilitarian purposes. Objective methods for characterizing the walkability of areas using geographical information systems (GIS) are available but technical and data requirements limit their utilization. This research aimed to construct and validate an objective index of walkability for metropolitan Sydney (Australia's most populous city) to facilitate research, policy and planning initiatives in this region.

Methods: Environmental measures of residential density, intersection density, land use mix and net retail area were compiled for 5,858 Census Collection Districts in Sydney using a GIS. Each environmental variable was divided into deciles, scored from 1 (lowest) to 10 (highest), and summed to give a single walkability index score, which was categorized into low, low-medium, medium-high and high walkability quartiles. The prevalence of reporting walking to work within Sydney Census Collection Districts at the 2006 Australian Census of Population and Housing adjusted for area-level median household income was used to validate the walkability index score.

Results: An abridged index of residential density, intersection density and land use mix was constructed for all metropolitan Sydney because net retail area was unavailable for 94.7% of Census Collection Districts; a full index including net retail area was calculated for 311 Census Collection Districts in the City of Sydney local government area. Abridged and full walkability index scores for these 311 areas were strongly correlated ($r=0.93$) and there was good agreement between walkability quartiles (weighted Kappa=0.73). Land use and density estimates were moderately to strongly positively associated for the greater Sydney metropolitan area ($r=0.26–0.67$). Prevalence of walking to work was 3% in low income-low walkability areas versus 7.9% in low income-high walkability areas, and 2.1% in high income-low walkability areas versus 11% in high income-high walkability areas. The odds of walking to work were 1.24 (1.20–1.27), 2.31 (2.25–2.37) and 6.15 (6.01–6.30) times higher in Census Collection Districts with low-medium, medium-high and high walkability compared to low walkability after controlling for household income.

Conclusion: The abridged walkability index for metropolitan Sydney is comparable to existing indexes that include net retail area and has demonstrated specificity for utilitarian walking behavior. The index utilizes the best available spatial data and is easily linked to existing data sources with address-level identifiers, reducing the need for high-level GIS expertise and potentially contributing to greater comparability across research, policy and planning applications.

76 Can publicly available webcameras and mechanical Turks be used to evaluate physical activity policy and built environment change?*

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Introduction: Fewer than 50% of adults and 40% of youth meet US CDC guidelines for physical activity (PA) with the built environment (BE) a culprit for limited PA. A challenge in evaluating policy and BE change is the forethought to capture a priori PA behaviors and the ability to eliminate bias in post-change environments. The present objective was to analyze existing public data feeds to quantify effectiveness of BE interventions. The Archive of Many Outdoor Scenes (AMOS) has collected 135 million images of outdoor environments from 12,000 webcams since 2006. Many of these environments have experienced BE change.

Methods: One example of BE change is the addition of protected bike lanes and a bike share program in Washington, DC. We selected an AMOS webcam that captured this change. AMOS captures a photograph from each webcam every half hour. AMOS captured the 120 webcam photographs between 0700 and 1900 during the first work week of June 2009 and the 120 photographs from the same week in 2010. We used the Amazon Mechanical Turk (MTurk) website to crowd-source the image annotation. MTurk workers were paid US$0.01 to mark each pedestrian, cyclist and vehicle in a photograph. Each image was coded 5 unique times (n=1200). The data, counts of transportation mode, was downloaded to SPSS for analysis.

Results: The number of cyclists per scene increased four-fold between 2009 and 2010 (F=36.72, p=0.002). There was no significant increase in pedestrians between the two years, however there was a significant increase in number of vehicles per scene (F=16.81, p<0.001).

Discussion: This novel research presents unobtrusive surveillance of PA policy and BE intervention effectiveness. Washington, DC, added bike lanes during 2009 and the use of webcam data allowed for a pre- and post-bike lane analysis of travel. The addition of the bike lane is associated with a significant four-fold increase in number of cyclist per scene. The number of vehicles per scene also increased. A portion of this increase may be associated with compressed lanes due to lane removal for the bike lane, thus increasing vehicles per remaining lane. Captured public webcam scenes and MTurks offer an inexpensive (US$12.00), discreet means to evaluate effectiveness of BE policy change and interventions. This abstract presents an initial effort. We continue to test methodology with additional scenes, including parks, school playgrounds, and safe routes to schools, and are working to automate the MTurk process.

*Shortlisted for the ICPAPH 2012 Early Career Research Award

77 In search of sports medicine success: Five lessons for clinical, team, and research success

PLENARY KEYNOTE
REFSHAUGE LECTURE

Australian Sports Medicine Federation Fellows Sponsored Speaker

K. Khan[1]* ▪ [1]University of British Columbia

Major General Sir William Dudley Refshauge, AC, CBE, ED, FRSH, FRCOG (3 April 1913–27 May 2009) was an Australian soldier and public health administrator. He was Honorary Physician to Queen Elizabeth II (1955–64), Director-General of the Commonwealth Department of Health (1960–73), and Secretary-General of the World Medical Association (1973–76). The Sir William Refshauge Lecture was inaugurated in 1999 and it is a tremendous privilege to give the 14th in this series. I believe this will be the first Refshauge lecture focused on how teamwork and team leadership influences success in work and sport (which for many audience members is the same thing). One of the major shifts in the 'information age' has been that from working individually to working in teams. Similarly, even in the so-called 'individual sports' champions acknowledge the critical contribution of the retinue of supporters of which the sports medicine/strength and conditioning team is just one element. The Refshauge Lecture provides an ideal opportunity for us to consider this 'big picture' issue – Why do some teams succeed and others are a nightmare to be part of? Because of the various disciplines that make up this exciting international meeting, I will define teams broadly – I will consider i) sporting teams, ii) the 'off-field teams' that support athletes via sports science and sports medicine, iii) research teams such as labs/research groups, as well as iv) workplace teams. It is the norm to apply 'data' and 'evidence' to make clinical decisions, to decide research strategy and to make policy. Given this platform then, please consider how much evidence to we apply to the critical process of i) forming teams and ii) contributing to clinical and research teams? Is this a 'random' or 'gut feel' process. Is that good enough in the 21st century? The vast majority of the participants in this 'Be Active 2012' conference have successful leadership roles in various organizations. What literature and evidence is there to guide this behaviour? For team success which is the greater priority – a compelling goal, effective communication, or trust? Do teams function better than individuals? What is the difference between a team and working group and when does it matter? A substantial body of evidence relates to both teams and leadership. The majority of it has been outside the setting or sport, some of it has been in the setting of academia and large organizations which are relevant to the workplace of many conference participants. I contend that the principles espoused by thought leaders in organizational behaviour and leadership such as Jon Katzenbach, Richard Hackman, Jim Collins, and John Kotter, to list a few, have enormous relevance to our daily lives. This work is based on research – studies of teams and leaders. This research has been cited many thousands of times. It is my hope that shining a light on this body of work will add value for conference participants by providing principles that can be applied immediately and, perhaps, inspiring further reading and study in this domain. I argue that teams and leadership are pervasive to all the disciplines that contribute to the Be Active 2012 conference.

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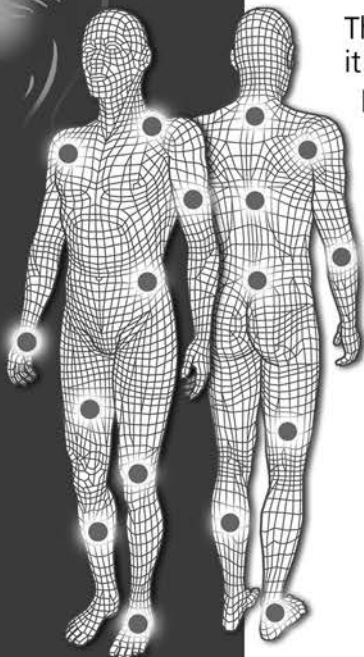*If symptoms persist consult your Healthcare Professional.*

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0815 – 0915	Tutorial Lecture	Measurement advances in physical activity, sleep, and strength: The US National Health and Nutrition Examination Survey	Rick Troiano	102	79
0815 – 0915	Workshop	Breast and bra fit: Optimising breast support during physical activity	Deirdre McGhee	103	80
0815 – 0915	Workshop	Taping for ankle instability – Treatment and prophylactic taping review	Kurt Robertson	104	81
0815 – 0915	Workshop	CPR Certification (HLTCPR211A)	Sports Medicine Australia	105	82
0815 – 0915	Workshop	The effects of pole walking on health in adults: A systematic review	Juliette Fritschi	106	83
0815 – 0915	Tutorial Lecture	How health research can contribute to planning processes: Views from planning	Norma Shankie-Williams Susan Thompson Peter McCue Chair: Takemi Sugiyama	201	84
0815 – 0915	Workshop	Diagnosis of tendonopathies with MSK ultrasound – an interactive ultrasound workshop	Lisa Briggs	203	85
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0815 – 0915	Tutorial Lecture	Lancet series on physical activity and public health	Adrian Bauman Pedro Hallal Brian Martin Mike Pratt Ross Brownson Bill Kohl Peter Katzmarzyk Chair: Adrian Bauman	204B	87
0930 – 1030	Keynote	The hare and the tortoise revisited: Measuring physical activity and sedentary behaviour	Kong Chen Chair: Tim Olds	Auditorium A	88
0930 – 1030	Keynote	What are the limits to human economy?	Art Kuo	Terrace	89
0930 – 1030	Symposium	Novices, amateurs and children in sports; Requirement of a joint effort in physical activity promotion, sports medicine, and injury prevention	Evert Verhagen	106	90
		Impact of injury on physical activity and return to sport	Belinda Gabbe		91
		Injury prevention in junior sport: Time for new priorities	Geraldine Naughton		92
		Self-reported skill level and injury severity in skiers and snowboarders	Claude Goulet		93
		Kinematic changes during fatigue and relations with core endurance in novice runners; a missing link for injury prevention?	Evert Verhagen		94
		SMA's role in bridging the gaps between different fields	Nello Marino		95

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		Associations of physical activity and sedentary time with weight status among school-aged girls and boys across five European countries	Ilse De Bourdeaudhuij		98
		Levels and bouts of sedentary behaviour and physical activity: Associations with cardio-metabolic health in overweight and obese children	Dylan Cliff		99
		Relationships between physical activity with BMI and percentage body fat among girls by locality in Tlokwe Local Municipality, South Africa: The PAHL-Study	Makama Andries Monyeki		100
		Do Canadian obese adolescents who meet the recommended sedentary behavior guidelines have higher resting metabolism and fitness?	Angela Alberga		101
		Does fatness predict fitness or vice versa? A two year longitudinal study in British 11–13 year olds	Gavin Sandercock		102
		Associations between walkability, physical activity and body fat in Hong Kong adolescents	Duncan Macfarlane		103
		The international study of childhood obesity, lifestyle and the environment	Peter Katzmarzyk		104
1100 – 1230	Ageing and physical activity: Patterns, associations and interventions Chair: Jannique van Uffelen Distinguished Discussant: David Buchner			103	
		How diverse was the leisure time physical activity of older Australians over the past decade?	Dafna Merom		105
		Prevalence and sociodemographic correlates of muscle-strengthening activity among Japanese older adults	Kazuhiro Harada		106
		Barriers and enablers to physical activity among older Australians who think they are insufficiently active	Rona Mcniven		107
		Access to neighbourhood commercial destinations and associations with walking in older Australians	Andrea Nathan		108
		Effect of daily physical activity on mobility maintenance in elderly Japanese	Akio Kubota		109
		Can a website-delivered computer-tailored physical activity intervention be acceptable, usable, and effective for older people?	Corneel Vandelano		110
		Intervention to increase older adults' physical activity: Results of the Epidoso Project, Brazil	Mirella Valerio		111
		Physical activity results of a home-based physical activity and nutrition program for seniors (PANS)	Linda Burke		112
		How is objectively measured physical activity associated with recurrent falls and fear of falling in older community dwelling men?	Barbara Jefferis		113
		Home exercise improved balance but increased falls in older community-dwelling people after hospital stays: An RCT	Catherine Sherrington		114

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		Impact exercise and bone mass in premenopausal women at or beyond peak bone mass	Peter Rich		118
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		Can people with lifestyle related chronic disease BEAT IT through physical activity and education?	Erin Freeman		120
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		Doping in sports (Part 2): (D)etermination, (O)bservance, (P)ermissibility or (E)ducation?	Benjamin Koh		128
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			Chair: Jim Sallis		
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	Chair: Wendy Brown				
	Distinguished Discussant: Peter Katzmarzyk and Berit Heitman				
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78 The business of publishing

WORKSHOP

G. Kolt* ▪ ¹University of Western Sydney

The business of publishing not only involves getting your own work published and disseminated for wider use, but also contributing to the process by which other research is peer reviewed and considered. Publication of research and clinical practice material is an important and integral part of the research process, as it provides a wider audience with the benefit of work undertaken. Dissemination of such work can take the form of original research reports, reviews of literature (many of which will grade the evidence available for particular questions), the presentation of case studies that will be of interest and clinical importance, reports of clinical trial protocols, or, on occasion, informed opinion pieces and editorials. Selecting the best outlet for your work (depending on its nature) can be tricky, and needs to be well considered in relation to the optimal audience and reach.
The increasing number of journals in the sport and exercise medicine and science areas provides greater choice in selecting appropriate avenues for dissemination. Despite an increasing number of journals that consider work in the sports medicine and science areas, journals have been facing a markedly increased number of submissions for consideration. This often results in journals having to make difficult decisions about which papers it considers most worthy for publication, and a consequent number of good papers that simply cannot get published. At the journal's end, there is a strong reliance of the goodwill of a large bank of reviewers who can pass judgement (in a structured and constructive manner) on the papers under consideration. The general aim of this workshop is to provide a platform from which participants can understand more about the process of getting their work accepted for publication, and also provide an insight into the importance of the peer review process in the business of publishing.

79 Measurement advances in physical activity, sleep, and strength: The US National Health and Nutrition Examination Survey

TUTORIAL LECTURE

R. Troiano¹* ▪ J. McClain¹ ▪ ¹US National Cancer Institude, NIH

Reported physical activity has been assessed in the National Health and Nutrition Examination Survey (NHANES) since NHANES I (1971–1973). Accelerometer-based physical activity assessment was included in the 2003–2006 survey cycles. NHANES 2003–2006 accelerometer data were the basis of more than 50 publications as of December 2011, including several analyses that focused attention on health effects of sedentary time. The presence of both reported and device-based physical activity measures highlighted the differences obtained with the two methods and has stimulated new thinking about the roles of self-report and device-based measures. NHANES 2011–2014 includes an accelerometer component with three substantial modifications. First, monitor technology was updated to the ActiGraph GT3X+, which has a water-resistant case and will log 80 Hz raw acceleration data (milli-g) in three axes and ambient light for 8 days. Second, the sensor location was changed from the waist to the non-dominant wrist. Finally, the monitoring period was changed from waking hours to continuous (24hr/day) wear. These protocol modifications were selected to 1) enhance wear compliance, 2) enable simultaneous monitoring of physical activity and sleep, and 3) allow data processing flexibility as methods evolve. In addition to the accelerometer for activity and sleep measures, body strength is being measured by hand-grip dynamometer with 3 trials for each hand. Accelerometer measures are being obtained on survey participants aged 3 year and older and strength is being measured on participants aged 6 years and older. This presentation will provide an overview of physical activity measurement in NHANES with a focus on the objective measures currently being obtained. Lessons learned from simultaneous physical activity reports and accelerometer measures will be discussed. Planned outcome variables from the NHANES 2011–2014 accelerometer component will be described. Wrist wear of a water-resistant accelerometer in NHANES 2011–2014 has improved component compliance and added sleep monitoring. The survey will provide researchers with valuable nationally representative objective data from the United States on physical activity, sleep, and body strength for children, adults and older adults.

80 Breast and bra fit: Optimising breast support during physical activity

WORKSHOP

D. McGhee¹* ▪ ¹University of Wollongong

Introduction: Insufficient breast support during physical activity leads to excessive breast movement. This has been found to be a barrier to females participating in physical activity due to both breast discomfort and embarrassment. Excessive breast movement and discomfort can also negatively affect sporting performance through changes in both the posture and movement of the upper limbs and trunk. Consequently, correct breast support is an important factor for all females to consider, and is an important educational issue to promote physical activity in females and optimise sporting performance in female athletes.
Methods: Sufficient breast support requires both a supportive bra design and correct bra fit. The level of breast support required varies with the age, bra size and the type of physical activity. This practical evidence-based workshop shows how to optimise breast support by providing simple guidelines of how to choose a supportive bra to wear during physical activity and ensure that it fits correctly. Educational strategies on how to inform specific sub-groups such as female sporting teams, patient populations and adolescents with mother/daughter sessions, will also be covered. Free educational resources that can act as an ice-breaker to bring up this important but sensitive topic will also be available.
Results: Participants will leave the workshop with both the skills and resources to optimise breast support in active women across a wide range of ages, bra sizes and activity levels.

81   Taping for ankle instability – Treatment and prophylactic taping review

WORKSHOP

K. Robertson[1]* ▪ [1]Newcastle Podiatry

Kurt Robertson will be presenting a hands on workshop on rigid taping for the ankle. Kurt is a Podiatrist at Newcastle Family and Sports Podiatry currently treating the Newcastle Knights NRL squad and the Newcastle Jets A-League squad. This workshop will include methods used at an elite athlete level for acute lateral ankle injury as a part of the early rehabilitation program. It will also encompass acute and chronic medial ankle injury, high ankle sprains and prophylactic ankle taping for chronic ankle inversion. All participants will be assured a practical component to ensure relevant clinical adaptations are achieved.

82   CPR Certification (HLTCPR211A)

WORKSHOP

Sports Medicine Australia

This Workshop is designed to provide a CPR update with a Sports Medicine flavour. It provides an ideal opportunity for Sports Medicine Clinicians to up skill in a credentialed emergency resuscitation hands on session. It is primarily provided for Doctors, Physiotherapists, Podiatrists or any other health professionals who require an annual update for their daily work and to fulfill the requirements for their professional education or registration. The workshop will fulfill the updated 2011 guidelines of the Australian Resuscitation Council and all participants will receive a Statement of Attainment as Nationally Recognised Training for HLTCPR211A-Perform CPR.

83   The effects of pole walking on health in adults: A systematic review

WORKSHOP

J. Fritschi[1]* ▪ **W. Brown[1]** ▪ **R. Laukkanen[2]** ▪ **J. van Uffelen[1,3]** ▪ [1]The University of Queensland, School of Human Movement Studies
[2]University of Oulu, Department of Health Sciences, Finland ▪ [3]Monash University, Primary Care Research Unit, School of Primary Health Care

Introduction: The aim was to crtically evaluate and summarise the effects of pole walking (PW) programs on physical and psycho-social health. Methods: Systematic review of randomised controlled and controlled trials, identified from literature searches in PubMed, Cochrane library, EMBASE, SPORTdiscuss, CINAHL and PEDRO from January to October 2011. Two reviewers independently screened the papers for eligibility and rated their methodological quality using a standard quality rating list.
Results: 14 papers from 13 studies met the inclusion criteria. Eleven studies had a quality score of 50% or higher. Most studies included mid to older aged men and women in clinical populations with various medical conditions, including type 2 diabetes, cardiovascular disease, peripheral artery disease, musculo-skeletal conditions, chronic obstructive pulmonary disease, Parkinson's disease, Sjogren's syndrome and breast cancer. Only two of the studies were conducted in exclusively non-clinical populations of middle aged women. The majority of the PW programs consisted of supervised group sessions performed two to three times weekly for eight weeks or longer. Most studies investigated the effects of PW on both physical and psycho-social health and the majority examined effects on four to five health outcomes. The effects of PW on cardiorespiratory fitness were most extensively studied (eight studies), and significant effects of PW compared with control groups were found for 16 out of 26 of the cardiorespiratory measures. Other physical outcomes included functional status, pain, physical activity levels, anthropometric characteristics, muscle strength and flexibility, fatigue, gait parameters and blood glucose levels. The most frequently examined psycho-social outcome was general quality of life (predominantly assessed with the SF36). Other psycho-social outcomes included disease specific quality of life, fatigue, anxiety and depression. Seven of the eleven studies examining quality of life reported at least one positive effect of PW. All studies reported at least one beneficial effect of PW on health compared with the control group.
Discussion: This systematic review highlights that PW for health and fitness benefits is an emerging area of research, particularly in adults with clinical conditions, although there is less research in adults in non-clinical conditions.

84   How health research can contribute to planning processes: Views from planning

TUTORIAL LECTURE

N. Shankie-Williams[1]* ▪ **S. Thompson[2]*** ▪ **P. McCue[3]*** ▪ **T. Sugiyama[4]** ▪ [1]NSW Department of Planning and Infrastructure
[2]UNSW, Healthy Built Environments Program ▪ [3]NSW Premier's Council for Active Living ▪ [4]Baker IDI Heart and Diabetes Institute

Public health research has produced evidence on environmental attributes that might have an impact on physical activity. The ultimate aim of this research is to assist planners and policy makers to design neighbourhood environments conducive to physical activity. However, most public health researchers do not know how evidence is used in planning and what type of evidence is needed. This tutorial aims to give an overview of what health researchers can do to better inform planning and transport policies and practice. The session will include three presentations. Norma Shankie-Williams will discuss how the NSW Department of Planning and Infrastructure make planning decisions, using case studies, and what role additional research evidence could play in the process. Susan Thompson will explain to what extent research evidence has contributed to planning practice, and the types of information that are likely to have impact on policy and practice. Peter McCue will talk about how researchers can build a link with local planners and policy makers, and how to engage advocacy groups in the process of knowledge transfer. A panel discussion will conclude the session and offer an opportunity for comments and questions from the audience.

85   Diagnosis of tendonopathies with MSK ultrasound – an interactive ultrasound workshop

WORKSHOP

L. Briggs[1]* ▪ [1]Orthopeadic Research Institute

Musculo-skeletal ultrasound is widely used in the diagnosis of tendonopathies and muscle changes. This workshop will demonstrate the imaging of these pathologies and describe in detail the changes shown. Tendon tears, neo-vascularisation and tendon healing will be explained in detail during this interactive workshop. Live scanning of the shoulder, elbow, hand and ankle will be shown.

86   Sports Medicine Emergency Care Course

WORKSHOP

S. Brun[1,2,3]* ▪ [1]Musculoskeletal and Sports Medicine, School of Medicine and Dentistry, James Cook University
[2]Immediate Past President Sports Doctors Australia ▪ [3]SMA National Board Member

This fully comprehensive short course for the On-field Emergency Care of the seriously injured or ill athlete has been developed and accredited by Sports Doctors Australia. The course is also recognised and accredited by RACGP for category 1 QI & CPD points and rural GPs who are registered in the emergency component of the Rural Procedural Grants program can access this grant for attending this course. Given the more serious nature of sporting events and the greater demand for high quality and competent medical care within sport, the SMECC has been designed for the medical practitioner who has the responsibility for the care of athletes or sporting teams of all levels. The course focuses on the on-field management of the seriously injured and seriously ill athlete and involves the essential theory and will focus on the practical application of immediate emergency medical management and is designed around systems and skills stations, whereby the doctor becomes confident at recognising and managing serious incidents without immediate hospital or medical backup.

1. Each station is sport based, and focuses specifically on the four major systems requiring acute medical intervention.
   The systems covered and some of the skills learnt will include: Airway problems;
   a. Recognising and managing the compromised airway or an airway which has the potential of becoming compromised.
   b. Practicing the basics of establishing and maintaining an airway, including: Cervical spine control, Oxygen Therapy and appropriate delivery systems, Bag and mask resuscitation, inserting an oral/nasal airway, ETT and LMA insertion and needle cricothyroidotomy.
2. Breathing problems;
   a. Recognising and managing the athlete suffering from both medical and surgical problems of this system including asthma and pneumothorax.
3. Circulatory problems;
   a. Recognising and managing the shock state and the various types of shock, fluid resuscitation and fracture management and stabilisation.
   b. Identification and management of life threatening arrhythmias will also be addressed.
4. Head and spinal injuries.
   a. Recognising and managing the head injured patient including how to assess these patients, such as determining ominous neurological signs and how to immobilise a patient with a spinal injury.

Each station will identify compromise and potential compromise of the system covered. It will also focus on essential intervention as well as certain contraindications to management.
The stations will also emphasise the basics of emergency management as well as the critical advanced medical skills required to stabilise the seriously injured athlete. The course will then tie together as a complete management model so as the participant will gain the confidence and skills required managing the seriously injured athlete.
Course pre reading: Medical Emergencies in the Sporting Context. In: Peter Brukner & Karim Khan, editors.
Clinical Sports Medicine. 4 ed. Sydney: The McGraw-Hill Companies; 2012. p. 972–95.

87   Lancet series on physical activity and public health

TUTORIAL LECTURE

A. Bauman[1]* ▪ **P. Hallal**[2]* ▪ **B. Martin**[3]* ▪ **M. Pratt**[4]* ▪ **R. Brownson**[5]* ▪ **D. Parra**[5] ▪ **H. Kohl**[6,7]* ▪ **P. Katzmarzyk**[8]* ▪ [1]School of Public Health, Sydney University
[2]Universidade Federal De Pelotas ▪ [3]Institute of Social and Preventive Medicine of The University of Zurich ▪ [4]Promotion Centers for Disease Control and Prevention
[5]Washington University ▪ [6]University of Texas Health Science Center - Houston, Texas, USA ▪ [7]Championship Hearts Foundation, Austin Texas, USA
[8]Pennington Biomedical Research Center

The Lancet journal invited a series of papers covering physical activity and health, launched intentionally just before the London 2012 Olympics. [see http://www.thelancet.com/series/physical-activity]. This Tutorial Lecture will summarise the five papers and one research article in the series. The first paper was a review of prevalence and trends in Physical activity levels globally, and showed that a third of adults don't meet even minimal recommendations for health. Paper 2 described physical activity correlates and determinants research, and showed how 'correlate' studies are less useful [only showing associations in the data], and don't help us sufficiently in understanding why people are or are not physically active. The third and fourth papers review interventions to promote physical activity, and discuss issues relevant to a global context. The fifth paper provides a summary and policy context for physical activity and public health as a field. Finally, the research paper was a new meta-analysis of the health consequences of inactivity; it used conservative modelling for inactivity, and found that 5 million deaths annually were attributable to inactivity alone; exactly the same number as were attributed to tobacco use.

88   The hare and the tortoise revisited: Measuring physical activity and sedentary behaviour

KEYNOTE

K. Chen[1]* ▪ [1]The National Institute of Diabetes and Digestive and Kidney Diseases

Introduction: The epic battle of the two animals somewhat resembles the recent "duel" about the roles of physical activity and sedentary behaviour in health. Before we can position ourselves in these debates, let's examine how they are, and should be, measured. We will mainly focus on objective measures.

Methods: The definitions of physical activity and sedentary behaviour are often ambiguous, thus lead to inaccurate and/or imprecise measurements in many studies. One commonly used characteristic is intensity, which has been used to define active vs sedentary components of daily living (e.g. MVPA is greater than or equal to 3 METs and light-intensity is <1.5 METs). We can measure the rate of energy expenditure with sufficient time resolution and parse out the two activity intensity components. One method is minute-by-minute energy expenditure measurements by whole-room respiration chambers we use as reference criterion for studying physiology of activity and for developing portable accelerometers for the free living. While earlier studies showed good correlations between accelerometer output (counts) and activity-associated energy expenditures, simple threshold cutpoints and timing patterns have been used to estimate sedentary behaviour and physical activity in population studies. However, the traditional output of "counts" is an arbitrary unit which may further complicate modeling and classification efforts. Newer raw-signal accelerometer adopt standardized acceleration units (G's or meter/sec^2), increase measurement dimensions and capacities, all of which is allowing sophisticated modeling approaches aiming to improve the prediction of activity intensity and classify physical activity and sedentary behaviour in children and adults.

Results: Physical activity and sedentary behaviour occupies two components of one dynamic spectrum that characterizes daily living. The evidences of these two components act independently and oppositely on many health effects are not completely delineated. Thus far, objective measurements of physical activity and sedentary behaviour have been based on pre-determined accelerometer counts. It has been shown that sedentary time and sedentary breaks correlate with cardiometabolic biomarkers in middle-age and older adults in cross-sectional and longitudinal studies. However, different methods for controlling physical activity may impact such independent contributions of sedentary behaviour. The latest developments in sensor technology and mathematic modeling are enhancing our toolboxes to improve measurement accuracy and precision of physical activity and sedentary behaviour using portable wearable devices.

Discussion: To determine who wins the race, we need to measure two "animals" better.

89   What are the limits to human economy?

KEYNOTE

Asics Sponsored Speaker

A. Kuo[1]* ▪ [1]Department of Mechanical and Biomedical Engineering, University of Michigan

Almost any significant musculoskeletal injury or neural disability leads to a reduction in the economy of locomotion, limiting mobility and independence. Many endurance sports also require economy, balanced with high speed. For the physically impaired, new assistive devices such as spring-like prosthetic feet have enabled extraordinary performance, as exemplified by double amputee Oscar Pistorius's track accomplishments. This leads to the question of what limits economy, and whether and how far performance can be improved. We will examine the fundamental principles of locomotion, and show that there are no fundamental limitations that prevent an assistive device from equalling able-bodied performance. In principle, an assistive device could well exceed what is possible from present-day athletes. We will examine a number of ways that the economy or performance of locomotion could be improved, with low-powered assistive devices. We also consider the practical matters that currently limit achievement of better economy.

90   Novices, amateurs and children in sports; Requirement of a joint effort in physical activity promotion, sports medicine, and injury prevention

SYMPOSIUM

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Recent evidence shows that physical activity (PA) participants with low levels of habitual PA have a higher and different injury risks than more experienced athletes. This not only poses specific challenges for the field of PA promotion, in which specifically this low active population is targeted, but also for the fields of sports medicine and injury prevention. While there is a demand for effective preventive measures and treatment protocols, the majority of evidence within these fields is derived from higher active athletes. This symposium will set the stage for a joint approach between various fields of research in order to impact the joyful and safe participation in healthy sports and physical activities. After a brief introduction to the theme, Belinda Gabbe will outline the findings that PA related injury negatively affects continued participation in PA. Geraldine Naughton then discusses the specifics for injury prevention in children in order to provide continued joy in PA throughout childhood. Claude Goulet presents data indicating that (novice) participants with low self-esteemed PA ability are at increased injury risk, after which Evert Verhagen shows novel objective outcomes that might predispose specifically novice runners to injury. Finally, Nello Marino summarises the views presented in this symposium in relation to the aims of Sports Medicine Australia. The session will be closed with a general discussion on the well needed consonance between the different seemingly segregated areas of research.

Evert Verhagen: Introduction
Paper Title 1: Impact of injury on physical activity and return to sport
Paper Title 2: Injury prevention in junior sport: Time for new priorities
Paper Title 3: Self-reported skill level and injury severity in skiers and snowboarders
Paper Title 4: Kinematic changes during fatigue and relations with core endurance in novice runners; a missing link for injury prevention?
Paper Title 5: SMA's role in bridging the gaps between different fields
All: General discussion

91 Impact of injury on physical activity and return to sport

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Introduction: Participation in sport and active recreation is an important avenue for achieving health enhancing physical activity and is a key social and leisure activity for many. Injury can have substantial physical and psychosocial impacts and these are commonly described. A less commonly described aspect of injury burden is the impact on participation in physical activity.
Methods: To describe the impact of injury on participation in physical activity, evidence from the literature was combined with data from a qualitative study and a prospective cohort study. The qualitative study involved in-depth interviews of 120 participants who were hospitalised for injury to explore barriers and facilitators to recovery. The cohort study involved an investigation of the return to health and physical activity of 324 injured sport and active recreation participants, hospitalised for their injuries.
Results: Survey studies have identified the risk of injury as a barrier to physical activity participation. The majority of studies investigating sport and active recreation or other injury burden have failed to consider the impact on physical activity. Data from the cohort study of 324 injured sport and active recreation participants found an almost halving of pre-injury physical activity levels at 12-months post-injury even in those that reported a full recovery. The proportion of participants meeting health-enhancing levels of physical activity decreased from 92% (95% Confidence Interval (CI): 89%, 95%) pre-injury to 62% (95% CI: 57%, 67%) post-injury. An inability to return to usual sporting and leisure activities was commonly reported by participants in the qualitative study. Many participants in the qualitative study reported a "flow on" effect of the loss of physical activity to substantial weight gain and its associated emotional and self-esteem impacts. Many found it difficult to regain the motivation for participation in physical activity. For a small number of participants in the qualitative study, the injury resulted in a substantial improvement in their physical activity levels and perceived health due to the intensity of rehabilitations.
Discussion: The risk of injury has been identified as a barrier to physical activity participation, but the impact of injury on physical activity participation has not been well explored. The studies described here highlight positive and negative impacts on physical activity participation following injury. Overall, short and long term reductions in sport and active recreation are evident following injury, with injured participants reporting emotional and health impacts of this loss.

92 Injury prevention in junior sport: Time for new priorities

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Introduction: Strategies to prevent injuries in junior sport lack the priority given to performance. However, optimal and sustainable performance goals cannot be met without attention to injury prevention. Drawing on our own and the existing research, this presentation will profile four strategies for junior sports development in relation to injury prevention.
Methods: Although many issues have been discussed in relation to junior sport and injury prevention, some strategies were more frequently repeated in the literature. We selected four strategies: avoiding early specialization, being considerate of growth-related differences among young athletes, monitoring physical and psychological loads and ensuring injury prevention diligence at the all levels of participation.
Discussion: The first strategy involves avoiding early specialization in sports for which there are adult champions. Despite the dearth of evidence on early specialization, negative consequences to physical, social and psychological development are frequently discussed. However, contrasting arguments of the capacity for skill refinement only from early engagement, early recognition being the pathway to better facilities and coaching and more intrinsic motivation also lacks evidence. The second strategy is to be more 'inclusive' than 'exclusive' at a time in young people's development when physical and biological maturation is most diverse and complex. Talent development programs will have limited success if only early developers are recognized. The third strategy is to take advantage of current technology and objectively measure young athletes. Monitoring growth and workloads in young athletes is becoming more possible. Growth spurts can make young athletes particularly vulnerable to musculoskeletal sporting injuries. However, the long term consequences of growth-related injuries in sport remain poorly understood. Also, sporting demands can be monitored physically and psychologically, and can result in early injury risk identification among young athletes. With greater investments in the structure of junior sport, more is expected of young athletes in terms of the intensity, duration and complexity of participation. The fourth strategy involves ensuring that all adults responsible for junior sport prioritise injury prevention practices with equal importance to performance goals. Injury prevention practices include safe techniques, well maintained equipment, logical precautions to prevent injuries such as hot weather policies and strong links to injury surveillance systems and medical/allied health services.
Conclusion: Parents, coaches and organisations involved in junior sport can take responsibility for injury prevention strategies when the young person, not the performance remains at the centre of a developmentally appropriate model.

93 Self-reported skill level and injury severity in skiers and snowboarders

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Introduction: There is evidence to suggest that the rate of injury is lower for expert skiers and snowboarders than for beginners. A better understanding of the relation between injury severity and skill level is also needed for planning injury prevention strategies. Our objective was to examine the severity and location of injuries sustained by self-reported expert and beginner skiers and snowboarders.
Methods: A case-control study design was used. Injured skiers and snowboarders had to report their skill level on a 5 point scale (1: "beginner"; 5: "expert"). Two sets of severely injured cases were defined based on the type of injury (i.e. fractures...) and ambulance evacuation. Controls were those who did not sustain severe injuries. Logistic regression analyses were performed independently for each set of cases and body regions to relate injury severity to skill level. Odds ratios were adjusted for age, sex, helmet use, season, type of activity (snowboarding vs alpine skiing), and location of injury (snow-park vs other slopes). Generalised Estimating Equations (GEE) were also used to account for potential season and ski area effect. Subjects were 48 108 injured skiers and snowboarders who reported to the ski patrol with an injury sustained on the slopes of an alpine ski centre of the Canadian province of Québec during the seasons 2001–2002 to 2009–2010.
Results: Compared with beginners, expert skiers had an increased risk of suffering from a severe injury (adjusted odds ratio [AOR]: 1.62; 95% CI: 1.45–1.81). Expert snowboarders were also more likely to suffer from a severe injury or be evacuated by ambulance (AOR: 1.21; 95% CI: 1.09–1.35). For expert skiers, the proportion of head or neck injuries (AOR: 1.62; 95% CI: 1.50 to 1.76), trunk injuries (AOR: 1.67; 95% CI: 1.48 to 1.88), and upper extremity injuries (AOR: 1.94; 95% CI: 1.80 to 2.09) was greater than for beginners. For snowboarders, the proportion of upper extremity injuries was lower for experts compared with beginners (AOR: 0.70; 95% CI: 0.65 to 0.77). When an injury occurred to the head or neck, there was evidence that the risk of sustaining a more severe injury was lower for expert snowboarders (AOR: 0.80; 95% CI: 0.67 to 0.96)
Discussion: The body regions injured and severity of injuries differ for expert and beginner skiers and snowboarders making skill level of the target population a consideration in the development and implementation of prevention strategies.

94 Kinematic changes during fatigue and relations with core endurance in novice runners; a missing link for injury prevention?

E. Verhagen[1]* ▪ [1]Department of Public and Occupational Health / EMGO Institute for Health and Care Research

Introduction: Running is a popular form of physical exercise associated with easy health benefits for the masses. Running is, however, also associated with a high incidence of injury, particularly in novices. To date no true effective preventive strategies against running related injuries in novice runners are available. Studies have shown abnormal running kinematics to be a predisposing factor for injury. In addition, core stability has been widely accepted as an influential factor for running kinematics, running performance and injury prevention. While core stability is arguably low in novice runners who pick up running for health reasons, this might pose a novel hook for preventive programs against running injuries in novices. Evidence concerning running kinematics in novices and relations with core stability is lacking, however.
Methods: Seventeen novice runners who participated in a start-to-run program, participated in a controlled running-induced fatigue protocol and core endurance assessment. Kinematic data were analyzed for the lower extremities and trunk throughout the running protocol and, on separate days, core endurance measures were recorded. Changes in pre- and post-fatigue running kinematics and relations with core endurance measures were analyzed.
Results: Significant changes in trunk flexion, trunk extension, bilateral hip extension, bilateral ankle pronation, and non-dominant ankle supination were found as a result of running-induced fatigue. Kinematic changes displayed positive relations with core endurance measures, in contrast to expected negative relations.
Discussion: Core endurance measures display unexpected relations with running kinematics and require further investigation. Novice runners, however, do display changes in trunk flexion and extension, indicating an overall increase in trunk-flexed posture during fatigued running. Changes in hip extension, ankle pronation, and ankle supination additionally occur. Such fatigue induced kinematic changes have not been found for experienced competitive runners. From these findings it can be concluded that kinematic changes due to fatigue may be predisposing factors for injury that should be considered in future preventive strategies.

95 SMA's role in bridging the gaps between different fields

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Sports Medicine Australia (SMA) is comprised of a multidisciplinary membership committed to ensuring safe participation in sport and physical activity. As an organisation which is approaching its 50th year, it has continued to evolve from an organisation borne out of providing sports medicine services for athletes at sporting events, to one which actively promotes safe participation more broadly through the facilitation of research, community education, professional development and advocacy. Like its membership, SMA's diversity enables it to play a significant role in numerous associated industries and through varied initiatives. Its slogan 'Safety, Prevention, Advice' also encompasses what it considers as key factors often overlooked in the delivery of key sport and physical activity promotion strategies.
Examples of its key programs include the Safer Sport community education program which has trained over 100,000 Australians in injury prevention and management techniques and maintained a standard in the Australian sports industry for this type of personnel.
Professional development of the SMA membership in injury prevention and management techniques which ultimately filter into elite and community sport through policy, the encouragement of research through the Journal of Science and Medicine in Sport and the SMA Research Foundation and the translation of key research into more accessible information through various mediums are also examples of SMA's support of collaboration across the industry and the delivery of its vision. The Smartplay program has also for a number of years stood as means of promoting sports injury information to the broader sporting community through the support of research and the dissemination of sport safety information and advice.

The Be Active Conference is a further example of SMA facilitating cross sectoral collaboration, combining the National Physical Activity Conference, The Australian Conference of Science and Medicine in Sport and the National Sports Injury Prevention Conference. It is one of the few events of its kind which actively seeks to encourage cross collaboration of important disciplines and sectors associated with various aspects of sport, health and physical activity. This presentation will focus on the importance of an organisation like SMA in ensuring the various key sectors continue to collaborate in the delivery of better sport and physical activity outcomes for all of our communities.

96   Closing the gap between injury prevention research and community safety promotion practice

KEYNOTE

NSW Sporting Injuries Sponsored Speaker

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Sports Medicine Australia aims to promote and promulgate high-quality, innovative research. As laudable as this is, it is not enough. Unless this research culminates in practical and cost-effective interventions capable of attracting the political and social support required to allow effective implementation; it will not prevent harm or save lives.

The Public Health Model has been proposed as a framework to promote the progression of sports medicine research towards real-world application. In this four-stage model, research progresses in a stepwise manner through:

Stage 1:   establishing the magnitude of the problem
Stage 2:   identifying risk factors
Stage 3:   developing effective interventions
Stage 4:   ensuring widespread adoption and use

Unfortunately most sports injury research does not result in adequate dissemination or widespread use of effective interventions. Several gaps between injury prevention research and safety promotion practice are identified:

- the efficacy and effectiveness gap (a scientific problem),
- the research to practice gap (an implementation problem),
- the injury prevention to safety promotion gap (a political problem).

These gaps stem from the contrasting approaches researchers, policy makers, practitioners and the community take to the scientific, practical, and social challenges posed by the contextual complexity of injury. Some researchers believe that stages 1 to 3 constitute the real scientific work of injury prevention arguing that Stage 4, dissemination and adoption, can essentially be delegated to practitioners who merely have to apply their research findings. This approach underestimates the importance of the contextual determinants of success.

Three types of experts are required to design effective interventions capable of dissemination into the wider community: researchers (content experts), practitioners (process experts) the target community itself (context experts). From the outset, an open transdisciplinary dialogue that synthesizes the expertise of all stakeholders is required to design effective interventions that can be applied in the real world.

97   Birth weight, sedentary time and abdominal adiposity in youth: The international children's accelerometry database (ICAD)

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Introduction: Low birth weight (BW) is linked to higher risk of metabolic diseases in adulthood whereas high BW appears to be associated with high general and central adiposity. Higher amounts of time spent sedentary is also associated with abdominal adiposity in children but this association may be bi-directional. The aim of the present study was to examine the associations between BW and central adiposity and whether this association is mediated by time spent sedentary in children.

Methods: We used data from 11,643 children (5,511 boys) aged 11.6 ± 1.7 yrs. from the International Children's Accelerometry Database (ICAD) comprising 7 countries. BW was obtained by maternal report. Waist circumference (WC) was measured according to standardized procedures. Sedentary time (<100 counts/min) was assessed by Actigraph accelerometry after reanalyzing all raw data. The association between BW and WC was analyzed by general linear modeling adjusted for sex, study, and age. In the second model we examined the association between BW and sedentary time adjusting for the same covariates as above and monitor wear time. Finally, we analyzed the association between BW and WC with additional adjustment for sedentary time.

Results: Girls accumulated significantly higher amounts of sedentary time than boys (368 ± 86 min/d vs 350 ± 89, $P<0.0001$). BW (3457 ± 588g vs 3341 ± 536g, $P<0.0001$) and WC (66.8 ± 9.4cm vs 65.7 ± 9.3, $P<0.0001$) was significantly higher in boys than in girls. After adjusting for sex, age, and study, a bi-directional cross-sectional association between sedentary time and WC was observed ($P<0.0001$). BW was positively associated with higher WC ($\beta=0.002$, 95% CI, 0.001;0.003, $P<0.0001$), suggesting that a 1kg higher BW was associated with a 2cm larger WC. Similarly, BW was significantly and positively associated with sedentary time ($\beta=0.005$, 95% CI, 0.003;0.008). We thereafter analyzed whether sedentary time mediated the association between BW and WC by including sedentary time as a covariate in the model and the association between BW and WC was only slightly attenuated ($\beta=0.002$, 95% CI, 0.001;0.002).

Discussion: High BW is associated with a larger WC independent of sedentary time in children which may influence their current and future health. The bi-directional association between sedentary time and WC complicates the interpretation on whether sedentary time acts as a mediator on the association between BW and WC. Given the association between maternal obesity during pregnancy and high birth weights, preventive efforts should aim to promote healthy body weight in young women of childbearing age.

98 Associations of physical activity and sedentary time with weight status among school-aged girls and boys across five European countries

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Introduction: No study included objective measures of both sedentary time and physical activity to study their combined or independent associations with or effect on overweight among (school) children. The aim of this study is to identify subgroups of children based on their moderate-to-vigorous physical activity and sedentary time, and explore the differences in body mass index (BMI), waist circumference and overweight prevalence between these subgroups.

Methods: Randomly selected primary schools from cities with a different degree of urbanization in five European countries were included within the EU funded ENERGY project. A sample of 722 children, 53.2% girls, mean age 11.6 years (sd=0.8) was recruited from Hungary (n=147), Belgium (n=107), The Netherlands (n=102), Greece (n=160) and Switzerland (n=206). Measures included objectively measured BMI, waist circumference and overweight/obesity and accelerometer based sedentary time and physical activity.

Results: Cluster analysis revealed four clusters in both gender groups showing an unhealthy pattern (low physical activity/high sedentary time), a healthy pattern (high physical activity/low sedentary time), a low mixed pattern (low physical activity/low sedentary time), and a moderate to high mixed pattern (moderate to high physical activity/moderate sedentary time). In girls, the high physical activity/low sedentary time cluster had a significantly lower mean BMI (p≤0.05), a lower waist circumference (p≤0.01), and the lowest percentage of overweight (p≤0.10) compared to the other three clusters. In boys, both clusters with higher activity levels had significantly lower BMIs (p≤0.001) and waist circumference (p≤0.001) than the two low activity clusters, independent of sedentary time.

Discussion: Engagement in more physical activity and less sedentary time is associated with more favorable weight and weight status among girls. Among boys physical activity seems most important for weight and weight status, while sedentary time appears to be less relevant.

99 Levels and bouts of sedentary behaviour and physical activity: Associations with cardio-metabolic health in overweight and obese children

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Introduction: Total sedentary time and patterns of sedentary behaviour, including the number of breaks in sedentary time, are independent predictors of cardio-metabolic health in adults. The evidence, however, is less conclusive among children. Associations between objectively measured sedentary behaviour, physical activity and cardio-metabolic health outcomes have not been investigated among overweight and obese children. The purpose of this study was to examine associations of levels and bouts of objectively measured sedentary behaviour (SB) and moderate-to-vigorous physical activity (MVPA) with individual and clustered cardio-metabolic health outcomes in overweight and obese children.

Methods: Cross-sectional data from a clinical sample of 120 overweight and obese 5.5- to 10-year-olds (8.3±1.1 years, 62% girls, 74% obese) prior to participation in a treatment trial were used. SB and MVPA were assessed during waking hours over 8 days using Actigraph 7164 accelerometers. Mean bouts/day of SB (≥10, ≥20, ≥30min) and MVPA (≥5, ≥10, ≥15min) were calculated and categorised into quartiles. Fasting blood was collected and associations with triglycerides, HDL cholesterol, glucose, insulin, HOMA-IR, systolic and diastolic blood pressure, and clustered cardio-metabolic health (cMet) were examined using linear regression. Models were adjusted for age, sex, waist circumference z-score, energy intake, saturated fat, fibre, weekly electronic screen time, accelerometer wear time, and MVPA, or SB, or both (for bout analyses). Interactions with age, sex, or weight status were examined but were not significant (p>0.1).

Results: Independent of MVPA, SB was inversely associated with HDL cholesterol (β: -0.29, 95% CI -0.52, -0.05). MVPA was inversely associated with diastolic blood pressure independent of SB (β: -0.22, 95% CI -0.44, 0.01). MVPA was also inversely associated with cMet (β: -0.19, 95% CI -0.36, -0.01), but the association was attenuated after adjustment for SB (β: -0.14, 95% CI -0.33, 0.06). Independent of covariates, including MVPA and SB, participants in the highest quartile of ≥30min bouts/day of SB (mean bouts/day=0.78±0.54) had lower HDL cholesterol than those in the lowest quartile (mean bouts/day=0) (p=0.046, p_{trend}=0.11).

Conclusions: In addition to increasing MVPA, targeting reductions in SB may also contribute to improved cardio-metabolic health in overweight and obese children. Limiting bouts of SB to <30min might be an important public health message for supporting cardio-metabolic health among overweight and obese children, particularly in relation to HDL cholesterol levels.

100 Relationships between physical activity with BMI and percentage body fat among girls by locality in Tlokwe Local Municipality, South Africa: The PAHL-Study

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Background: The prevalence of overweight has tripled in the past decades coinciding with steep decline in physical activity levels, especially in girls. The purpose of this study therefore was to investigate the relationships between physical activity with BMI and percentage body fat among girls by locality in Tlokwe Local Municipality, South Africa.

Methods: A cross-sectional study involving 153 adolescent girls (Township=110; Town=43) from Physical Activity and Health Longitudinal Study (PAHLS) with mean age of 14.85±0.73 were studied. Body weight, height, triceps and subscapular skinfolds were measured. BMI and percentage body fat (%BF) were calculated from body weight and skinfolds respectively. Physical activity (PA) was assesses by the IPAQ and indirect VO_2max assessed with the 20 meters shuttle run test. Data was analyzed by descriptive statistics, frequencies, student's t-test and Pearson Moment correlation coefficients.

Results: Overall, 28.6% and 29.2% of the adolescent girls were overweight and underweight, respectively. Prevalence of overweight was high in girls residing in Town (30.2%) compared to girls from the Township (27.9%). Prevalence of underweight was high in the Township girls (32.4%) as compared to girls in Town (20.9%). Girls in town were significantly (p<0.05) taller (162.04±6.87) and heavier (56.19±14.74) than the girls (156.07±6.45; 51.65±11.54) in the township area. Girls in town significantly (p<0.01) performed better in VO$_2$max (30.55±5.60) than their counterparts in the township (27.52±4.54). Overall, 73.2%, 10.5% and 16.3% of the adolescent girls had low, moderate and high PA, respectively. Significant negative relationships were found between BMI (r=-0.47; p=0.00; r=-0.53; p=0.01), %BF (r=-0.45; p=0.00; r=-0.01) and VO$_2$max for girls in township and town respectively, in the low PA. In moderate PA, significant negative relationship was found for %BF (r=-0.52; p=0.01) and VO$_2$max for the girls in the township. In the high PA, significant negative relationships were observed for BMI (r=-0.57; p=0.028), %BF (r=-0.68; p=0.005), and VO$_2$max for girls in the township with non-significant positive relationship between BMI (r=0.58; p=0.24), %BF (r=0.68; p=0.41), and VO$_2$max for girls in town. Conclusions: The prevalence of underweight and overweight were evident and showed that township girls were more prone to underweight while girls residing in town were more susceptible to being overweight, possibly due to differences in physical activity levels. Fatness was negatively associated with cardio-respiratory endurance among the girls. From the public health perspective, urgent preventative strategies to tackle both underweight and overweight, hence physical inactivity are required.

101 Do Canadian obese adolescents who meet the recommended sedentary behavior guidelines have higher resting metabolism and fitness?

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Introduction: Sedentary behavior has been linked to an increased risk of an adverse cardiometabolic profile in youth. Canadian children and adolescents aged 12–17 years old are recommended to limit their screen time (TV, computer, inactive video game playing) to no more than 2 hours per day. However, it is unknown if adolescents who meet the guidelines have higher resting energy expenditure (REE) and cardiorespiratory fitness (CRF) compared to those who accumulate more screen time. The purpose of this study was to investigate REE and CRF in overweight and obese adolescents who meet the Canadian screen time recommendations (≤2 hours/day) compared to those who exceed the guidelines (>2 hours/day). Methods: Overweight and obese adolescents aged 14–17 years (N=312; 89 males, 223 females, BMI 34.5±4.5 kg/m^2) who volunteered for the HEARTY trial (Healthy Eating Aerobic and Resistance Training in Youth) were included in the study if they had a baseline body mass index (BMI) >95th percentile for their age and sex, or >85th percentile + an additional diabetes risk factor. Time spent in screen time behaviors (hours/day spent watching TV + recreational computer use + seated inactive video games) was assessed by a self-report questionnaire. Baseline REE (kilocalories/day) and CRF (peak oxygen uptake; VO$_2$peak) were assessed using indirect calorimetry at rest and during a maximal graded exercise test on a treadmill respectively. Participants were categorized into two groups: 1) Meeting the guidelines (≤2 hours/day) (n=37), and 2) Exceeding the guidelines (>2 hours/day) (n=274). Results: 88% of our sample reported exceeding the sedentary behavior guidelines. The group who exceeded the guidelines had higher weight (98±17 vs 91±11 kg), BMI (34.7±4.6 vs 33.0±3.0 kg/m^2) and systolic blood pressure (114±10 vs 109±9 mmHg) compared to the group who met the guidelines (p<0.05). The group who exceeded the guidelines also had lower CRF (VO$_2$peak 30.0±5.2 vs 32.2±4.3 ml/kg/min, p<0.05) although they had similar REE (2019±424 vs 1968±359 kcal/day, p>0.05). Discussion: Overweight and obese adolescents accumulating more than 2 hours of screen time have higher weight, BMI, systolic blood pressure and lower aerobic fitness than those who meet the recommended guidelines. Accumulating ≤2 hours of screen time per day may help maintain cardiorespiratory fitness even in adolescents considered overweight or obese.

102 Does fatness predict fitness or vice versa? A two year longitudinal study in British 11–13 year olds

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Introduction: Cardiorespiratory fitness (fitness) and adiposity (fatness) are interrelated indicators of pediatric health status. Cross-sectional analyses show clearly that they are positively associated with one another, but their temporal relationship is a matter of debate. There is limited evidence that physical inactivity may precede fatness in younger children, but whether such a relationship exists between fatness and fitness is unknown. The aim of this longitudinal study is to determine the temporal relationship between fitness and fatness. Methods: We measured mass and stature then calculated BMI of n=1501 11 year olds. Participants then completed the Fitnessgram PACERTM test to assess their fitness. Procedures were repeated two years later. BMI and fitness were converted to z-scores based on international reference data. We performed standard and time lagged-correlations to assess the temporal relationship between variables using BMI z-score (Fatness) as a predictor of future PACER z-score (Fitness) and vice versa. We calculated change (△) in BMI and fitness (△=Follow-up − Baseline) and predicted change using baseline values. Results: There was evidence of tracking for both fatness (r=.806) and fitness (r=.678) over the 2y period. Baseline fatness was significantly related to fitness, both at baseline (r=-.364) and follow up (r=-.306). Baseline fitness was also significantly related to Fatness at follow up (r=-.302). Fatness increased by z=.18(95% CI.14-.22) and fitness by z=.12(95% CI.08-.16). These changes were negatively correlated with one another (r=-.147). While baseline Fitness was significantly associated with △BMI (r=.129) there was no significant correlation between baseline BMI and △fitness (r=0.050, p=.08). Discussion: These data are the first to assess the complex temporal relationship between fatness and fitness in this age group. We support the notion that greater fatness can predict lower fitness two years later but present equally strong evidence that fitness can predict future fatness. The problem with this analysis is that it does not account for baseline values. Using the more powerful analysis technique based on changes variables (△) we found no evidence that previous fitness predicted future fitness. The converse of this association was supported by a significant negative correlation showing that those with initially low fitness showed the greatest increases in fatness over two years.

103   Associations between walkability, physical activity and body fat in Hong Kong adolescents

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Introduction: Neighbourhood walkability can be associated with accrued levels of daily physical activity (PA) and this may have a resultant influence on levels of body fat. Growing evidence suggests a likely trend that residents living in high walkable neighbourhoods tend to accumulate more physical activity and may have lower obesity levels than those living in low walkable areas, although much of this research has been delimited to Western populations, predominantly on adults, and from low or medium density cities. The influence of neighborhood walkability on Asian adolescents, especially in ultra-high density cities is largely unknown. The main aims of this study were to examine if neighborhood walkability is associated with i) various levels of objectively-measured PA, ii) different patterns of how PA is accrued, and iii) if body fat is associated with these levels of PA.
Methods: A convenience sample of 188 adolescents (mean=15.3±2.2 SD years) was recruited using an intercept method from 32 neighbourhoods in Hong Kong that varied in socio-economic status (High v Low mean household income) and objectively-measured walkability (High v Low street connectivity and dwelling density). Actigraph accelerometers were used to measure daily PA (at least 5 days with >10 hr/d); body fat was estimated from triceps skinfold thickness, waist circumference, as well as a validated portable bio-electrical impedance analysis (BIA, Tanita) system. A total of 69 adolescents provided complete data for the final analysis.
Results: No significant difference was found in total PA between adolescents living in High v Low Walkable areas (246 v 263 min/d; effect size=0.27); yet those living in Low Walkable areas accrued significantly more light activity (238 v 209 min/d: effect size=0.49), whilst those living in High Walkable areas accrued significantly more moderate-to-vigorous PA (MVPA: 37 v 25 min/d; effect size=0.71). These differences mainly occurred in the short 1–4 and 5–9min bouts of PA. Only the triceps skinfold was significantly associated (negatively) with levels of MVPA.
Discussion: Adolescents living in high- and low-walkable neighbourhoods in an ultra-high density Asian city do not conform to the PA habits often seen in Western adults. A larger and more representative study that includes the influence of confounders is justified.

104   The international study of childhood obesity, lifestyle and the environment

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Introduction: Given the wide range in prevalence of childhood obesity and its correlates around the world, ISCOLE was designed to examine the relationships among lifestyle, obesity and environmental measures in a multi-national sample of children. The primary aim of the International Study of Childhood Obesity, Lifestyle and the Environment (ISCOLE) is to determine the relationship between lifestyle characteristics and obesity in children, and to investigate the influence of behavioural settings and physical, social and policy environments on the observed relationships within and between countries.
Methods: The targeted sample includes 6000 10-year old children from eleven countries in all major geographic regions of the world (Asia, Africa, Europe, South America, North America, and Oceania). The protocol includes procedures to collect data at the individual level (lifestyle, diet and physical activity questionnaires, accelerometry), family and neighborhood level (parental questionnaires and Geographic Information System (GIS) analyses), and the school environment (school administrator questionnaire and school audit tool).
Results: A standard study protocol has been developed for implementation in all regions of the world. Quality control is addressed through the training and certification of personnel, active monitoring of remote data entry, and site visits. A rigorous system of training and certification of study personnel has been developed and implemented, including web-based training modules and regional in-person training meetings. As of March 2012, 756 children have been evaluated from six sites, with a mean (±SD) age of 9.9±0.6 years and mean BMI of 18.5±3.3 kg/m^2. The mean BMI percentile (CDC reference) is 58.6±29.4, with a range from 0.01 to 99.5.
Discussion: Unique features of the ISCOLE study include the global representation of study sites with a range of low to high income countries at different stages of nutritional and epidemiological transition, robust, standardized training and data collection methods, and the multi-level nature of data being collected, including individual, family, neighborhood, and school levels.
Discussion: The results of this study will provide a robust examination of the correlates of body weight and obesity in children, focusing on both sides of the energy balance equation. The results will also provide important new information that will inform the development of lifestyle, environmental, and policy interventions to address childhood obesity that can be culturally adapted for implementation around the world. ISCOLE represents an international collaboration among all world regions, and represents a global effort to increase research capacity and infrastructure in childhood obesity.

105   How diverse was the leisure time physical activity of older Australians over the past decade?

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Introduction: Public health recommendations for older adults highlight the need to engage in a combination of aerobic, muscle strength, flexibility and balance activities. This study characterised leisure time physical activity in older Australians (≥65 years), examining the diversity in reported activities and mode of participation.
Methods: The Exercise Recreation and Sport Surveys (ERASS, 2001–2009) were combined and analysed for 22,050 elderly. Participants were asked to list any type of physical activity they engaged in for exercise, recreation or sport in the past 12 months (unprompted) and whether each activity was organised. Prevalent activities were those reported by 1% of the adults. Prevalent types of activity were further grouped as primarily aerobic types (i.e. walking, jogging, swimming, golf, cycling, racquet ball and rowing), primarily balance and flexibility (i.e. tai chi, dance and yoga) and primarily muscle training (i.e. gym workout, weight lifting and callisthenics).

Results: Thirteen activity types were reported during the years 2001–2009 by at least 1% of the elderly. Walking was the most prevalent type, reported by 45.6% of older people, followed by bowls (9.4%), aerobics/callisthenics (9.1%), golf (7.7%), swimming (6.4%), gym workouts (5.2%), cycling (3.2%), tennis (2.9%), dancing (2.1%), fishing (2.0%), tai chi (1.4%), weight lifting (1.2%) and yoga (1.1%). Significant gender differences were apparent. Over time, significant increases were reported in walking, aerobic/callisthenics and gym workout in both genders. In the previous year, 32.0% of older adults participated in "nil" activity, 40.6% engaged in one activity, 19.5% and 8.0% participated in two or three or more activities, respectively. Common combinations were walking with another aerobic activity. Strength activities were reported by 17.3% and balance-enhancing activities by 6.1%. Only 2.6% reported a combination of aerobic, balance and strength activities, Multiple-activity participation increased over the years, but declined with increasing age, education and for the most disadvantaged, compared to single-activity participation. Partially or exclusively organised participation, combined, was reported by 42.5% of older adults. Women were more likely to combine mode of participation and so are the older old. Geographic region was associated with multiple-activity participation and organised-only participation.

Discussion: Raising awareness of and participation in balance and strength enhancing activities will be important for decreasing the burden of falls and injuries. Interventions to promote leisure time participation should be implemented either in organised (centre-based) or non-organised home based exercise settings. Research should identify types of activities that can benefits several fitness dimensions all at once.

106 Prevalence and sociodemographic correlates of muscle-strengthening activity among Japanese older adults

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Introduction: Current physical activity guidelines recommend people participate in muscle-strengthening activity at least twice weekly, including older adults. Thus, promoting muscle-strengthening activity among older adults is a public health priority. Notably, not only exercise but also some types of lifestyle activities are recommended as muscle-strengthening activities in the current guidelines. Examining the prevalence and sociodemographic correlates of each type of muscle-strengthening activity among older adults is necessary to consider who and what type of muscle-strengthening activities should be targeted for promotion. Although some studies have examined the prevalence and sociodemographic correlates of muscle-strengthening activity, they have not distinguished between types of activity or excluded lifestyle activities. This study examined the prevalence and sociodemographic correlates of muscle-strengthening activity for exercise and in lifestyle activities among Japanese older adults.

Methods: A cross-sectional survey targeted 3000 Japanese people (aged 65–74 years) randomly sampled from the registry of residential addresses in 2011. Among them, 1559 responded. Muscle-strengthening activities for exercise (using equipment or body weight) and muscle-strengthening activities in lifestyle activities, as well as sociodemographic factors (gender, age, current marital status, educational background, household economic status, and smoking habit) were assessed. Logistic regression analyses were conducted.

Results: Among respondents, 68.9% participated in lifestyle activities >=2 days/week, 8.9% in exercise using equipment, and 25.0% in exercise using body weight. Women (adjusted OR: 0.61; 95% CI: 0.40–0.95), those with middle high school education (adjusted OR: 0.48; 95% CI: 0.24–0.97), those with low household economic status (adjusted OR: 0.48; 95% CI: 0.27–0.87), and smokers (adjusted OR: 0.45; 95% CI: 0.22–0.92) were significantly less likely to engage in exercise using equipment. Education from middle high school (adjusted OR: 0.60; 95% CI: 0.39–0.93) and low household economic status (adjusted OR: 0.65; 95% CI: 0.47–0.91) were also negatively associated with participation in exercise using body weight. There was a significant association between low household economic status and not participating in lifestyle activities (adjusted OR: 0.68; 95% CI: 0.51–0.89).

Discussion: This study contributes to a better understanding of the patterns of muscle-strengthening activity, and to the development of promotion strategies for muscle-strengthening activity among older adults. The prevalence and sociodemographic correlates of muscle-strengthening activity in lifestyle activities were notably different from those for exercise. Older adults, especially women, smokers, and those with low educational background, would accept lifestyle activities promotions much more readily than exercise. However, those with low household economic status did not engage in any type of muscle-strengthening activity.

107 Barriers and enablers to physical activity among older Australians who think they are insufficiently active

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Introduction: Older adults' participation in physical activity is essential for prevention and treatment of cardiovascular, metabolic and bone diseases yet less than half of older adults are sufficiently active. Physical activity interventions targeting older adults can be optimised if barriers and enablers are better understood. This study examined whether associations between barriers and enablers of physical activity differ by demographic and health characteristics and which were associated with meeting physical activity recommendations.

Methods: Participants were 2,225 adults aged 65 years and above who perceived themselves to be insufficiently active and self-reported their barriers and enablers to physical activity in the 2009 New South Wales Falls Prevention Survey (Australia). Binary logistic regression analyses examined associations between barriers and enablers and meeting physical activity recommendations.

Results: Forty five percent of respondents met physical activity recommendations, participating in at least 150 minutes a week. After adjusting for gender, age, BMI, and education, people who listed ill health (51%) as a barrier (OR=0.53, 95% CI 0.43–0.65) and people who listed having no one to exercise with (4%; OR=0.48, 95% CI 0.27–0.85) were significantly less likely to meet recommendations. Those citing too expensive (3%) as a barrier (OR=2.33, 95% CI 1.27–4.29) and those who listed nothing will help (33%; OR=1.39, 95% CI 1.12–1.73) and making time to be active (8%; OR=1.76, 95% CI 1.23–2.53) as enablers were significantly more likely to meet physical activity recommendations.

Discussion: These findings give insights into older adults' perceptions of factors that influence their physical activity, which could assist physical activity program planning in this population. In particular, the study highlights the importance of considering issues related to health status and social support when developing physical activity programs for older people.

108   Access to neighbourhood commercial destinations and associations with walking in older Australians

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Introduction: The health benefits of walking are numerous, but the majority of adults aged over 65 years remain insufficiently active to accrue such benefits. Evidence continues to grow on the importance of built environment features for walking, however few studies involving the senior population examine destinations within neighbourhoods. Our purpose was to investigate access to specific, objectively-measured commercial destinations and how this impacts the walking behavior of Australian older adults.

Methods: Secondary analysis was conducted using cross-sectional data from the Western Australian state government's health surveillance survey for those aged 65–84 years and living in the Perth metropolitan region from 2003–2009 (n=2,918). Prevalence of weekly walking was self-reported using the Active Australia Survey, and minutes dichotomized to produce the dependent variable (none vs some walking). Road network service areas were generated at a distance of 800m to define neighbourhood at the individual-level. The most temporally relevant spatial data for commercial destinations were matched to surveillance data. The presence or absence of seven categories of commercial destinations accessible within the neighbourhood service areas was identified. The categories included supermarkets, other food retail, general retail, financial services, medical services, general services, and social infrastructure. Logistic regression models predicted access to neighbourhood commercial destinations associated with walking, adjusting for age, sex, highest level of education completed, marital status, self-rated health, and use of assistive equipment.

Results: Participants were aged 72.9 years (SD=5.4) on average, and most were female (55.9%) and married (62.0%). Overall, 66.2% reported engaging in some weekly walking. The odds of participating in some walking were significantly higher for older adults with access to neighbourhood general services (OR=1.20, 95% CI=1.02–1.42, p=0.027) and access to neighbourhood social infrastructure (OR=1.19, 95% CI=1.01–1.40, p=0.043). All other commercial destination categories were unrelated to walking.

Discussion: Our findings hint of slight differences in the types of neighbourhood commercial destinations that promote walking among seniors, compared with those reported for adults. Commercial destinations facilitating more social interaction, for example eating at a restaurant, church involvement, or visiting the pharmacy or hairdresser, were associated with older Australians engaging in some weekly walking in this study. This underscores the importance of planning neighbourhoods with proximate access to social infrastructure, and highlights the need to create residential environments that support activity across the life course.

109   Effect of daily physical activity on mobility maintenance in elderly Japanese

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Introduction: The purpose of this study was to clarify the effect of daily physical activity on maintaining mobility in the Japanese elderly.

Methods: Data on the frequency of daily physical activity and physical independency were obtained from a population-based cohort study in Shizuoka, Japan. Of the randomly selected 22,200 residents aged 65–84 years, 11,515 subjects were followed from 1999 to 2008 and analyzed. The difference from 1999 to 2008 was evaluated on the changes of mobility. In addition we applied logistic regression analysis to evaluate the influence of mobility changes (independent variable) on daily physical activity (dependent variable).

Results: In total, 3,311 subjects (74%) answered again going out alone in the follow-up survey. The analysis showed that walking speed was recognized affected from most on the changes of mobility among physical activity factors analyzed in this study.

Conclusion: This study suggests a protective effect of walking speed even with the use of self-assessment on the changes of mobility among Japanese elderly people.

110   Can a website-delivered computer-tailored physical activity intervention be acceptable, usable, and effective for older people?

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Introduction: Despite the numerous health benefits, population physical activity levels are low and declining with age. The Internet has become an increasingly important communication tool, and website-delivered physical activity interventions have the potential to reach large populations and contribute to the promotion of PA and behaviour change, however older people have typically not been considered for this type of intervention. Therefore, the purpose of this study was to evaluate a website-delivered computer-tailored physical activity intervention, with a specific focus on differences in tailored advice acceptability, website usability, and physical activity change between three age groups.

Methods: In January and February 2011, 3,233 male and female adults over 18 years of age were invited by e-mail to participate in the study. To mimic 'real-life' conditions, the intervention, which provided personalized physical activity feedback delivered via the Internet, was implemented and evaluated without any personal contact for the entire duration of the study. Data were collected online at baseline, one week, and one month follow-up and analyzed for three age groups (≤44, 45–59, and ≥60 years of age) using Linear Mixed Models. The measures obtained were: physical activity (Active Australia Survey), website usability, physical activity advice acceptability, Internet self-confidence, and time spend on website.

Results: Overall, 803 participants received the intervention and 288 completed all measures. At baseline, the oldest age group had significantly lower perceived Internet self-confidence scores when compared to the youngest age group; however younger participants were more likely to drop out during the course of the intervention when compared to older participants. Though generally high, no between group differences were found in terms of website usability and tailored advice acceptability. The young age group spent significantly ($F=8.44$, $p<.01$) less time on the website (10.6min), when compared to the middle (13.6min) and oldest (16.3min) age group. No significant interaction effect was found for change in total physical activity, however the oldest age group significantly increased walking (+40min vs +16min and +14min, respectively), moderate intensity physical activity (+15min vs -15min and -6min, respectively) and vigorous intensity physical activity (+15min vs -6min and +1min, respectively) more when compared to the other young and middle age groups.

Discussion: Despite popular belief, these results suggest that website-delivered physical activity interventions can be suitable and effective for older aged adults and that low Internet self-confidence can be overcome when applying a simple but robust website design, which is suitable for all ages.

111 — Intervention to increase older adults' physical activity: Results of the Epidoso Project, Brazil

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Background: several intervention models aiming at increasing physical activity have been published in literature. However, there is no evidence regarding the best method to be applied, particularly among older adults.

Purpose: to analyze the effectiveness of two different interventions to change older adults' sedentary behavior in their leisure time.

Methods: a quasi-experimental study with individuals who take part in a cohort of older adults that live in the urban area in São Paulo, SP, Brazil, was carried out. A long version of the IPAQ was applied to record activities of the previous week and to measure the level of physical activities of the sample. Only sedentary subjects were included in the study (<10 minutes per week), divided into three groups: a) Class group (CG), with two 60-minute classes per week, carried out aerobic activities, flexibility, balance and muscle strengthening for 3 months; b) Stimulus group (SG) got a folder with information about the benefits of practicing physical activities and how to carry them out, as well as phone calls during the same period. Evaluation was made by re-applying the IPAQ after each intervention and at the end of the 3-month period; c) The control group was just re-evaluated after the end of the intervention which was applied to the experimental group.

Results: data collected from 121 subjects (71.5 ± 7.1 years old) were analyzed. Refusals and losses represented 35% (80 individuals). Variance analysis with repeated measures with a 3-level category factor showed that, at the end of the intervention, group CG had significantly increased the average of minutes per week dedicated to physical activities by comparison with group SG (111.1 and 42.7 min/week, respectively). However, both averages were similar (71.5 and 71.8 min/week, respectively) three months after the end of the intervention but still higher than the one found in the control group (43.3 min/week).

Conclusion: strategies of teaching classes and handing out folders with guidelines about physical activities, followed by phone calls, significantly decreased sedentarianism in older adults' leisure time.

112 — Physical activity results of a home-based physical activity and nutrition program for seniors (PANS)

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Introduction: Obesity has reached epidemic proportions globally, with more than one billion adults overweight and at least 300 million clinically obese. Reduced levels of physical activity have contributed to over 60% of older Australians being overweight or obese. Inactive seniors are a difficult group to target and researchers use a variety of approaches to engage them. As the population ages there is an urgent need to develop sound interventions capable of making positive changes to health status with consequent reduction in costs to the health care system. This intervention aimed to confirm if a low-cost, accessible physical activity and nutrition program could improve levels of physical activity and nutrition behaviours of insufficiently active 60–70 year-olds residing in Perth, Australia.

Methodology: A 6-month randomised controlled trial targeting sedentary and overweight older adults aged 60 to 70 years from low to medium socio-economic suburbs within metropolitan Perth. Intervention participants (n=314) received mailed materials and telephone/email support to improve nutrition and physical activity levels, controls (n=303) received small incentives to complete baseline and post-intervention questionnaires. Physical activity was measured using *The International Physical Activity Questionnaire* (IPAQ). A strength exercise question based on recommendations from the American Heart Association was included to ensure the main components of the home-based exercise program were also measured.

Results: In total 176 intervention and 199 controls (response rate 61%) with complete data, were available for analysis. There was a significant change in the intervention group's level of physical activity, but no change in the control group. Intervention group results showed significant increases in behavioral improvements including participation in strength exercises, walking and vigorous physical activity, a reduction in sitting time and waist to hip ratio measurements.

Conclusion: The positive results from the PANS program demonstrate that a minimal contact, low-cost and home based physical activity program can positively influence changes to seniors' physical activity and can be effective in improving participants' waist-to-hip ratio. Longer term studies should be implemented to obtain more data on effectiveness of such interventions. This physical activity and nutrition program offers a unique approach compared to other such programs previously conducted with older people in Australia, as the project was designed to evaluate the effect of combining both physical activity and nutrition to improve the health of seniors. This project provides guidelines for the development, implementation and evaluation of a minimal, home-based tailored physical activity and nutrition intervention program.

113 How is objectively measured physical activity associated with recurrent falls and fear of falling in older community dwelling men?*

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Introduction: Falls are a major cause of disability in older age and fear of falling (FOF) may limit physical activity. Associations between falls (including recurrent falls and falls requiring medical attention), fear of falling and objectively measured physical activity (PA) has been little studied, particularly in community-dwelling older adults.

Methods: Men participating in a prospective, population-based cohort study in 24 British towns provided questionnaire information on history of falls in the previous year, fear of falling, other medical history and wore an Actigraph GT3X accelerometer for 7 days. Data were analysed in 60 second epochs.

Results: 1543 men with a mean age of 77 (range 71–91y) wore the Actigraph, 1238 (80%) had >600 minutes wear time on >5 days and questionnaire data. 8% (104/1238) of men reported one fall in the previous year and 11% (131/1238) reported recurrent falls (range 2–50). A dose response was seen whereby men with recurrent falls had lower activity levels than men who fell once or not at all. Men with recurrent falls took fewer steps/day than men who did not fall: mean difference (adjusted for age, day order, month, wear time and town) -780 (95% CI -433, -1152) and spent more minutes sedentary 21(95% CI 9, 33), and less in light -16 (95% CI -5, -28) and moderate to vigorous PA (MVPA) -6 (95% CI -3,-8). In relative terms, the reduction in MVPA was greatest: 22% (95% CI 7, 37). Differences were explained by exercise self-efficacy and mobility limitations, and to a lesser extent by exercise outcome expectation. 30% (n=68) of fallers received medical attention for their fall and a similar, although weaker pattern of lower activity levels was observed among men who had a fall requiring medical attention compared to no fall. 13% (n=141) men reported FOF, of whom 53% (n=74) had fallen in the past year. Men with FOF took markedly fewer steps than men without: -1325 (95% CI -1646, -1005), spent more minutes in sedentary 29 (95% 18, 40), and less in light activity -21 (95% CI -32, -11) or MVPA -9 (95% CI -11, -7). In relative terms, the reduction in MVPA was greatest: 75% (95% CI 95, 55). Differences were partly explained by exercise self-efficacy and mobility limitations. We did not find evidence that FOF had a greater impact on PA levels among men who fell compared to those who did not.

Conclusions: PA levels and in particular step counts and MVPA levels, were lower among men who had recurrent falls, and even more markedly, among those who reported FOF.

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114 Home exercise improved balance but increased falls in older community-dwelling people after hospital stays: An RCT

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Introduction: Previous trials have found home exercise to prevent falls in community-dwelling older people. Older people are at an increased risk of disability and falls after returning home after hospital stays.

Methods: 340 older people recently discharged from hospital were randomised to intervention and usual care control groups. In ten home visits from a physiotherapist the intervention group were taught a home exercise program aiming to enhance balance and prevent falls. Balance was assessed at 3 and 12 months by a research physiotherapist masked to group allocation using the Maximal Balance Range test which measures the distance forward the person can lean without moving the feet. Falls were assessed over 12 months using monthly calendars.

Results: Participants had an average age of 81.2 years (SD 8.0), an average of 6.8 health conditions (SD 2.7) and were prescribed an average of 7.5 medications (SD 3.3). At 3 months Maximal Balance Range was significantly better in the intervention group than the control group (between group difference after adjusting for baseline values 10 mm, 95% CI 2 to 18 mm, p=0.011, n=288) but the difference was not statistically significant at 12 months (between group difference after adjusting for baseline values 8 mm, 95% CI -1 to 16 mm, p=0.070, n=302). The intervention group had more falls in the 12 months after randomisation (IRR 1.43, 95% CI 1.07 to 1.93, p=0.017, n=340).

Discussion: Further research is needed to investigate the link between exercise and falls in people at a high risk of falls.

115 Demystifying the groin

INVITED

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Injuries of the groin have a substantial impact in sport, particularly in the popular Australian sports of Australian football, rugby union, rugby league and soccer. The diagnosis and management of groin injuries present a difficult problem for sports medicine practitioners. Historically, pathology in this area has been given a generic term such as adductor related groin pain or osteitis pubis, while the current literature is limited by the lack of a clinical framework to assist diagnosis. Geographical biases with diagnosis also exist that suggests a lack of agreement between clinicians around the world. Some clinical models of groin pain have been previously published in the literature however they have not been validated. A model containing eight subgroups of exercise related pubic pain is proposed that is currently subject to further research in aiming to validate this model. The model recognizes the anatomical structures of the region that might contribute to groin pain. The eight different subgroups of exercise related pubic pain will be presented as well as key subjective and objective findings pertaining to each subgroup. These varied diagnoses are essential to improve the understanding and management of this condition in sport. Importantly, accurate diagnosis leads to the application of a different model based treatment, targeting the cause of tissue pathology. The treatment model is based on these specific findings, optimization of biomechanical loading and evidence based management of tissue pathology. Return to sports guidelines are related to the specific pathology and hence vary with each subgroup rather than being generic.

116 Effectiveness of lifestyle interventions including resistance training for type 2 diabetes prevention: A systematic review and meta-analysis

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Introduction: Recommendations for Type 2 Diabetes (T2D) prevention promote lifestyle behaviour changes in diet and exercise (traditionally aerobic). In the 2012 guidelines for pre-diabetes, Exercise and Sports Science Australia (among other International organisations) has endorsed resistance training (in combination with aerobic activity). We conducted a systematic review and meta-analysis of multi-component lifestyle T2D prevention studies which included diet + aerobic exercise + resistance training and assessed their characteristics and effectiveness.
Methods: Eight electronic databases were searched up to January 2012. Studies were eligible if they: 1) recruited pre-diabetic or individuals at risk of T2D; 2) conducted diet and exercise [both aerobic and resistance training] programs; 3) reported impact on body weight and plasma glucose.
Results: In total, 23 articles from eight studies were eligible including five randomised controlled trials, one quasi-experimental, one two-group comparison and one single-group pre-post study. Median intervention length was 12 months (range 4–48 months). In general participants were advised to lose weight (7–10%), achieve a target macronutrient distribution, perform aerobic exercise for an average frequency of 5.0 ± 1.5 days/week, with an average weekly duration of 157.5 ± 44.4 min, and perform RT for an average of 2.3 ± 0.7 days/week for an average total duration of 90.0 ± 24.5 min. Four articles had a low risk of bias (score $\geq6/10$). Meta-analysis favoured interventions over controls for weight loss (-3.79 kg [-6.13, -1.46; 95% CI], Z=3.19, P=0.001) and fasting plasma glucose (-0.13 mmol.L^{-1} [-0.24, -0.02; 95% CI], Z=2.42, P=0.02). Aerobic exercise tests to measure/predict VO_2max (fitness) were reported in five studies, and improvements were observed in all intervention groups. No studies used objective measures to assess physical activity, which is a major limitation. It is noteworthy that only one study measured changes in muscular fitness.
Discussion: Multicomponent lifestyle programs for prevention of T2D are effective in eliciting moderate weight loss and small improvements in glycaemic control. Indications of impact on aerobic fitness were commonly reported, however impact on muscular fitness was generally not reported. The lack of studies evaluating muscular fitness makes it impossible to determine whether the addition of resistance training to other lifestyle interventions is beneficial for improvements in muscular fitness or glycaemic control. Future multicomponent T2D prevention studies should provide comprehensive and objective evaluation of effects on aerobic and muscular fitness.

117 Chronic kidney disease and cardiovascular disease in Australia: A comparative cost analysis

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Introduction: Cardiovascular disease (CVD) is the most expensive disease group in Australia, accounting for 11% of total healthcare expenditure. However, according to an Australian Institute of Health and Welfare (AIWH) report produced in 2011, CVD-related hospitalization rates, which account for nearly half of CVD-related cost, have fallen over the past decade. In contrast, the number of patients being treated for chronic kidney disease (CKD) has increased. Therefore, the aim of this study was to predict the overall cost per-patient cost associated with CKD and CVD.
Methods: Data published by the Australia and New Zealand Dialysis and Transplant Registry (ANZDATA) and the Australian Institute of Health and Welfare (AIHW) were used to compare CKD and CVD costs. Renal replacement therapy (RRT) costs were also examined as they are the primary contributor to CKD expenditure. Disease prevalence and cost predictions were made using a linear regression model.
Results: CKD and RRT prevalence, per-patient expenditure, and overall expenditure are increasing more quickly than CVD. By 2020, the prevalence of RRT patients is estimated to increase by 29% (2012: 20,428, 95% CI: 14,215–26,640; 2020: 26,346, 95% CI: 15,950–36,742) compared to a 7% increase in CVD prevalence (2012: 3.5M, 95% CI: 3.3M–3.8M; 2020: 3.8M, 95% CI: 3.4M–4.2M). In this regard, CKD- and RRT-related expenditures are both estimated to increase by 41% (CKD: 2012: $1.5B, 95% CI: $1.2B–$1.9B; 2020: $2.2B, 95% CI: $1.6B–$2.8B) (RRT: 2012: $1.3B, 95% CI: $925M–$1.7B; 2020: $1.9B, 95% CI: $1.2B–$2.5B) compared to a 14% increase in CVD-related expenditure (2012: $6.9B, 95% CI: $6.7B–$7.1B; 2020: $7.8B, 95% CI: $7.4B–$8.2B). Furthermore, the average annual RRT patient cost is estimated to increase by 23% (2012: $68,027, 95% CI: $41,572–$94,483; 2020: $83,806, 95% CI: $39,573–$128,075) compared to an 8% increase in average annual CVD patient cost (2012: $1,956, 95% CI: $1,854–$2,058; 2020: $2,112, 95% CI: $1,938–$2,286).
Discussion: The substantial healthcare costs associated with CVD are due to the large number of patients who suffer from this category of disease. When examined on a per-patient basis, CKD produces a considerably higher financial burden on Australia's healthcare system. Given the high per-patient cost and increasing prevalence of CKD, research focusing on novel prevention and/or therapeutic interventions is warranted. Individualized interventions, such as supervised exercise training, might be a cost-effective means of therapy for CKD patients.

118   Impact exercise and bone mass in premenopausal women at or beyond peak bone mass

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Introduction: The current study was designed to test the efficacy of a 64-week entirely home-based progressively incremented impact exercise program for improving bone mass at clinically relevant sites in adult women with low bone mass for age who were at or beyond the age of attainment of peak bone mass.

Methods: Participants were 107 premenopausal women (mean 39 years), identified with negative Z-scores for total proximal femur, lumbar spine and/or radius randomly assigned to either exercise or control groups and subsequently pair-matched on the bases of age, regional bone mass and BMI (52 exercisers, 55 controls). Exercise programs were designed on the basis of forceplate evaluations of ground reaction forces generated by unilateral landings from different step heights (targeting femur and spine) or from falls onto the hands (targeting forearm). Bone mass was measured pre and post by DXA and calcium intake by calcium frequency re-call questionnaire. Exercise sessions were no more than 10 minutes with up to 4 sessions per week recorded in exercise logs. Progression involved periodic change to height of drop, number of falls and/or number of sessions per week.

Results: Average vertical ground reaction forces associated with the hip and spine step protocol were estimated at between 2.5 and 4.5 BW while, for the forearm, peak impact forces approximated 0.8 BW (time to peak force <50 msecs for all). Compliance was relatively low (46%, 59%, 48% for femur, spine radius regimes respectively) nonetheless, none of the exercisers lost bone mass and overall had significant gains at each site while controls had significant losses (femur 2%, -2.9%; lumbar spine 2.8%, -2.8%; radius 3.9%, -3.8% exercise and control respectively).The intergroup differences were strongly significant at each site $p<0.001$ for all). The relationship between change in bone mass and exercise compliance was strong in each case ($r=0.73$; 0.82; 0.79 femur, spine radius respectively). Calcium intake improved significantly over the course of the program without intergroup differences.

Discussion: The improvements were absolute (within group) as well as relative (between groups) and were achieved without supervision, without injury and in the face of moderate compliance. Since no participants were excluded from the analyses, significant improvements at all sites in the face of moderate compliance overall, strengthens the conclusion that this form of progressively incremented impact exercise engendering moderate GRFs is an effective form of exercise for bone mass improvement that can be carried out safely in the home with little equipment.

119   The prevalence of chronic health disease in a resistance trained Australian population

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Introduction: A profusion of muscle strengthening research and targeted randomized controlled trials report the many health benefits from resistance training for both healthy and at risk populations. Endorsed physical activity recommendations also explicitly state that Australian adults should initiate and maintain engagement in muscle strengthening activities in conjunction with aerobic, flexibility and neuromotor activities to encourage healthy lifestyles in the absence of chronic health disease. The primary objective of this research was to highlight the strength of association between self-reported resistance training and selected diseases in randomly selected adults living in Central Queensland, Australia.

Methodology: A Computer-Assisted-Telephone-Interview (CATI) survey conducted by the Population Research Laboratory at CQUniversity performed a survey of 1289 Central Queensland adults (male=635, female 654) in October–November 2010. Respondents were asked to report on questions including age, gender, stature, mass, and health status along with questions relating to resistance training participation, knowledge and training levels. The strength of association between variables was determined using odds ratios and 95% confidence intervals.

Participants: Respondents were 18 years of age or older that could be contacted by direct-dialed, land-based telephone service. A telephone database using a computer program to select, with replacement, a simple random sample of phone numbers selected respondents.

Results: Only 13% of the respondents reported that they were currently participating in muscle strengthening activities. Significantly more males performed resistance training than females ($p<0.05$).Young resistance training respondents (18–24 yrs) reported the prevalence of no chronic disease as 67%, (25–34 yrs) 47%, (35–44 yrs) 37%, (45–54 yrs) 24%, (55–64 yrs) 14% and 65 years and over only 6%. Resistance training activity was associated with a significant ($p<0.05$) decrease in prevalence of heart disease (OR: 1.89, 1.23–2.90), arthritis (OR: 1.65, 1.23–2.20), abnormal blood pressure (OR: 1.92, 1.48–2.50), elevated cholesterol (OR: 1.58, 1.18–2.11), and an increased prevalence of reporting no known disease condition (OR: 0.71, 0.57–0.89).

Conclusions: The present data suggests that performing resistance training activities is associated with a reduced risk of heart disease, arthritis, blood pressure and cholesterol levels, and an increased likelihood of an absence of a chronic health condition. The present data also confirms a lack of prevalence of Australian's participating in regular muscle strengthening activity programs to gain health benefits. These findings suggest the need to increase overall education on the health benefits and absence of chronic health disease resulting from a lifestyle change that includes regular resistance training.

120   Can people with lifestyle related chronic disease BEAT IT through physical activity and education?

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Introduction: Funding was received for a three year period under the Australian Government's Healthy Communities Initiative to nationally roll out BEAT IT: Physical Activity & Lifestyle Program. The program aims to target communities with largely disadvantaged populations and individuals predominantly not in the paid workforce. BEAT IT is midway through the funding period and the aims of this study are to examine the program's effectiveness in reducing chronic disease risk factors, increasing physical activity levels and promoting sustainable and positive lifestyle behaviour change.

Methods: BEAT IT program involves 8–12 weeks of twice weekly group based physical activity sessions incorporating progressive resistance, aerobic, balance and core exercises coupled with fortnightly lifestyle education sessions. Pre and post data is collected and analysed including anthropometric data (weight, BMI, waist circumference, resting BP, resting HR), exercise testing (6 minute walk (6MW), seated 2kg medicine ball throw, sit and reach, 5 stage abdominal, 60s single leg balance, 60s sit to stand) and questionnaires (combination of IPAQ and Active Australia Survey).

Results: Since July 2010, 36 BEAT IT programs have been completed, totalling 243 participants at commencement (approximately 65% female vs 45% male) with an average age of 62.3. Completion rate was 70% (n=169). On completion, there was an increase of 19% of participants who met the physical activity (PA) criteria (exercise 30 minutes at least 5 day per week; 45% vs 64%) and there was an 85% increase in the average total of minutes spent doing PA per week. There were improvements in all anthropometric measures: body mass index (BMI) (-0.4, p-value NS), weight (-1.1 kg, p-value NS), waist circumference (-3.5 cm, p-value=0.03), SBP (-2.3 mmHg, p-value NS), DBP (-0.9 mmHg, p-value NS). Statistically significant improvements (p-value<0.001 for all) were found for 6MW, seated 2kg medicine ball throw, sit and reach, 60s single leg balance, and 60s sit to stand.

Discussion: It is clear through these results that the BEAT IT program can positively influence increases in physical activity levels and improvement in health outcomes in a population group that is typically difficult to engage. These positive changes may be attributable to the amount of regular contact between the program provider and participants, and amongst participants themselves during the physical activity and education sessions. At the midpoint of the program we are yet to establish whether changes in behaviour are sustainable post program; however, we hope to demonstrate this through the second half of the funding period.

121 Physical inactivity at work and leisure: A 12-month study of cardiac patients

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Introduction: Physical inactivity has been identified as a distinct health risk. However little is known about how this can vary at work and leisure in cardiac patients. The aim of the current study was to investigate the prevalence and pattern of work-time and leisure-time physical inactivity in the 12 months after a cardiac event, and to identify risk factors for physical inactivity in these settings.

Methods: A series of 425 patients (90% male; mean age=54.8 years) consecutively admitted to three Melbourne hospitals with acute coronary syndrome were interviewed in hospital, and 4 and 12 months later. Physical activity was measured using the Stanford Brief Activity Survey. Patients scoring in the first category were classified as 'physically inactive'. Socio-demographic and psychosocial data were collected by interview and self-report. Medical records were consulted for medical data.

Results: Approximately 50% of participants were physically inactive in their work, regardless of whether this was measured prior to or after the acute event. In contrast, leisure-time physical inactivity declined over the course of 12 months recovery, with 52% inactive prior to their event and 29% inactive by 12 months. Those who were inactive in both work and leisure decreased from 27% prior to their event to 15% by 12 months. Patients at risk of being physically inactive in their leisure were more financially stressed ($\chi2=10.16$, p<.01), had lower education ($\chi2=5.46$, p<.1), were non-home owners ($\chi2=6.55$, p<.05), had poorer self-rated health ($\chi2=3.74$, p=.05), were smokers ($\chi2=12.09$, p<.01), had a history of angina ($\chi2=3.69$, p=.05) and had a higher body mass index (BMI) (F=6.8, p<.05). In logistic regression, the significant predictors of physical inactivity at leisure were financial stress, non-home ownership, higher BMI and smoking. Those at risk of being physically inactive in their work were white collar workers, those with higher education and those with a history of diabetes ($\chi2=31.95$, p<.001; $\chi2=7.10$, p<.05; $\chi2=3.64$, p<.1 respectively). In logistic regression, the significant predictors of physical inactivity at work were white collar occupation and having a history of diabetes.

Discussion: These results highlight the different risk factors for physical inactivity in work and leisure settings. Socio-economic and health status variables are significant predictors of physical inactivity in both settings. Interventions to support these 'at risk' cardiac patients to increase their physical activity could be developed and trialled.

122 What we can learn from health risk assessment: Meeting physical activity guidelines and clustering of health risk behavior in the Vitality health promotion program

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Introduction: The growing prevalence of chronic, non-communicable diseases in the last few decades has prompted the increasing use of health assessment and screening tests to identify persons at-risk of developing chronic disease. The health risk assessment (HRA) used to identify these at-risk individuals typically relies on self-reporting of family and medical history and lifestyle behavioral risk factors, such as: dietary habits, physical activity (PA), tobacco use, and body mass index (BMI). When combined with biometric screening tests (finger-prick cholesterol and glucose) and other clinical measures such as blood pressure and waist circumference, the HRA can become an effective way of identifying individuals at-risk, and is often the first step in engagement with a health promotion or employee wellness program.

Aims: Because physical inactivity is the most prevalent of the lifestyle, behavioral risk factors, and amenable to intervention, the present study aimed to determine the extent to which other lifestyle risk factors clustered with inactivity in persons enrolling in a commercial, incentive-based health promotion program.

Subjects and methods: The current cross-sectional, observational study examined a sample of 2011–2012 HRA results of members of the Vitality health promotion program (N=41076) and compared the health risk status and health behaviors of members who were meeting PA guidelines (>=150 min of moderate-to-vigorous PA) against those not meeting guidelines.

Results: The mean age of the study sample was 45+11 yrs, and 55% were men and 46% were meeting PA guidelines. Those meeting PA guidelines were significantly younger, had lower fasting blood glucose concentrations, total cholesterol, LDL-cholesterol and triglyceride concentrations (mM), lower systolic and diastolic blood pressure, smaller waist circumferences, (84+13 vs 88+15cm), lower BMI (26.4+5.1 vs 28.6+6.5), higher HDL cholesterol concentrations, fruit and vegetable intake and overall better dietary behavior scores (P<0.0001). These differences remained significant even after adjusting for age and gender. In addition, physically active persons were less likely to smoke (5% vs 8%, P<0.0001), to report one of 4 chronic conditions (diabetes, cardiovascular disease, cancer and lung disease) (11.5% vs 8.5%, P<0.0001) and back pain (P<0.001).

Conclusions: These results demonstrate that in persons presenting for HRA, those meeting PA guidelines are significantly more likely to have an overall better health risk status, and highlights the problem of selection. In addition, these data provide guidance for the development of lifestyle interventions for health service providers, with PA as a central focus.

123   Quantification of walking events in patients with Intermittent Claudication

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Introduction: Intermittent claudication (IC) is a symptom of peripheral vascular disease and describes a cramp-like pain in the calf or thigh muscles, aggravated by physical activity (PA) and relieved by rest. Patients report needing to stop whilst walking, but few studies have attempted to quantify their walking patterns. The aim of this study was to compare the duration and cadence of free-living walking events of IC patients with aged-matched controls.
Methods: Thirty patients (mean age 67±9 years) with varying degrees of IC were recruited from vascular out-patient clinics at Stirling Royal Infirmary, UK. Seven days of activity data was recorded from all subjects using the activPAL™. PA data from 30 healthy matched (age±5 years; gender) participants from the Glasgow Caledonian University PA database were used for comparison. A walking event was defined as a continuous period of walking, and each event had an associated duration, number of steps and average cadence. The total number of events and the number of steps per day were compared between groups using an independent samples t-test (p<0.05). A further comparison between groups was made using only those events above 60s and events above an average cadence of 100 steps/min (threshold for MVPA).
Results: There was no difference between the groups for the total number of events (414 and 384 p=0.40) but IC patients took 23% fewer steps per day (6,526 and 8,436; p=0.01). For events above 60s, IC patients had 38% fewer walking events (8.8 and 14.2; p<0.01) and took 50% fewer steps per day (1,938 and 3,892; p<0.01) than controls. For all walking events with an average cadence greater than 100 steps/min IC patients had a similar number of events to the control group (36.3 and 37.9; p=0.82) but took 54% fewer steps (1,392 and 3,049; p<0.001). For walking events which were longer than 60s and which had an average cadence greater than 100 steps/min, IC patients had 50% fewer events (2.9 and 5.9; p<0.001) and took 62% fewer steps (969 and 2,545; p<0.001).
Discussion: Analysis of the individual walking events revealed that IC patients took fewer steps at longer duration and that above the cadence threshold this difference was more marked as might be expected from reported clinical symptoms. This type of analysis might be able to determine the severity of IC and quantify the effectiveness of interventions.

124   Doping knowledge in sports: Actus reus versus mens rea

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The World Anti-Doping Agency (WADA) is the lead regulatory body on performance-enhancing substance and method (PESM) use in sports. WADA imposes a stringent code on athletes regarding PESM use and strict legal liabilities for its misuse. Strict liability in doping regulations means that mens rea ("guilty mind") does not have to be proved by sports governing bodies in relation to one or more elements comprising the actus reus ("guilty act"). Although intention, recklessness or knowledge may be required in relation to other elements of the offence, a positive test alone is sufficient for sanction. However, none of the above aids researchers in understanding the phenomenon of banned PESM use. Although it is important that researchers seeking to understand banned PESM use that athletes' knowledge of anti-doping rules be assessed, few studies or theoretical psychological models of doping have addressed this fundamental issue. Furthermore, from discussion with various anti-doping agencies, sporting bodies, and experts in the field, it appears no consistent or appropriate assessment tools to measure this knowledge exist. The present paper is part-one of a two-part paper that explores the level of anti-doping knowledge in Australian aquatic-sports competitive athletes (both elite and potentially-elite). In part-two we assess how knowledge acts as a statistical confounder in previously reported research. An eleven-item criterion-referenced survey instrument based on WADA's educational material was developed to assess athletes' level of knowledge of anti-doping rules. It was administered to over 300 elite and potentially-elite aquatic-sport athletes. Total item scores and per-item scores were statistically analysed. The majority of athletes surveyed had high total knowledge scores, with the overall mean being 75.18%. However, just 29 participants (9.0%) scored 100% with the implication that, given the opportunity, inadvertent doping under WADA's strict liability legal requirements could potentially occur in 91.0% of the athletes surveyed. This research has provided an effective instrument for assessing the level of anti-doping knowledge in elite athletes. Such a tool is needed for any study on PESM use.

125   A pilot study into amino acid supplementation and strength training in females

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Introduction: Oestrogen has been shown to influence metabolism both at rest and during endurance exercise resulting in differences in substrate utilisation between women and men. Previous research has established the effectiveness of protein supplementation together with resistance training on measures such as strength and lean body mass. The great majority of research analysing protein supplementation, however, has investigated males and the relationship between resistance training and nutrition in females has been neglected. The aim of the current study was to examine the effectiveness of protein supplementation combined with resistance training in female subjects.
Methods: Two groups of reproductive aged females underwent leg strength training twice weekly for an eight week period and were provided with either a placebo (P) (n=6 age 27.1±9.8 years, height 163.3cm±3.5 cm and weight 60.3±5.7 kg) or 15g of essential amino acids (S) (n=5 age 28.4±10.4 years, height 163.0±4.5cm and weight 60.8±5.2 kg) immediately following each training session. Strength testing consisting of 1RM testing of smith squats, leg extension and stiff legged deadlift was undertaken pre, mid and post training. Measures of muscular hypertrophy included anthropometric measures (skinfolds and 3 leg girths). Testing was set at four week intervals to ensure it was conducted during the same phase of the menstrual or oral contraceptive cycle in order to reduce potential hormonal influences.

Results: Repeated measures ANOVA showed that both the P and S groups significantly increased 1RM strength across all time periods. Pre to post training 1RM strength gains were: Smith squats (P+79%±17%; S+94%±37%), leg extension (P+51%±17%; S+50%±28%) and deadlift (P+50%±7%; S+59%±11%). There were no significant differences between the two groups. In both groups the measures of muscular hypertrophy showed no significant change over time.

Discussion: The results indicate that 15g of essential amino acid supplementation immediately following exercise may not be adequate to induce additional strength gains or muscular hypertrophy in females compared to strength training alone. Our findings contradict most of the research conducted with male participants. This may imply that females require longer training periods in order to induce the changes shown in males. Another explanation could be that an increase in total dietary protein is required rather than twice weekly protein supplementation. Our results suggest that females may respond differently to males in relation to amino acid supplementation and that further research is required.

126 Does training status influence peak caffeine levels following caffeine ingestion?

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Introduction: There is some evidence in the literature to suggest that the ergogenic potential of caffeine may be related to training status. The aim of this study was to determine whether differences in training status influence serum caffeine concentrations following caffeine ingestion.

Methods: Trained male cyclists and triathletes (n=14) and active but untrained healthy males (n=14) consumed a standardised high carbohydrate meal on arrival at the laboratory that collectively provided 2 g·kg^{-1} CHO and 45 kJ·kg^{-1}. Capsules containing 6 mg·kg^{-1} anhydrous caffeine or colour-matched placebo (calcium sulphate) were then consumed. Venous blood was sampled for serum caffeine concentration at baseline and at 6 time-points over 4 h following supplementation. Participants remained at rest for the 4 h duration of the testing period. Hydration, diet and training were controlled for 24 h prior to testing.

Results: There were no differences between groups in weight, height or usual caffeine intake (p>0.05). Following caffeine ingestion, trained athletes displayed significantly lower (p=0.028) peak serum caffeine concentrations (trained=32±5 µmol·L^{-1}, untrained=38±8 µmol·L^{-1}; mean±SD) and earlier (p=0.044) time-to-peak caffeine concentrations [trained=120 (120, 180) min, untrained=150 (90–240) min; median (minimum, maximum)] compared to untrained individuals. Total concentration of caffeine in the system determined by area under the curve over 4 h (trained=1459±244 µmol·L^{-1}·h^{-1}, untrained=1643±319 µmol·L^{-1}·h^{-1}) approached significance (p=0.055).

Discussion: The present data indicate that endurance-trained athletes experienced lower and earlier peak serum caffeine concentrations compared to untrained active males. Differences in training status could be responsible, at least in part, for inconsistencies in the caffeine-performance literature.

127 Effects of prolonged exercise with and without carbohydrate-electrolyte solution on salivary α-amylase activity in men

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Introduction: The study of the physiological responses of salivary glands to endurance exercise has gained attention in recent years. Both parasympathetic and sympathetic stimulation induces the salivary secretion. However, whether prolonged exercise with and without carbohydrate-electrolyte solution influences the salivary α-amylase activity still remains to be elucidated. The purpose of this study was to clarify the effects of 2 h of prolonged cycling exercise with and without carbohydrate-electrolyte solution on salivary α-amylase activity in physically active men.

Methods: Eleven physically active men served as the subjects [age: 19.6±1.2 year; height: 171.2±3.7 cm; body weight: 67.7±13.0 kg; body mass index: 23.0±3.7 kg/m^2; body fat: 15.1±6.6 %; VO$_2$peak: 62.1±8.9 ml/kg/min (mean±SD)]. All subjects performed an incremental cycling exercise until volitional exhaustion to determine their peak oxygen uptake. On two different occasions, each subject performed 2 h of cycling exercise corresponding to a constant power output at 60%VO$_2$peak. After an overnight fast, all subjects drank either carbohydrate-electrolyte solution (CHO) (glucose: 62 g/L, Na+: 49 mg/dL; K+: 20 mg/dL; Ca2+: 2 mg/dL; Mg2+: 0.6 mg/dL) or water placebo (WP)(Na+: 0.53 mg/dL; K+: 0.05 mg/dL; Ca2+: 1.20 mg/dL; Mg2+: 0.28 mg/dL, pH: 6.8) immediately before cycling and every twenty minutes thereafter (2 ml/kg body weight). At the 10-min period before and after 2 h of cycling exercise, salivary α-amylase activity was determined with a biosensor qualified by Yamaguchi et al. (J Int Med Res, 34: 152–159, 2006).

Results: In light of the salivary α-amylase activity, two-way (time x treatment) analysis of variances (ANOVA) showed significant main effects for time and treatment (Pre: 40.2±13.9, Post: 63.7±42.8 for CHO; Pre: 39.5±11.2, Post: 113.7±62.4 kIU/L for WP, p<0.05), whereas no significances for interaction were observed. The percent increase concerning salivary α-amylase activity level before and after exercise was three-fold higher in WP than in CHO.

Discussion and Conclusions: Recent studies have demonstrated the augmentation of immune function by the CHO intake during exercise. However, the effects of prolonged exercise with and without carbohydrate-electrolyte solution on salivary α-amylase activity was not still apparent. The findings of the present study indicate that 2 h of cycling exercise with a constant carbohydrate-electrolyte ingestion appears to induce lesser salivary α-amylase activity than only with a mineral water, which could enhance oral mucosal defense during exercise.

128   Doping in sports (Part 2): (D)etermination, (O)bservance, (P)ermissibility or (E)ducation?

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The Olympic motto of Citius, Altius, Fortius captures the essence of performance excellence and that of being an elite athlete. Striving for performance excellence may help explain the latent psychological construct of doping. Part-one of this two-part paper showed that elite and potentially-elite level athletes lack knowledge of anti-doping rules. This ignorance of performance-enhancing substance and method (PESM) use may lead to inadvertent doping and its consequences of penalties under the strict liability legal positions adopted by the World Anti-doping Agency. The literature review showed that the psychological models of self-determination, social desirability and doping permissibility are the most common theoretical frameworks cited in studies of athlete behaviour and/or doping. Doping permissibility, in particular, adopts a stance that doping is an intentional behaviour. However, the lack of knowledge of PESM use may be a confounding variable affecting result interpretation on doping permissibility but not previously addressed in these studies. PESM use itself may also be a latent factor that cannot be directly measured but may be captured by indicators like self-determination ("Determination"), social desirability ("Observance"), doping permissibility ("Permissibility"), and doping knowledge ("Education"). In this part-two paper, over 300 elite and potentially-elite aquatic-sport athletes were assessed using validated theoretical instruments of Determination, Observance and Permissibility, all commonly adopted in PESM use studies. The athletes were also assessed on Education as described in the part-one paper. Since Determination is context-specific, this study was conducted in the context of aquatic-sport and complementary and alternative medicine utilisation. Education scores were then analysed against Determination, Observance and Permissibility scores to determine the amount of statistical covariance that exists. Bivariate correlations of the total scores of each participant and factor analysis using the reproduced correlation coefficients and residuals were calculated as part of a structural equation model for the four indicators.
Statistically significant correlations were shown to exist between doping knowledge and the three other indicators. Specifically, the Permissibility score decreases as the Education score increases. Education accounted for 24.2%, while Permissibility accounted for only 1.4%, of the total variance in the latent factor that potentially explains PESM use. The findings of this study suggest that athletes may violate anti-doping rules out of ignorance rather than deliberately. It thus suggests that conclusions drawn in previous studies adopting an intentional doping stance may be inaccurate. The practical application of this study is that doping behaviour in athletes could be reduced through better educational programmes on PESM use.

129   Nutritional evaluation of the dietary program for Thailand national rowing athletes during the 2011 training program

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Rowing is a high-energy demanding activity, in averages, requiring up to 3,100–4,000 and 2,400–3,000 kcal per day in volunteered male and female athletes respectively as suggested by Recommended Dietary Allowances (RDA). In this study, we analyzed the nutritional status of the Thailand National Rowing Athletes in highly training program during Suranaree University of Technology sports camp 2011. The averages BMIs of the athletes were 23.2 ± 1.16 kg/m^2 in 13 males and 21.2 ± 1.54 kg/m^2 in 7 females. The averages body fat composition of all female athletes significantly decreased after 4 months of the program (from 25.5% to 19.9%, $p < 0.001$). Two-time point comparison (n=9) of the daily intake between 1 month and at the end of the training showed that the rowing athletes had not adequate daily calories intake for training activities, only 2,202 kcal in 7 male athletes and 1,305 kcal in 2 weighted control female athletes. Carbohydrates and fat contributed 51 ± 1.16 and 31 ± 10 % of the total calories taken respectively. The percent of fat was high than recommendation for weighted controlled females. The micro-nutrients taken by the athletes were inadequate according to recommended daily allowance (RDA). Male athletes received only 97.78% of calcium, 69.82% of vitamin A, and 96.75% of vitamin C per day, comparing with RDA values. Weighted controlled female received 82% of calcium, 62% of ferrous, 32% of vitamin A, 88% of vitamin B1 and 93.5 % of niacin per day, comparing with RDA values. This study indicated the need of appropriate training program and intervention of nutritional management for these rowing athletes. We suggested that better nutritional control of dietary fat and increase the intake of grain, brown rice, low fat milk, red meats and fruits would benefit the rowing athletes in both energy and micro-nutrient requirements.

130   Development of a psycho-educational anti-doping intervention program for emerging athletes

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Introduction: Current anti-doping programs focus on knowledge of banned substances, reporting and testing requirements, and penalties for noncompliance. This current approach ignores personality variables that may render an athlete susceptible to doping. We sought to develop an intervention targeting junior elite athletes that involved psycho-educational activities and exercises that target the personality variables we found to significantly differentiate athletes with respect to increased doping susceptibility: Sport motivation – susceptibles are more externally regulated and lesser intrinsically motivated; Achievement goals – susceptibles are characterised by lesser performance-approach and greater performance-avoidance; Athletic identity – susceptibles tend to have a strong public identity; Perfectionism – susceptibles are more concerned with mistakes and parental pressure; Fear of failure; Self-presentational concerns – susceptibles tend to be more worried about appearing athletically untalented, physically unattractive, fatigued/lacking energy, and mentally weak; Morality – susceptibles tend to have a positive disposition towards cheating and gamesmanship.
Methods: The project consisted of three phases: 1) Focus group interviews with sports psychologists from across Australia to assist in generating the content of a psycho-educational intervention; 2) Following the input from psychologists a number of counselling approaches in common use by both psychologists in general and sports psychologists were reviewed to develop the specific content of the intervention; and 3) Feedback on the draft intervention was obtained from sport psychologists previously involved in the project.

Results: A four modules intervention, to be delivered by a sports psychologist over four weeks in sessions lasting from 1½ to 2 hours for groups of around 10 athletes, was developed. The intervention is titled "Improving performance by dealing with negative thoughts that can impede sport performance". The overall aim of the intervention is to show athletes how they can overcome various negative thoughts and feelings that are impeding their performance.

Discussion: By dealing with these issues, the intervention not only aims to improve performance, but also lessen athletes' likelihood of showing poor sportsmanship, being tempted to cheat, and hence lessen their vulnerability to trying illegal methods to improve their performance. Sports psychologists who wish to field test the intervention are advised that: a) specific examples are to be elicited from athletes and from the participants' fields of sport; b) sport psychologists could adapt their preferred counselling technique to the issues; and c) to avoid boredom and to enhance internalisation of the concepts, the sessions should be as interactive as possible.

131 Longitudinal trends in physical activity level and sedentary behavior in a population based sample of youth

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Introduction: Most studies investigating trends in physical activity and sedentary behavior are based on self-report. The purpose of this study was therefore to describe longitudinal trends in objectively assessed physical activity and sedentary behavior from age 9 to 15.

Methods: In 2005–06, a nationally representative sample of 1306 9-year-old Norwegians participated in a cross-sectional study where the aim was to describe their objectively assessed physical activity level. Six years later these participants were invited to participate in the study "ungKan2" as 15-year-olds. A total of 671 subjects participated in both studies. Physical activity was assessed using the ActiGraph accelerometer. Outcome variables were daily activity counts per minute (cpm) as well as time spent in sedentary behaviour (<100 cpm) and moderate-to-vigorous physical activity (MVPA>2000 cpm). General linear models were used to assess changes in physical activity.

Results: A total of 512 participants provided valid physical activity assessments that met all inclusion criteria at both time points (girls: n=244; boys: n=268). At age 9, girls had a mean (SD) physical activity level of 608 (203) cpm, and the activity level was reduced to 434 (140) cpm at age 15 (p<0.001). For boys, the mean activity level was 701 (233) cpm at age 9 and 523 (182) cpm at age 15 (p<0.001). At age 9 the girls and boys, on average, were sedentary for 431 (64) and 417 (70) min/day, and sedentary behavior increased over time to 570 (63) and 549 (71) min/day at age 15. In the same time period, girls reduced their time spent at MVPA from a mean time of 78 (23.7) min/day at age 9 to 60.4 (21.4) min/day at age 15 (p<0.001). Boys reduced their time spent at MVPA from a mean time of 98.4 (31.1) min/day at age 9 to 72.1 (26.7) min/day at age 15 (p<0.001).

Discussion: Girls reduced their activity level (cpm) by 28.6% from age 9 to 15 whereas boys had a 25.4% reduction. At age 9, girls and boys spent more than 7 hours per day engaged in sedentary behavior, and this increased with more than 2 hours over time. In the same time period time spent at MVPA was reduced. As there are known health risks associated with being sedentary and health benefits associated with being in moderate physical activity, these factors should be targeted in intervention studies.

132 Secular change of cardiorespiratory fitness in Chinese children and adolescents: 1985–2010

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Introduction: Student's Physical Fitness and Health Survey have been conducted by the Minister of Education and the Physical Fitness Surveillance Center since 1979 by about 5-year-cycles in China. Chinese children and adolescents experienced secular growth acceleration in body size parameters in past 30 years. The present study aims to analyze the secular change of cardiorespiratory fitness by comparing Vital capacity (VC) and endurance running performance of Chinese students from 1985 to 2010.

Methods: Urban and rural samples were collected according to the same sampling procedure (a complex multi-stage, 31 province-covered samples aged 7 to 22-y-old) in 1985, 1995, 2000, 2005 and 2010 surveys, which provide data for this analysis. To evaluate Chinese students cardiorespiratory fitness, 50m×8 shuttle run was tested for 7~12-yr-old boys and girls, and 1000m and 800m run was tested for 13~22 boys and girls respectively. Vital capacity was tested for all students.

Results: 1) the performance of endurance run was declined from 1985 to 2010 in all age group both urban and rural samples. The run time of 50 m×8 in 7~12-yr-old boys and girls increased by 12.27s, 9.89s and 9.14s, 7.17s for urban and rural areas sampling respectively. The time of 1000m run increased by 31.35s, 34.20s for urban and rural areas 13~22-yr-old boys respectively. The time of 800m run increased by 32.14s, 35.33s for urban and rural areas 13~22-yr-old girls respectively. The vital capacity was decreased by 240ml and 320ml, 240ml and 350ml respectively for urban boys and girls, rural boys and girls. 2) the extent of endurance run performance declining was greater in pre-pubertal and puberty than post-pubertal youth, whereas the extent of vital capacity declining was greater in post-pubertal youth than pre-pubertal and pubertal children and adolescents. 3) According to annual declining rate of endurance and vital capacity, Chinese children and adolescents have been experienced the secular declining since 1985, the biggest declining was in 1995 to 2000 for urban and rural areas students.

Discussion: our data suggest that cardiorespiratory fitness of Chinese Children and adolescents both urban and rural areas has significantly decreased over the past 25 years, which might bring effect on their long-term health. School-based and after-school cardiorespiratory fitness promoting exercise training program should be encouraged. Supported by the National Science and Technology Infrastructure Program 2009BAK62B04.

133 Trends in the prevalence of sufficient physical activity among South Australian adults, stratified by income level: 1998–2010

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Introduction: Lower levels of habitual physical activity are consistently seen among adults of low socioeconomic position. This study examined trends in self-reported physical activity among South Australian adults from the highest and lowest categories of annual household income, between 1998 and 2010.

Methods: The South Australian Physical Activity Survey has been conducted every three years since 1998, with ~3000 respondents per survey. The questionnaire is administered by computer-assisted telephone interview. Telephone numbers are randomly selected from the Adelaide metropolitan and country Electronic White Pages listings. Within households, the person ≥18 years with the most recent birthday was selected for interview. Respondents were defined as sufficiently active if they reported ≥150 minutes per week of walking, moderate or vigorous exercise, with vigorous activity doubled to account for its additional health benefits. Low and high annual household income categories were defined as <$20000 (28% of sample in 1998 to 10% in 2010) and ≥$60000 (18% of sample in 1998 to 44% in 2010), respectively.

Results: In the whole sample, the prevalence of sufficient physical activity rose from 49.7% in 1998 to 60.1% in 2010. In the lowest income category, the prevalence fell from 46.1% in 1998 to 40.8% in 2010, with the sharpest fall between 1998 and 2001. In the high income category, the prevalence rose from 55.8% in 1998 to 67.1% in 2010, with the trajectory steady at ~1.0–1.5% per year between 1998 and 2007, and little change between 2007 and 2010.

Conclusions: The widening socioeconomic disparity in regular physical activity among adult South Australians is an urgent public health concern. Interventions and policies designed to promote physical activity are not reaching those at highest risk of overweight and chronic disease.

134 Temporal changes in sleep duration, domain-specific sedentary behaviour and physical activity. A survey among 25 to 79 year-old Danish adults

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Introduction: Recent evidence suggests that prolonged leisure time sedentary behaviour, including TV-viewing, is an independent risk factor for type 2 diabetes, cardiovascular disease and all cause mortality, irrespective of physical activity level. Monitoring sedentary behaviour as well as physical activity at population level is important in order to elucidate whether the two types of behaviour are in fact independent behaviours that should be addressed separately in public health recommendations. The main purpose of the present study was to examine temporal changes in sleep and domain-specific sedentary behaviour and moderate to vigorous leisure time physical activity.

Methods: Two cross sectional population-based surveys of 25 to 79-year-old inhabitants were conducted in The Capital Region of Denmark in 2007 (n=69.800, response rate 52.3%) and 2010 (n=77.517, response rate 54.8%). Information on sedentary behaviour and physical activity was collected by self-report questionnaire (Physical Activity Scale 2), and information on sociodemographic characteristics was obtained from central registers. Data were weighted for non-response and analysed by multiple regression analyses.

Results: In 2007 the entire survey population reported a mean daily sleeping duration of 7.4 hours, leisure time sitting of 3.4 hours per day, occupational sitting of 4.4 hours per day (among working age participants only), moderate or vigorous physical activity 0.87 hours per day and a total daily MET-score of 40.12 per day. Three years later, in 2010, duration of sleep was unaltered (p=0.1), whereas sedentary leisure time and sedentary work time had significantly increased by 12.6 minutes (p<0.0001) and 13.2 minutes (0<0.0001) per day, respectively. Likewise time spent on moderate to vigorous activity had significantly increased by 2,9 minutes per day (p<0.0001). The total daily MET-score had significantly decreased by 0.28 METs per day(0<0.0001).

Discussion: As demonstrated in the present population-based surveys from 2007 and 2010, adult Danish men and women spend an increased amount of time on daily sedentary work and sedentary leisure time activities, but a small increase in daily moderate to vigorous leisure time physical activity was also observed. As duration of sleep is unaltered findings suggest that activities of low intensity may be displaced, by primarily sedentary activities in everyday life. In order to tailor and target future public health guidelines and recommendations, we need to continuously monitor domain-specific sedentary behaviour and physical activity, including physical activity of low intensity.

135 Has non-occupational sedentary time changed in Australian adults? Trends from Australian Time Use Surveys 1992, 1997, 2006*

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Introduction: Current prevalence data on adult sedentary behaviour are limited to single data collection periods and little is known about changes over time in defined populations.

Methods: We analysed population representative data from Australian Time Use Surveys 1992, 1997 and 2006 involving respondents aged at least 20 years old with completed time use diaries for two days. Weighted samples for 1992, 1997 and 2006 were n=5851, n=6419 and n=5505, respectively. We recoded all primary activities by domain (sleep, occupational, transport, leisure, household, education) and intensity (sedentary, light, moderate), and used adjusted multiple linear regressions to test for differences in time spent in non-occupational sedentary behaviours in 1992 and 1997 with 2006 as the reference year.

Results: Total non-occupational sedentary time was slightly lower in 1997 than in 2006 (mean=894min/2d and 906min/2d, respectively; B=-11.2; 95% CI: -21.5, -0.9). By domain, time spent in sedentary transport (B=-6.7; 95% CI: -10.4, -3.0) and sedentary education (B=-6.3; 95% CI: -10.5, -2.12) was lower in 1997 than in 2006, while time in sedentary household and leisure activities was stable. Total time in all leisure time sedentary behaviours constituted 57% and 56% of total sedentary waking hours in 1997 and 2006, respectively. Time spent in screen-based activities (watching TV, using computer) in leisure time was lower in 1992 (B=-62.0; 95% CI: -69.4, -54.6) and 1997 (B=- 24.2; 95% CI: -31.3, -17.0) compared to 2006. About 90% of leisure time was spent sedentary in 2006 and 53% of this was spent watching TV and using the computer.

Discussion: The amount of time adults spend in non-occupational sedentary behaviour is high and increasing in some contexts. Almost all leisure time is spent in sedentary behaviours and the composition of sedentary leisure time changed between 1992 and 2006 towards a larger proportion being screen-based activities. Leisure time sedentary behaviours, TV-viewing and computer use in particular, may be suitable targets for public health interventions because much of the evidence on the detrimental effects of sedentary behaviour is about TV-viewing and health.

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136   Trends in physical inactivity and sedentary behavior in the Dutch population

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Introduction: Continuous monitoring of physical (in)activity was initiated in The Netherlands in 2000 to identify trends in physical (in)activity at population level. From 2006 onwards, sedentary behavior was monitored too.

Methods: The monitor involves a representative rolling sample of the Dutch population (n=approximately 8.000 yearly), interviewed by telephone (mean response rate: 54%). Respondents are asked about demographic characteristics, physical activity (number of days per week with at least 30 minutes of at least moderate physical activity) and sedentary behavior (number of hours spend on sitting during a regular weekday -at work/school and during leisure time- and during a weekend day, and number of hours spend on lying in bed).

Results: In 2000, 9,2% of the Dutch adult population were physical inactive (not one day in a week at least 30 minutes of moderate intensity physical activity). This percentage declined steadily towards 5,5% in 2009. Inactivity of Dutch youth (defined as having less than two days a week moderate physical activities of at least 60 minutes) was stable during 2006–2009 at 13,6% (2009), with marked differences between adolescents (15–20%) and primary school children (around 10%). Other groups with relatively high levels of inactivity were older people (75+, 25%), unemployed people (12%), people not performing sports (11%), obese people (10%), and lower educated people (8%). In 2009, the mean number of hours spent sedentary in adults was 3,5 during working hours and 3 during leisure time. Adolescents were the most sedentary group (5,9 hours at school/work and 3,2 hours during leisure time). On weekend days, they were even more sedentary than people aged 75+. These percentages were relatively stable during the years 2006–2009. Sedentary people complied less with the moderate intensity physical activity guideline and are somewhat more inactive, but they also performed slightly more vigorous intensity physical activities and are slightly more often doing sports.

Discussion: The percentage of the Dutch adult population that is inactive was relatively low and decreased steadily during 2000–2009.

Inactivity in youth was more prominent. Sedentary behavior was widespread, in particular among adolescents. Our findings indicate that complying with the physical activity guidelines is not an equivalent of a non-sedentary lifestyle. In the future, the prevention of sedentary behavior should be a new focus in public health besides the promotion of physical activity.

Note: results of the monitor up to 2011 will be released in June this year and will be presented at the congress.

137   Time trends of physical activity in Brazil: 2009–2011

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Introduction: The aim of this study was to examine time trends in physical activity (PA) in Brazilian state capitals from 2009 to 2011.

Methods: This analysis is based on data from the Brazilian surveillance system (VIGITEL) totaling an annual sample of approximately 54,000 individuals. PA indicators were analyzed in free time (leisure), transportation along with time watching television and inactivity considering all PA domains. Linear regression models were used to measure the variation of indicators over time. We considered the changes corresponding to a regression coefficient different from zero as statistically significant (p<. 05).).

Results: The percentage of PA free time (leisure) was 38.1% (2009) to 39.6% (2011) (p<0.164) whereas the proportion of men physically inactive in the four domains was reduced from 16% to 14.1% (p<.001). Women were less active than men in all indicators, except household chores.

Between 2009 and 2011, PA levels in the Brazilian population are stable in free time and household chores, but increased in transportation, resulting in a decrease in the percentage of inactive individuals. There were no significant changes in the other indicators.

Discussion: The continued monitoring and strengthening of VIGITEL are public health priorities, and PA is a key part of it. In the long run, PA evolution may be re-evaluated.

138 Life course social class and physical activity at age 34 years in the 1970 British birth cohort

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Introduction: Poor socioeconomic conditions across the life course act cumulatively to increase risk of cardiovascular diseases. We aimed to determine how socioeconomic conditions across the life course are associated with physical activity, a key determinant of cardiovascular health. Methods: We used data from the 1970 British birth cohort, a nationally representative, prospective cohort of 16,571 children born in 1970 in the UK. Data were analyzed using structural equation modelling to determine whether social class at birth and at ages 5, 10, 30, and 34 years was associated with physical activity at age 34 years. Outcomes were leisure-time physical activity and transport-related physical activity. Three life course models were compared: the accumulation of risk model with additive effects, the accumulation of risk model with trigger effect, and the critical period model. Results: For leisure-time physical activity, the accumulation of risk model with trigger effect fit the data best for men (RMSEA=0.077 [0.069–0.085]) and women (RMSEA=0.065 [0.058–0.073]). In this model, only social class at age 34 years was directly and significantly associated with leisure-time physical activity at age 34 years. Their estimated direct association was 0.117 for men (p<0.05) and 0.053 for women (p<0.05). For transport-related physical activity, none of the tested models showed good fit to the data and none of the regression coefficients were statistically significant for men. For women, the accumulation of risk model with trigger effect fit the data best (RMSEA=0.068 [0.061–0.076]). In this model, social class at age 34 years was directly, inversely, and significantly associated with transport-related physical activity at age 34 years. Their estimated direct association was -0.104 (p<0.05).
Discussion: During adulthood, high social class is associated with more leisure-time physical activity for men and women, and with less transport-related physical activity for women. Social class at birth, during childhood, and across the life course is not associated with physical activity during adulthood independently of social class during adulthood.

139 Prevalence and correlates of low motor skill competency in Australian children

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Introduction: Fundamental movement skills (FMS) are the building blocks for movement and they form the foundation for many of the specialised skills required in popular sports and leisure activities The aim of this study is to describe the demographic and health-related characteristics of school-aged children with low competency in FMS.
Methods: Cross-sectional representative school-based survey of Australian elementary and high students (n=5,669) conducted in 2010. Trained field staff measured students' height, weight, and assessed FMS and cardiorespiratory endurance (fitness). Information on students' demographics and physical activity was collected by questionnaire.
Results: Overall, the prevalence of students with low motor skill competency was high. Low SES girls were twice as likely to be less competent in locomotor skills compared with high SES peers. Among boys, there was a strong association between low competency in FMS and the likelihood of being from non-English-speaking cultural backgrounds. There was a clear and consistent association between low competency in FMS and inadequate cardiorespiratory fitness. For boys there was a clear association between low competency in object-control skills and not meeting physical activity recommendations. Conversely, the odds of being inactive were double among girls who had low competency in locomotor skills. Discussion: This is the first study to examine the associations between low skill competence (a new and novel way to report motor skills) and a range of health-related and socio-demographic factors in a large representative sample of children and youth. Low competency in FMS is strongly associated with lower cardiorespiratory fitness and physical activity levels in children and adolescents. The characteristics of students with competency in FMS differ by sex and skills types and show that interventions need to target girls from low SES backgrounds and boys from non-English-speaking cultural backgrounds. The high prevalence of low competency in FMS among Grade 4 students indicates that FMS interventions need to start during the pre-school and early preschool years.

140 The level of physical abilities in 7-year-old children in relation to the time spent on the computer games

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Introduction: Limiting the level of daily physical activity results in the increase in the percentage of individuals diagnosed with numerous conditions. Very often health issues affect children as young as preschool age. Besides sedentary lifestyle and low physical activity do not enhance physical performance or learning and practicing new physical tasks. The aim of the research is to define the differences in the level of physical abilities in relation to the time spent on the computer game.
Materials and methods: The research study was conducted in 2006 based on a randomly selected group of children. The study included the results of 23,893 children at 7 year old (11,702 girls and 12,191 boys) with complete research data concerning their physical abilities and the time spent on computer games. The diagnosed skills included throws and catches of ball, jumps, kicks, run and overall coordination of a child when performing physical exercises. The questionnaire was addressed to parents and served as a means of collecting data regarding the family environment of the children and the amount of time they spend on the computer. The research participants were grouped into 4 categories based on the amount of time spent in front of the computer. A single factor variance analysis was conducted using SPSS.
Results: In both gender groups statistical differences were observed with regard to the level of physical abilities depending on the time spent on the computer. In both groups differences in the time spent on computer games were noted. In all cases it was observed that the assessment of physical abilities of those children whose parents indicated an hour or more on the computer is significantly lower compared to those children who do not spend any time or only several minutes in front of the computer. The statistical significance levels are p≤0.01 and p≤0.001.
Discussion: In Poland only 1/5 of preschool-age children attend preschool. The one-year kindergarten education program meant to equip a child for school does not provide opportunities for learning and developing physical skills required for school. In this case, parental involvement in the realization of educational programs aimed at physical education of children is necessary. It is suggested that physical activity of preschool-age children should be monitored in order to identify negative changes in the ways they spend free time.

141   Parents and children's perceptions of whether active video games can help children's fundamental movement skills

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Introduction: Considerable research in recent years has examined the energy cost associated with playing seated and active video games. However, no research has focused on whether active video gaming (AVG) may benefit fundamental movement skills (FMS) in typically developing children, even though AVGs with a sport focus (e.g. Wii Tennis) are marketed as requiring similar skills to play. Improving skill proficiency is a priority as FMS proficiency has cross-sectional and longitudinal associations with physical activity; and children's proficiency levels are low. This study aimed to identify children and their parents' perceptions of AVGs as a tool for developing FMS.

Methods: A qualitative descriptive study was carried out exploring parents' and children's perceptions of the potential of AVGs to contribute to movement skill development. Twenty-nine parents of children aged 9–10 years participated in semi-structured telephone interviews while 38 children participated in 5 focus groups at school. Interview and focus group data were recorded, transcribed, and analysed thematically.

Results: Parents and children had different perspectives on the potential of AVGs for movement skills, which largely rested on different views of 'reality'. Parents felt AVGs were not a substitute for the '*real thing*', and therefore had limited FMS benefits. Some parents felt there might be *some* benefits of AVGs for *some* kids (these were focused on children perceived as disadvantaged in some way) but not for their own child. Overall, parents thought any FMS gained through AVGs would have poor transferability to 'real life' contexts. In contrast, children had a more fluid and expansive view of reality which incorporated both 'real life' and 'virtual' space. Whilst children could articulate limitations of AVGs for skill learning, they still reported extensive use of AVGs as a learning tool for movement skill and considered that skill acquisition was highly transferable in both directions between AVGs and real life settings.

Discussion: Despite contrasting beliefs from parents and children about the transferability of skills used to play AVGs into real world settings, children often used AVGs for movement skill learning purposes. Future research is needed to determine whether actual FMS benefits are gained through playing AVGs. With the increasing prevalence of electronic gaming (particularly seated gaming) amongst children, AVGs provide an opportunity to benefit health. Research is needed to establish what the potential benefits for children might be.

142   Relations between motor proficiency and sub-components of physical activity in children

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Introduction: At a time when low levels of physical activity (PA) among children threaten their health, children with neuro-physiological disabilities such as developmental coordination disorder (DCD) are at even higher risks. Children with DCD have been shown to be less physically active, have worse cardio-respiratory fitness and lower perceived quality of life. Numerous studies have found lower self-reported PA in motor deficient children, but studies using objective measures of PA are scarce and inconclusive. In addition to PA, sedentary behavior has recently been identified as a potential health hazard. The relation between motor proficiency and sedentary behavior are yet unknown. This study aimed to assess relations between motor proficiency and time spent in different physical activity intensities among children.

Methods: 31 children (mean [SD] age: 8.6 [0.65] yrs) were tested for gross motor skills using the Movement ABC test battery (M-ABC). Of these, 10 children were classified as having DCD based on M-ABC data cut offs. Physical activity was assessed by accelerometry (Actigraph GT3X) and proportions of time spent sedentary (SED,<1.5 METs) and in vigorous physical activity (VPA, >6 METs) were calculated. GLM-analyses were performed to test for relations, controlling for gender.

Results: In separate analyses, VPA (F=5.69, p=0.024) was related to M-ABC scores, while SED was found to be unrelated (F=0.81, p=0.38). When physical activity intensities were analyzed together, time spent in VPA (F=5.77, p=0.024), but not SED (F=1.03, p=0.32) was significantly related to M-ABC score. The model including gender, VPA and SED explained 37.6% of the total variation in M-ABC score.

Discussion: Results indicated that at least in this limited sample consisting of children with and without motor deficiencies, low levels of VPA, rather than high levels of SED was found to be the primary risk behavior. Poor motor proficiency appears to prevent children from participating in intense types of activities or *games* (perhaps due to low self esteem or the perceived risk of being *mocked* by peers) without promoting *sedentary* behaviors. Results further underline the importance of using objective measures of PA to allow distinguished analyses of sub-components of PA.

143 Do childhood motor problems predict later academic achievement through physical activity, fitness and obesity?

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Introduction: Recent studies indicate that the global epidemic of obesity and physical inactivity may have detrimental implications for cognitive function and school performance. This prospective study investigated whether childhood motor problems predict later academic achievement through physical activity, fitness and obesity.
Methods: The sample included 5,511 children who were recruited through the Northern Finland Birth Cohort 1986 (NFBC 1986). NFBC 1986 contains data about motor skills at age eight (parental report), and physical activity (self-report), body weight and height (measured in clinical examination) and cardiorespiratory fitness (cycle ergometer test) at age 16. Information on school performance (grades) at the end of Grade 9 (age 16) comes from the National Application Register for Upper Secondary Education. Structural equation models with standardized β coefficients were used to test whether, and to what extent, physical activity, cardiorespiratory fitness and obesity mediated the association between childhood motor problems and adolescent academic achievement. Analyses were sex-specific.
Results: The models fit the data well in terms of root mean square errors of approximation (boys: 0.029; girls: 0.022) and comparative fit indexes (boys: 0.986; girls: 0.985). Among boys, childhood motor problems predicted lower levels of physical activity (β=−0.28, P<0.001), poor cardiorespiratory fitness (β=−0.24, P<0.001) and obesity (β=0.25, P<0.001) in adolescence. Furthermore, physical activity was associated with higher school grade averages (β=0.10, P<0.001) in adolescence, for boys. Motor problems had a negative indirect effect on their academic achievement through physical activity (β=−0.03, P<0.001), but not through cardiorespiratory fitness or obesity. Among girls, childhood motor problems predicted obesity (β=0.18, P=0.01) and lower levels of physical activity (β=−0.14, P=0.01) in adolescence. Physical activity was associated with higher school grade averages (β=0.11, P<0.001) and obesity with lower averages (β=−0.16, P<0.001) in adolescence, for girls. Motor problems had a negative indirect effect on their academic achievement, through physical activity (β=−0.02, P=0.01) and obesity (β=−0.03, P=0.02), but not through cardiorespiratory fitness.
Discussion: Physical activity and obesity, but not cardiorespiratory fitness, mediated the association between childhood motor problems and adolescent academic achievement. Identification of childhood motor problems is a potentially important tool for preventing negative consequences of physical inactivity and obesity on scholastic performance.

144 Fundamental movement skills, sedentary behaviour and weight status in preschool children

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Introduction: The emerging evidence on the relationship between fundamental movement skill (FMS) proficiency and physical activity in early childhood is conflicting. Although there is a growing body of literature in this area, little attention has been given to investigating the relationship between FMS and sedentary behaviour. It has been purported that sedentary behaviour and physical activity are two independent constructs, influenced by different biological, social and environmental pathways. The purpose of this study was to investigate the relationship between FMS and sedentary behaviour.
Methods: Subjects included 46 children from seven preschools. Body mass index (BMI) was calculated as weight (kg) divided by height (m[2]). Sedentary behaviour was measured over a one-day period using a thigh-mounted inclinometer (activPAL™). Fundamental movement skills were assessed using the Test of Gross Motor Development, comprising seven locomotor skills and five object control skills. Percent proficiency in locomotor, object control, and total scores were calculated. Pearson product-moment correlations were used to determine correlations between variables.
Results: Participants (mean±SD; age=4.02±0.06; height=104.5±5.0; weight=17.17±2.29; BMI=16.6±1.3) spent approximately half their day participating in sedentary behaviour (49.7%). On average children were able to complete 10.3 of the 12 FMS tasks. Children performed better at object control skills than locomotor skills (81.7% versus 90.8% proficiency). No significant correlations were found between any of the FMS proficiency scores (percent locomotor, percent object control, total) and sedentary behaviour or BMI, or between sedentary behaviour and BMI. Among girls (n=26), there were medium negative correlations between total FMS and BMI (r=-.411, p=0.04) and percent object control and BMI (r=-.417, p=0.03).
Discussion: Results from the present study provide no evidence for a relationship between FMS and sedentary behaviour in young children. The results indicate that FMS proficiency (percent object control and total scores) and BMI are inversely associated among girls. Although this study employed robust FMS testing protocols and used the most accurate measure of free living sedentary behaviour (activPAL™) it was limited by a small sample size and short measurement period. Therefore, further research is needed with larger sample sizes and longer monitoring periods to better understand and quantify the nature of these relationships.

145 Does a movement skill intervention in preschools result in movement skill and physical activity outcomes three years later?

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Introduction: A 10-month intervention (2006/07) found intervention children improved their movement skills significantly more than controls. This study investigated whether intervention children were more skill proficient and physically active than controls three years later.
Methods: Children were assessed at ages 4 (T1/Pre), 5 (T2/Post) and 8 yrs (T3/Follow-up) for locomotor (LM) and object control (OC) proficiency using the Test Gross Motor Development-2 and at T3 for moderate to vigorous physical activity (MVPA) (accelerometer). Two multi-level age adjusted object control (strike, bounce, catch, kick, overhand throw, underhand roll) (six ball skills) and locomotor (run, gallop, hop, leap, horizontal jump, slide) regression models were fitted with variables time, intervention (yes/no) and a time*intervention interaction. Two MVPA regression models were fitted

with variables intervention (yes/no) and OC or LM at T3 and T1. All models added child gender and retained if significant, in which case interactions of gender with other variables were modelled and retained. SPSS (Version 17.0) was used.

Results: Consent rate was 66% (163/247) – 29% of T1 participants (163/559). There were no significant differences between those followed up at T3 and those who were not in T1 or T2 LM, or T2 OC. However, at T1, children followed up at T3, had slightly higher OC scores than those who were not (1.71 units, p=0.031). Of the 137 students used in final analysis, 53% were female (n=73) and 54% (n=74) were intervention children. Intervention girls maintained their OC skill advantage in comparison to controls (p=.002), but intervention boys did not (*p*=.591). There were no intervention/control differences in LM skill (*p*=.801). There was no relationship between T3 MVPA and T3 OC proficiency (*p*=.209) (adjusted for T1 OC), or T3 LM proficiency (*p*=.908) (adjusted for T1 LM).

Discussion: Intervention girls were still more OC proficient three years post intervention, suggesting early intervention can make a lasting impact. OC skills could be targeted in preference to LM skills as accelerating LM skills through the intervention did not result in increased LM ability three years later. Other research has found OC proficiency to be poor in girls and important to subsequent physical activity, supporting this to be an important future intervention focus. We found no relationship between OC skill and MVPA at follow-up, but this could be due to not having MVPA data at T1 and T2 to adjust for.

146 Promoting physical activity, cardiorespiratory fitness, and motor development in low-income, culturally diverse schools: Three-year outcomes from the Physical Activity in Linguistically Diverse Communities cluster randomised randomized trial

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Introduction: The prevalence of adequate levels of physical activity, cardiorespiratory fitness, and motor skills is markedly lower among children from non-English speaking backgrounds. Schools are an important setting to promote these health outcomes. It is important to build the capacity of schools to do this through training generalist classroom teachers to develop and implement lessons that meet curricular outcomes and provide developmentally appropriate physical activity experiences for students. The purpose of this study was to test the feasibility and potential efficacy of a school-based intervention on the motor skills and fitness of students in primary schools with a high proportion of students from culturally and linguistically diverse backgrounds.

Methods: A 3-year, 2-arm parallel-group nested cross-sectional controlled trial among eight primary schools in Sydney, Australia. Four schools were allocated to the intervention group (n=422; 8.54±1.68y) and matched with four control schools (n=417, 8.85±1.71y). Using a Quality Teaching and Learning Materials model and an action learning framework, each school developed an action plan for the intervention targeting the structure and delivery of physical education, modifying the physical and social environment in the school, and developing links with the home and local community. The primary outcome was total proficiency in seven fundamental motor skills. Secondary outcomes included cardiorespiratory endurance (multistage fitness test) and body mass index (BMI). Primary analysis followed the procedures outlined by Murray [1] for a nested cross-sectional design which included a fixed effect for group, school and time as categorical variables and school grade, sex, and cultural background of students modelled as covariates.

Results: The study successfully recruited a culturally diverse sample at both time points, with around 75% of students from non-English speaking backgrounds. Compared with students in the control schools, there was a significantly greater increase in motor skills among children in the intervention schools at follow-up (adj diff=5.2 components, 95% CI [1.65, 8.75]; P=0.01). The differences between the schools for cardiorespiratory endurance (3.41 laps, [-3.13, 9.95]; P=0.27) and BMI (-0.11, [-1.58, 1.36]; P=0.87) both favoured the intervention group but were smaller and not statistically significant.

Conclusions: Increasing generalist classroom teachers' confidence and competence to develop and implement developmentally appropriate physical education lessons to improve fundamental motor skills is a potentially sustainable approach and can have a positive effect on primary school students from culturally diverse backgrounds.

147 Lower limb and trunk muscles activity when exercising in water

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Exercise in a water environment is growing in popularity for a wide range of health and rehabilitation applications. The characteristics of the water environment have been found to create different muscle activation patterns when comparing the land and water based activities of walking, running and knee extension exercises. The aim of this research was to extend this knowledge by comparing other exercise routines, specifically: forward walking, backward walking, jogging, deep-water running, right-side walking, forward walking with long-step, forward walking with kicking, forward walking with knee-up, forward walking with trunk twisting, forward walking with elbow-knee touching, forward walking with knee side-up and backward walking with knee side-up. Ten male adults (age: 27.4±5.9 yr) conducted 20 sec of self-selected comfortable pace exercise for the 12 different forms listed. During each exercise, lower limb and trunk muscles activity of right side Tibialis Anterior, Soleus, Medial Gastrocnemius, Rectus Femoris, Vastus Lateralis, Biceps Femoris, Adductor Longus, Gluteus Medialis, Gluteus Maximus, Rectus Abdomen, Oblique Externus Abdominis and Erector Spine were measured by surface electrodes, sampled at 1,000Hz. A band-pass filter with 10–500Hz was applied to the collected data and the root mean square value was calculated for one step cycle, namely right side foot contact to the next right side foot contact. This was averaged across all subjects. The results showed that each form of exercise has its own unique muscle activation pattern. Jogging used lower limb muscles more than the other forms of exercise, and deep-water running used the thigh and trunk muscles. Forward walking with kicking, trunk twisting and elbow-knee touching used not only lower limb muscles, but also the trunk muscles, more than the other forms of exercise. The muscle activity of Vastus Lateralis was lower in the forward walking than the all other forms. In comparing each different form of exercise the backward, right-side and the forward walking with knee-up were identified as the lowest intensity form for the lower limb, compared to the other forms. This study identified the different muscle activity activation patterns of lower and trunk muscles with respect to 12 different water based exercises. This new knowledge can guide the exercise prescription protocols for more effective water based exercise routines.

148 Measuring mechanical properties of tendon in vivo

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Introduction: Understanding the mechanical properties of tendon is an important step to guiding the process of improving athletic performance, predicting injury and treating tendinopathies. The speed of sound in a medium is governed by the bulk modulus and density for fluids and isotropic materials. However, for tendon, which is a structural composite of fluid and collagen, there is some anisotropy requiring an adjustment for Poisson's ratio. In this paper, these relationships are explored and modelled using data collected, in vivo, on human Achilles tendon. Estimates for elastic modulus and hysteresis based on speed of sound data are then compared against published values from in vitro mechanical tests.
Methods: Measurements using clinical ultrasound imaging, inverse dynamics and acoustic transmission techniques were used to determine dimensions, loading conditions and longitudinal speed of sound for the Achilles tendon during a series of isometric plantar flexion exercises against body weight. Upper and lower bounds for speed of sound versus tensile stress in the tendon were then modelled and estimates derived for elastic modulus and hysteresis.
Results: Axial speed of sound varied between 1850 to 2090 m.s^{-1} with a non-linear, asymptotic dependency on the level of tensile stress in the tendon 5–35 MPa. Estimates derived for the elastic modulus ranged between 1–2 GPa. Hysteresis derived from models of the stress-strain relationship, ranged from 3–11%. These values agree closely with those previously reported from direct measurements obtained via in vitro mechanical tensile tests on major weight bearing tendons.
Discussion: There is sufficiently good agreement between these indirect (speed of sound derived) and direct (mechanical tensile test derived) measures of tendon mechanical properties to validate the use of this non-invasive acoustic transmission technique. This non-invasive method is suitable for monitoring changes in tendon properties as predictors of athletic performance, injury or therapeutic progression.

149 Relationship between hamstring muscle kinematics and hip rotation during the terminal swing of the sprinting gait cycle

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Introduction: Recently, video analysis of hamstring strain injury suggested that forward lean of the trunk, flexion of the hip, and extension of the knee cause stretching of the hamstring muscles. We hypothesized that, in addition to these observations, hip rotation also contributes to injury and, further, influences the difference in injury rates among the hamstring muscles. The purpose of this study was to examine the relationship between hamstring muscle kinematics and hip rotation during the terminal swing of the sprinting gait cycle.
Methods: Eight male sprinters (age, 19.4 (2.4) years) performed maximal sprint from the starting line, approximately 60 m away from the center of the measurement area. We obtained three-dimensional kinematics during 1 running cycle. These data were used to drive musculoskeletal models using nMotion musculous (NAC Image Technology Inc., JAPAN). Muscle length and muscle-tendon force were calculated for the biceps femoris (BF), semitendinosus (ST), and semimembranosus (SM). Hip flexion and internal rotation angles were also calculated. The time of peak muscle length and muscle-tendon force in terms of the percent of the running gait cycle were measured and compared with that of flexion and internal rotation angles of the hip using the Bonferroni multiple comparison test.
Results: The peak length of the BF, ST, and SM was seen at 82.8 (1.9) %, 77.5 (2.5) %, and 80.0 (2.8) % of the running gait cycle, respectively. The peak hip internal rotation angle during the terminal swing was seen at 83.0 (3.8) % of the running cycle, which was significantly different from the time of the peak ST length (p<0.01), but not significantly different from that of the peak BF and SM lengths. Peak hip flexion was seen at 75.3 (2.4) % of the running cycle, which was significantly different from the time of the peak BF and SM lengths (p<0.001 and p<0.01, respectively), but not significantly different from that of the peak ST length. A similar trend was observed for the muscle-tendon forces of the hamstring muscles.
Discussion: The results showed that the peak muscle lengths and muscle-tendon forces of the BF and SM were synchronous with the peak internal rotation angle of the hip. Hip internal rotation may influence susceptibility to the stretching of the BF and SM muscles, whose time of peak length and muscle-tendon force is considerably different from those of the ST.

150 Declines in eccentric knee flexor weakness following repeat sprint running are related to declines in biceps femoris voluntary activation.

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Introduction: Hamstring strain injuries (HSI) are the predominant non-contact injury in many sports. Eccentric hamstring muscle weakness following intermittent running has been implicated within the aetiology of HSI. This weakness following intermittent running is sometimes greater eccentrically than concentrically, however the cause of this unique, contraction mode specific phenomenon is unknown. The purpose of this research was to determine whether declines in knee flexor strength following overground repeat sprints are caused by declines in voluntary activation of the hamstring muscles.
Methods: Seventeen recreationally active males completed 3 sets of 6 by 20m overground sprints. Maximal isokinetic concentric and eccentric knee flexor and concentric knee extensor strength was determined at ±180^0.s^{-1} and ±600.s^{-1} while hamstring muscle activation was assessed using surface electromyography, before and 15 minutes after the running protocol.
Results: Overground repeat sprint running resulted in a significant decline in eccentric knee flexor strength (31.1 Nm; 95% CI=21.8 to 40.3 Nm; p<0.001). However, concentric knee flexor strength was not significantly altered (11.1 Nm; 95% CI=-2.8 to 24.9; p=0.2294). Biceps femoris voluntary activation levels displayed a significant decline eccentrically (0.067; 95% CI=0.002 to 0.063; p=0.0325). However, there was no significant decline concentrically (0.025; 95% CI=-0.018 to 0.043; p=0.4243) following sprinting. Furthermore, declines in average peak torque at -180^0.s^{-1} could be explained by changes in hamstring activation (R2=0.70). Moreover, it was change in the lateral hamstring muscle activity that was related to the decrease in knee flexor torque (p=0.0144). In comparison, medial hamstring voluntary activation showed no change for either eccentric (0.06;

95% CI=-0.033 to 0.102; p=0.298) or concentric (0.09; 95% CI=-0.03 to 0.16; p=0.298) muscle actions following repeat sprinting.
Discussion: Eccentric hamstring strength is decreased significantly following overground repeat sprinting. Voluntary activation deficits in the biceps femoris muscle explain a large portion of this weakness. The implications of these findings are significant as the biceps femoris muscle is the most frequently strained of the knee flexors and fatigue is implicated in the aetiology of this injury.

151 Estimation of tensile force in the hamstring muscles during overground sprinting

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Introduction: While it is generally known that the hamstring muscles are frequently injured during sprinting, the mechanisms of the injury remain unclear. The purpose of this study was to estimate the magnitude of tensile force in the hamstring muscles during overground sprinting by three-dimensional motion analysis and electromyography (EMG).
Methods: We conducted three-dimensional motion analysis of 12 male athletes performing overground sprinting at their maximal speed and calculated the length of the hamstring muscle-tendon and joint angles of the right limb throughout a gait cycle during which the ground reaction force was measured. EMG activity during sprinting was recorded for the biceps femoris long head, semitendinosus, and semimembranosus muscles of ipsilateral limb. We estimated the magnitude of tensile force in each muscle by using the length change occurred in the musculotendon and normalized EMG value.
Results: The study found a quick increase of tensile force in the biceps femoris long head during the early stance phase of the gait cycle during which the increased hip flexion angle and ground reaction force were occurred at the same time.
Discussion: This study provides quantitative data of tensile force in the hamstring muscles suggesting that the biceps femoris long head muscle is susceptible to a strain injury during the early stance phase of the sprinting gait cycle.

152 Effects of hyperventilation on repeated isokinetic torque production and EMG of lower limbs

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Introduction: Previously, effects of metabolic alkalosis through sodium bicarbonate ingestion on exercise performance has been extensively studied with varying results. However, when the exercise task is repeated and requires near maximum effort, the ergogenic effect is more likely to appear. Hyperventilation can produce similar effect on blood pH, however its influence on maximum repeated exercise remains to be investigated. Increased activity of respiratory muscles may also act as a diverting activity, which may prevent the reduction of central motor commands through the "Setchenov Phenomenon". This study therefore investigated the effect of hyperventilation performed during recovery that separated repeated sets of maximum isokinetic exercise.
Methods: Four physically fit males (age: 24.0±2.4 y-o; height: 177.3±3.8 cm; mass: 81.7±16.7 kg) performed both control and hyperventilation conditions on two occasions. Exercise consisted of 8 reps (60º/s) and 25 reps (300º/s) of maximum isokinetic knee extensions repeated for 8 sets (40-s recovery), with the respiration being monitored breath-by-breath using aeromonitor. In the control condition, spontaneous breathing was performed during the recovery. For the hyperventilation condition, subjects hyperventilated 20-s before each set at 60 breaths/min and $PETCO_2$ lower than 25 mmHg. EMG was recorded from the vastus medialis (VM) and lateralis (VL) to calculate integrated EMG (iEMG) for each set. Blood was collected from the earlobe at rest and immediately after the 2nd, 4th, 6th and last exercise set for lactate and pH.
Results: Work-done gradually decreased with set numbers for both speeds (p<0.001). iEMG also decreased with set numbers for VM for both speeds (p<0.01), which could indicate the presence of central fatigue. Work-done and iEMG tended to be greater for the hyperventilation condition, however the differences were not statistically significant. Blood lactate (p=0.044) and pH (p=0.008) was higher for the hyperventilation condition for 60º/s only.
Discussion: At present, only 4 subjects have been involved in the study so that it may be impetuous to draw conclusion. Nonetheless, with the current preparation, hyperventilation did not significantly affect work-done and the muscle activation levels. The higher blood lactate with hyperventilation may imply a sustained anaerobic energy supply. This was however insufficient to significantly enhance the performance. Besides increasing the subject numbers, hyperventilation method can be modified by altering the respiratory rate, tidal volume, $PETCO_2$, timing, and duration.
Further research is warranted to reveal the optimal hyperventilation technique and more suitable exercise types.

153 Altered neuromotor control of the Gluteus Medius and Gluteus Maximus in male runners with Achilles Tendinopathy

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Introduction: Achilles Tendinopathy is a prevalent musculoskeletal condition in running based sports. Whilst the etiology of the disorder is not yet fully understood, alterations in the neuromotor control of the gluteal muscles have been proposed to be associated with the condition. The purpose of this study was to compare the neuromotor control of the Gluteus Medius (GMED) and Gluteus Maximus (GMAX) muscles in runners with Achilles Tendinopathy to that of asymptomatic controls.
Methods: Data were collected from two groups of male distance runners: an Achilles Tendinopathy group (AT; N=14) and an asymptomatic control group (CRTL; N=17). Electromyography (EMG) activity was recorded using surface electrodes during over-ground straight-line running.
Results: The AT group demonstrated a delay in the activation of the GMED relative to heel strike (p=<0.001) and a shorter duration of activation (p=<0.001) compared to that of the CTRL group. However, GMED offset time relative to heel strike was not different between the groups (p=0.063). The GMAX followed the trend shown by the GMED with the AT group demonstrating a delay in its activation (p=0.008), and a shorter duration of activation (p=0.002), compared to the CTRL Group. Unlike GMED, the GMAX exhibited a statistically significant earlier offset after heel strike (p=0.001) in the AT group compared to the CTRL Group.
Discussion: This study provides preliminary evidence to support the possible role of proximal neuromotor control of the hip muscles in AT.

154   Impact of previous hamstring strain injury on rate of torque and EMG development during eccentric contraction

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Background: Hamstring strain injuries (HSIs) are prevalent in sport and re-injury rates have been high for many years. Whilst much focus has centred on the impact of previous hamstring strain injury on maximal eccentric strength, high rates of torque development is also of interest, given the important role of the hamstrings during the terminal swing phase of gait. The impact of prior strain injury on neuromuscular function of the hamstrings during tasks requiring high rates of torque development has received little attention. The purpose of this study is to determine if recreational athletes with a history of unilateral hamstring strain injury, who have returned to training and competition, will exhibit lower levels of eccentric muscle activation, rate of torque development and impulse 30, 50 and 100ms after the onset of electromyographical or torque development in the previously injured limb compared to the uninjured limb.

Methods: Twenty-six recreational athletes were recruited. Of these, 13 athletes had a history of unilateral hamstring strain injury (all confined to biceps femoris long head) and 13 had no history of hamstring strain injury. Following familiarisation, all athletes undertook isokinetic dynamometry testing and surface electromyography assessment of the biceps femoris long head and medial hamstrings during eccentric contractions at -60 and $-1800.s^{-1}$.

Results: In the injured limb of the injured group, compared to the contralateral uninjured limb rate of torque development and impulse was lower during $-600.s^{-1}$ eccentric contractions at 50 (RTD, p=0.008; IMP, p=0.005) and 100ms (RTD, p=0.001; IMP p<0.001) after the onset of contraction. There was also a non-significant trend for rate of torque development during $-180^0.s^{-1}$ to be lower 100ms after onset of contraction (p=0.064). Biceps femoris long head muscle activation was lower at 100ms at both contraction speeds ($-60^0.s^{-1}$, p=0.009; $-180^0.s^{-1}$, p=0.009). Medial hamstring activation did not differ between limbs in the injured group. Comparisons in the uninjured group showed no significant between limbs difference for any variables.

Conclusion: Previously injured hamstrings displayed lower rate of torque development and impulse during eccentric contraction. Lower muscle activation was confined to the biceps femoris long head. Regardless of whether these deficits are the cause of or the result of injury, these findings have important implications for hamstring strain injury and re-injury and suggest greater attention be given to neural function of the knee flexors.

155   The description of stepping activity using minute epochs. How much of each minute do we walk?

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Introduction: Physical activity monitoring over multiday periods in adults has routinely been analyzed by subdividing the whole time period into epochs, commonly one minute in length, reducing data recording capacity requirements. Criteria are set to determine if each minute should be placed within one or other category of activity intensity. If activity is not consistent across the whole epoch, the outcome will represent only average activity and not peak activity within the minute. To investigate the likely effect of categorizing physical activity by whole minute epochs and not by actual activity bouts we examined the time spent stepping within each minute of the typical daily lives of adults.

Methods: 36,000 minutes of physical activity data where stepping activity was evident were analyzed. These minute epochs were recorded from 117 adults (39M/78F, mean age 46y (23–82), mean 6.8days each, range 4–7days). The activPAL™ physical activity monitor was used to record steps taken and associated stepping time. The distribution of time spent stepping within each minute epoch was characterized.

Results: For each minute with stepping activity the length of time stepping was recorded. The duration of stepping within each minute had the following distribution: 31.9% of minutes had 0–10s of stepping activity; 22.5% of minutes had 10–20s of stepping activity; 14.4% of minutes had 20–30s of stepping activity; 9.1% of minutes had 30–40s of stepping activity; 6.1% of minutes had 40–50s of stepping activity; 3.7% of minutes had 50-<60s of stepping activity; 12.4% of minutes had the full 60s of stepping activity. Cumulative totals of the number of minutes were as follows: <10s 31.9%, <20s 54.4%, <30s 68.8%, <40s 77.9%, <50s 84.1%, <60s 87.8%.

Discussion: It is important to understand the effect upon outcomes of reporting data in minute epochs. Almost 70% of all minutes with stepping in had less that 30s spent actually stepping. The use of minute epochs for presentation of this data would have indicated average activity intensity of half that actually occurring. The nature of the everyday activity engaged in by our study participants, meant that the use of minute epochs considerably distorted the activity intensity outcomes. This evidence suggests that minute epoch based analysis of physical activity might present a considerably distorted characterization of physical activity distribution patterns.

156   Physical activity in adolescents – Accelerometer data reduction criteria: Number of valid days, minimum daily wear time, and non-wear time

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Introduction: Accelerometry is increasingly being recognized as an accurate and reliable method to assess free-living physical activity (PA). However, reporting of accelerometer data reduction and methods remains inconsistent. In this study we investigated the impact of different data reduction criteria on participant inclusion and PA data outcomes.

Methods: We used data from the Danish SPACE for physical activity study (n=1,348,11–13y). Adolescents wore the Actigraph GT3X for seven consecutive days. Accelerometer data were analyzed using a range of values for three key data reduction issues: number of valid days (1, 2, 3, 4, 5, 6 and 7days), daily wear time (6, 8, 9, 10 and 12 h/day) and non-wear time (10, 20, 30, 60 and 90 min of consecutive zeroes). The open source software Propero Actigraph Data Analyzer was used to compare the effects of the selected criteria on participant inclusion and PA outcomes (mean cpm). The following parameters in the data reduction analyses were fixed: 30sec epoch, 24h duration, first registration accepted after 4h, maximum value 20,000cpm, and two activity epochs permitted in blocks of non-wear.

Results: Accelerometer data were obtained from a total of 1,296 adolescents. Descriptive analyses showed that increasing minimum daily wear time and number of valid days resulted in a lower percentage of participants included for analysis. On average, 98.3% of participants had at least 1 valid day, 90.6% had 4 days, and 51.3% had 7 days. Lengthening non-wear duration resulted in a higher percentage of participants included.

In general we found the most substantial differences in compliance when looking at 10–12h (daily wear time), and 5–7days (number of valid days). Only 4.2% of participants had 7 valid days of 12h wear time, whereas 98.8% of participants had at least 1 valid day of 6h wear time using a 10min non-wear criterion. The corresponding numbers using a 90min non-wear criterion were 20.6% and 99.4%. Lengthening the non-wear period decreases PA level (mean cpm) substantially, e.g. average PA was 641 cpm (5 days of 10h) using the 10min non-wear criterion compared to 570 cpm using 90min non-wear. No systematic differences in PA outcomes were found when comparing the range of days and hours.

Discussion: We used a systematic approach to illustrate that even small inconsistencies in accelerometer data reduction can have substantial impact on compliance and PA outcomes. Optimal data processing techniques will depend significantly on the research question to be answered.

Support: TrygFonden supported the project.

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157   Comparison of ActiGraph cut-points for predicting physical activity intensity in preschool children

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Introduction: Currently several ActiGraph accelerometer cut-points are available to classify physical activity intensity among preschoolers. This may result in meaningful differences when estimating time spent in different intensities of physical activity. To overcome this, comparative validity studies are needed to simultaneously compare the different cut-points against a criterion measure. This study evaluated the classification accuracy of five light (LPA) and moderate-to-vigorous physical activity (MVPA) and six sedentary behaviour (SB) ActiGraph cut-point definitions in preschool children using energy expenditure–measured by a whole-room calorimeter–combined with direct observation as the criterion measures.

Methods: 38 children aged 4–6 years (5.3±1.0 years) completed a ~150 min whole-room calorimeter protocol involving age-appropriate SB, LPA and MVPA (e.g. watching a movie, drawing on a whiteboard, running on the spot, modified basketball shooting). Each child wore an ActiGraph GT3X. Physical activity intensity was classified using the following ActiGraph cut-points: Pate (MVPA: ≥420 counts/15s SB: ≤37 counts/15s); Evenson (MVPA: ≥574 counts/15s SB: ≤25 counts/15s); Van Cauwenberghe (MVPA: ≥585 counts/15s SB: ≤372 counts/15s); Sirard (MVPA: ≥891 counts/15s SB: ≤398 counts/15s); Puyau (MVPA: ≥800 counts/15s SB: <200 counts/15s); and; Reilly (SB: <275 counts/15s). Data were reintegrated to 15- or 60-second epochs depending on the specific cut-point. Classification accuracy was evaluated using weighted Kappa statistics, sensitivity, specificity, and area under the receiver operating characteristics curve.

Results: Pate (κ=0.65) and Evenson (κ=0.68) cut-points exhibited significantly better agreement than Van Cauwenberghe (κ=0.39), Sirard (κ=0.35) and Puyau (κ=0.52) across all intensities. Classification accuracy for MVPA was significantly higher for the Pate cut-point (ROC-AUC=0.78, 95% CI=0.77–0.79) compared to the others (ROC-AUC=0.68–0.76). The accuracy for SB was significantly higher for the Pate (ROC-AUC=0.89, 95% CI=0.89–0.90) and Evenson (ROC-AUC=0.90, 95% CI=0.89–0.90) cut-points compared to the others (ROC-AUC=0.69–0.80). Combining ≤25 counts/15s for SB and ≥420 counts/15s for MVPA resulted in significantly higher classification accuracy (ROC-AUC=0.72, 95% CI=0.72–0.73) for LPA compared to Pate, Van Cauwenberghe, Sirard and Puyau cut-points (ROC-AUC=0.55–0.71). Only the Pate and Evenson cut-points exhibited fair classification accuracy for all intensities.

Discussion: On the basis of these findings we recommend that researchers use cut-points of ≤25, >25 and <420, and ≥420 counts/15s to classify SB, LPA and MVPA, respectively, in preschool children when using the ActiGraph. Using consistent cut-points across studies will result in better classification of children's sedentary behaviour and physical activity as well as greater comparability between studies.

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158   Measuring the energy cost of children's play: Steps or counts?

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Introduction: Pedometers have been used to motivate people, including children, to increase their daily physical activity (PA) levels and thus, to prevent obesity. However, unlike accelerometers, little has been done to validate the use of pedometers for estimating PA energy expenditure (EE) or PA intensity. This study assessed the accuracy of predicting children's PAEE and PA intensity from pedometer and accelerometer data compared to indirect calorimetry.

Methods: Healthy weight (HW; BMI<85th %ile) and overweight (OW; BMI≥85th %ile) children played a random selection of 10 games for 6 min each. While playing the games, the children wore a lightweight backpack containing a metabolic unit to measure the oxygen consumption (criterion) and an activity monitor on their hip to measure both accelerometer counts/min and pedometer steps/min. Prediction equations were used to estimate EE from counts/min and steps/min. A RMANOVA was used to assess differences in activity monitor data, estimated EE, and measured EE with sex and BMI as main effects (p<0.05). Pearson's r correlation was used to examine the relationship among activity monitor data and EE.

Results: Twenty-four children (mean±SD: 9.6±1.3 y; 16 boys; 20 HW children) completed a total of 231 games. The mean(±SEE) EE of the games was 4.56±0.1 kcal/min (range=3.68±0.25–6.74±0.53 kcal/min), with all of the games classified as moderate-to-vigorous intensity PA (range=4.05±0.30 – 7.29±0.67 METs). There was no significant difference in measured EE between sex and BMI groups, whereas boys acquired significantly more counts/min (3654±103 vs 3075±170 counts/min) and more steps/min (72.1±2.0 vs 61.3±2.8 steps/min) than girls and HW children acquired significantly more steps/min than OW children (70.5±1.8 vs 58.8±3.9 steps/min). The accelerometer-based (counts/min) prediction equation accurately estimated the EE of the games for all children (p=0.60) and for each sex and BMI subgroup compared to measured EE. However, the pedometer-based (steps/min) predicted equation consistently overestimated the EE for the games for all groups by 23.0–48.9% (p's<0.001–0.0012) compared to measured EE. The relationships between activity monitor data and measured EE were weak for both steps/min and counts/min (R^2=0.19 and 0.12, respectively).

Discussion: According to our findings, using accelerometry data to estimate the energy cost of children's free-play PA is more accurate than using pedometer data. Due to the nature of children's free-play PA, pedometry does not capture all the variations in movement patterns to accurately assess the energy cost of the behaviour.

159   Can a single question provide an accurate measure of physical activity?

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Introduction: In order to collect data from a broad range of settings and across a range of interventions there is a need for short measurement tools which are practical and easy to complete. The single-item measure was developed to capture an assessment of physical activity using one question only. Although this tool has demonstrated strong repeatability and moderately strong validity against other self-report tools, further testing was warranted to determine whether the tool accurately assesses 'true' physical activity levels. The aim of the current study was to test the criterion validity of the single-item measure compared with accelerometry.

Methods: Participants (n=66, 65% female, age: 39±11 years) wore an accelerometer (ActiGraph GT3X) over a 7-day period and on day 8 completed the single-item measure. The number of days of ≥30 minutes of accelerometer-determined moderate–vigorous intensity physical activity (MVPA) were calculated using two approaches; firstly by including all minutes of MVPA and secondly by including only MVPA accumulated in bouts of ≥10 minutes (counts/minute ≥1952). Associations between the single-item measure and accelerometer were examined using Spearman correlations and 95% Limits of Agreement. Percent agreement and kappa statistic were used to assess agreement between the tools in classifying participants as sufficiently/ insufficiently active.

Results: Correlations between the number of days of ≥30 minutes MVPA recorded by the single-item and accelerometer ranged from 0.46–0.57. Participants under-reported their activity on the single-item measure (-1.59 days) when compared with all objectively measured MVPA, but stronger congruence was observed when compared with MVPA accumulated in bouts of ≥10 minutes (0.38 days). Overall agreement between the single-item and accelerometry in classifying participants as sufficiently/ insufficiently active was 58% (k=0.23, 95% CI=0.05–0.41) when including all MVPA and 76% (k=0.39, 95% CI=0.14–0.64) when including activity undertaken in bouts of ≥10 minutes.

Discussion: Correlations between the new single-item measure and accelerometry were stronger than previously reported for many other self-report tools. Agreement between the self-report and objective measure was reasonable, however agreement varied depending on whether all minutes of MVPA or only sustained bouts of ≥10 minutes were included in the analyses. When including activity undertaken in sustained bouts of ≥10 minutes, consistent with the government recommendation, the single-item measure correctly identified over 80% of insufficiently active participants. These results suggest that the single-item measure is a valid screening tool to determine whether respondents are sufficiently active to benefit their health.

160   Agreement between accelerometer-determined sedentary time and self-report measures: Project STAND

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Introduction: The measurement of sedentary ('sitting') time is challenging and current recommendations suggest use of both objective and self-report tools, depending on the research question. The aim of the present study was to determine the degree of agreement for two self-report measures with sedentary time determined by the ActiGraph GT3X+ accelerometer in young adults at risk of diabetes. Data are from baseline measures of a RCT – Project STAND.

Methods: 193 participants (64% female, age: 32.5±5.6 years, BMI: 34.6±5.0 kg/m^{2}) wore an ActiGraph GT3X accelerometer whilst continuing with their normal routine for 10 days. The ActiGraph was positioned on the right hip using an elastic belt. Accelerometer-determined sedentary time was calculated using the cut-point of 100 counts per minute. Accelerometer-determined sedentary times were compared to total daily sitting-related sedentary time measured by the International Physical Activity Questionnaire (IPAQ) and the Domain-Specific Sedentary Behaviour measure of Marshall et al. (MSSE, 2010). For the Marshall scale, an aggregated score was created by summing time reported for sedentary travel, sitting at work, TV viewing, and non-work use of a computer. Accelerometer derived sedentary time was compared to self-report measures using Spearman correlations and Bland-Altman plots to assess mean bias and limits of agreement.

Results: There were moderate and significant associations between accelerometer sedentary time and IPAQ (rho=.326, p<.01) and Marshall score (rho=.311, p<.01). Accelerometer sedentary time (M=615.07±103.94 mins) was overestimated by only 22 mins using the Marshall scale (n=128; limits of agreement from -518 to 560 mins). Accelerometer determined sedentary behaviour was underestimated by 251 mins using the IPAQ (n=131; limits of agreement from 499 to -1001 mins).

Discussion: IPAQ, but not the Marshall scale, significantly underestimates objectively assessed sedentary time in young adults and thus appears to be capturing a limited range of sedentary behaviours. The IPAQ may not be suitable for studies of sedentary behaviour prevalence. Both self-report measures are similar associations with accelerometer determined sedentary behaviour and therefore may be appropriate for use in outcome studies if objective measures are not available.

161   Validity of the ActiGraph GT3X+ inclinometer and different counts per minute cut-points for the assessment of sedentary behaviour

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Introduction: Accelerometers are gaining popularity as an objective measure of sedentary behaviour. Limited evidence exists however on the validity of different cut-points used to define sedentary time, or on the inclinometer function seen in newer models of the ActiGraph accelerometer. The aim of the present study was to determine the concurrent validity of the ActiGraph GT3X+ inclinometer and different counts per minute (cpm) cut-points for detecting sedentary behaviour in free-living adults.

Methods: 50 participants (52% male, age: 26.5±6.2 years, BMI: 23.5±3.1 kg/m^{2}) wore an activPAL3™ inclinometer (the criterion) and an ActiGraph GT3X+ accelerometer whilst continuing with their normal routine for 1 day. The activPAL3 was attached to the right thigh, whilst the ActiGraph was positioned on the right hip using an elastic belt. The output from both devices was reintegrated into 60-second epochs. Accelerometer-determined sedentary time was calculated using the inclinometer function of the ActiGraph, and by multiple cut-points (<10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 150 and 200 cpm) applied to activity counts derived from the vertical axis. Accelerometer-determined sedentary times were compared to sedentary

time measured by the activPAL3™ using a repeated-measures ANOVA and Bland-Altman plots. Associations between the different measures were examined using Pearson correlation coefficients. Sensitivity (identification of true sedentary time) and specificity (identification of non-sedentary time) were also calculated for each accelerometer measure of sedentary behaviour.

Results: The ActiGraph inclinometer function significantly underestimated sedentary time when compared to the activPAL3™ (450 ± 118 vs 482 ± 129 mins, p=0.03). There was a significant correlation between these measures (r=0.64), however the limits of agreement were large (-174–240 mins). The <50 cpm cut-point provided the closest estimate of sedentary time (478 ± 84 mins, p>0.05) relative to the criterion. This cut-point had a stronger correlation (r=0.71) and narrower limits of agreement (-174–182 mins) when compared to the ActiGraph inclinometer. The commonly used <100 cpm cut-point significantly overestimated sedentary time (526 ± 88 mins, p<0.01). The <50 cpm cut-point and the ActiGraph inclinometer yielded a more favourable balance between sensitivity (S_e: 0.78 and 0.75) and specificity (S_p: 0.73 and 0.75, respectively) when compared to the <100 cpm cut-point (S_e: 0.83, S_p: 0.67).

Discussion: The <50 cpm cut-point may provide a better estimate of sedentary behaviour in comparison to the widely used <100 cpm cut-point. The <50 cpm cut-point also appears to be superior to the ActiGraph inclinometer function for detecting sedentary behaviour in free-living adults.

162 Pedometer protocols for measuring physical activity: An examination of reactivity, tampering and perceptions among adolescents

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Introduction: Little is known about reactivity and tampering in pedometer-based research in adolescents. The primary aim of this study was to investigate adolescents' reactivity and tampering while wearing pedometers by comparing different monitoring protocols to accelerometer output. A secondary aim was to explore adolescents' perceptions and experiences regarding objective monitoring devices.

Methods: Six year 9 physical education classes from three secondary schools in New South Wales, Australia were recruited. The sample included adolescent boys (n=76) and girls (n=47) aged 14–15 years (N=123), who were blinded to the study aims. Schools were randomized to one of three pedometer protocols and all participants wore pedometers (Yamax CW700) and accelerometers (Actigraph GT1X) simultaneously for seven days. The Unsealed (US) group wore unsealed pedometers and recorded their step counts at the end of each day in a log book. The Daily Sealed (DS) group wore pedometers sealed with stickers and reported to a member of the research team each morning who recorded their step counts. Participants in the Weekly Sealed (WS) group wore sealed pedometers for the assessment period. At the completion of the monitoring period, participants completed a questionnaire examining perceptions and behaviours relating to pedometer monitoring. Repeated measures ANOVA were used to examine potential reactivity. Bivariate correlations were used to explore the associations between step counts and accelerometer counts per minute (CPM) in each of the three groups. ANOVA and Bonferroni post hoc procedures were used to compare participants' perceptions of, and behaviours while wearing monitoring devices.

Results: There was evidence of reactivity in the DS group (p<0.01). The association between accelerometer CPM and pedometer steps/day was strongest among participants in the WS group (r=0.77, p<0.001), compared to the US (r=0.51, p=0.04) and DS (r=0.14, p>0.05) groups. Participants in the WS group were less likely to report a desire to impress the research team with their step counts compared to those in the DS (p=0.02) and US (p=0.003) groups. Responses showed that 31% of participants changed their normal PA patterns as a result of being measured and 44% of participants reported shaking their pedometers to increase their step count.

Discussion: This study revealed that reactivity and tampering does occur in adolescents and contrary to existing research, the protocol selected for pedometer monitoring impacts on behaviour and compliance.

163 The Health Economic Assessment Tool (HEAT) for walking and cycling: From evidence to advocacy on active transport

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Introduction: Increasing walking and cycling for transport is an important contribution to reaching the public health goal to increase physical activity. Transport planners are crucial partners in helping create supportive transport environments. Economic appraisals are an established practice for transport projects, but they rarely take health impacts into account.

Methods: The World Health Organization coordinated the development of the Health Economic Assessment Tool (HEAT), which quantifies the economic benefits from reduced mortality due to specified levels of walking or cycling. Systematic reviews of economic valuations of cycling or walking for transport and reviews of epidemiologic literature were conducted to identify risk estimates for the health impacts of walking and cycling. Consensus meetings with international experts helped agree key aspects of the methodology such as health effects, relative risks, age groups and quantification of the economic benefit. An online tool was produced that allows the user to input measured or estimated levels of cycling and walking. The tool then applies relative risks determined from a meta-analysis (for walking) and a large cohort study (for cycling) to calculate risk reduction for all-cause mortality. Avoided deaths are valued applying the "value of statistical life", a standard measure used by transport planners. The online tool provides adaptable default values, interactive user guidance, and case studies.

Results: HEAT has been applied in a wide variety of situations across the world, including evaluations of planned or completed projects, and modelling of proposed changes. For example: in North and South America, four Ciclovia (mass recreational) programmes were estimated to provide a mean annual benefit of between US$4.4m and US$68m per programme. In Austria, the policy goal to double the cycling share by 2015 was estimated to lead to a mean annual benefit of US$1bn. In the UK, a cycling town programme was estimated to provide US$5.2m of benefits per year. In New Zealand, a hypothetical 1000 additional adult regular urban commuter cyclists led to an estimated annual benefit of US$630,000. All examples are valuations of mortality only and thus underestimations of the full impacts, which could include improvements to morbidity, air quality and casualties. HEAT is now part of the government approach in Sweden and England, and is under consideration in France.

Discussion: These figures allow comparison with real or estimate costs of a programme to demonstrate the comprehensive projected benefit to cost ratio, and thus provide strong evidence-based advocacy for investment in cycling and walking.

164 Changing the environment to promote transport-related walking: Evaluation of the 'Fitter for Walking' project

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Introduction: Associations between the built environment and participation in physical activity have been well reported and a number of attributes of the physical environment are known to be associated with participation in specific types of physical activity such as walking. Despite this, few interventions have been delivered to date which combine changes to the physical environment with promotional activities to increase walking as a mode of transport. The purpose of this study was to evaluate the Fitter for Walking (FFW) project which aimed to improve local environments and deliver promotional activities to increase walking for short journeys.

Methods: FFW worked with deprived communities in twelve Local Authority (LA) areas across five regions of England. Coordinators located in each region delivered project activities, in conjunction with LA partners, based on the needs and interests of local residents in each community. Activities included small local-level infrastructural improvements completed by the LA; community-led environmental improvements; and awareness-raising activities. A mixed methods approach was used to evaluate a sub-set of FFW projects including route user counts and surveys at baseline, 12 months and after 18–22 months; residents' surveys at follow-up; interviews with coordinators and LA partners; and focus groups with community representatives.

Results: A wide range of environmental improvements and awareness-raising activities were delivered. Promotional activities were seen to be essential in engaging communities. Community involvement was important for identifying local issues and barriers to walking whereas LAs played a critical role in providing funding and resources for infrastructural improvements. Increases in the number of pedestrians using the project routes were observed at follow-up in six of the seven community projects evaluated (range 5.4% to 58.9%) and up to 25% of route users perceived they had used the improved route more often in the last 12–18 months. Route users reported more transport-related walking overall and walking for a wider variety of journey purposes. Community members and residents reported doing more walking in their local area, discovering new walkable destinations and routes, and perceived that more people were walking in their local neighbourhood.

Discussion: The FFW project successfully engaged LA partners and community members in improving local environments and delivering promotional activities to increase walking for transport; the model should be expanded to other communities in the UK. Further evaluation is needed to assess the impact of these types of interventions on individual levels of transport-related walking.

165 Is an increase in active travel associated with an increase in overall physical activity? Findings from the iConnect study

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Introduction: There is increasing evidence that active travel reduces the risk of cardiovascular mortality and its risk factors; in some studies, this is observed even after controlling for recreational physical activity. These health benefits may largely reflect the extent to which participating in active travel translates into greater overall physical activity, an interpretation supported by cross-sectional studies. To better understand the health benefits of *promoting* active travel it is necessary to extend this work longitudinally by examining whether an increase in active travel is associated with a commensurate increase in overall physical activity or whether adults compensate for this shift by reducing their recreational physical activity.

Methods: These analyses use seasonally-matched repeated measures data from 1628 adult participants (47% male; mean age 55.4±16.3 years) from the iConnect study cohort in the UK. Travel behaviour and recreational physical activity were assessed using detailed seven-day recall instruments. Respondents were categorised according to whether their weekly duration of active travel had increased, was maintained or decreased between baseline and one-year follow-up. Linear regression analyses controlling for baseline sociodemographic characteristics were used to examine associations between change in active travel and change in a) recreational and b) total physical activity. Models were also run for the disaggregated exposures of commuting and non-commuting active travel and walking and cycling. For all models 'maintainers' were used as the reference category.

Results: Over one year, active travel had increased in 35% (n=566) of respondents, had been maintained in 27% (n=440) and had decreased in 38% (n=622). Recreational physical activity decreased in all groups, but there was no evidence that the decrease was greater in those who had increased their active travel ('increasers': -18.1±337.6 min/wk; 'maintainers': -30.0±292.8 min/wk; 'decreasers': -27.2±318.3 min/wk). Changes in active travel were associated with commensurate changes in overall physical activity. Compared with 'maintainers', overall physical activity levels were 124.3 min/wk lower among those whose active travel had decreased (β=-124.5, 95% CI -166.0 to -83.0) and 137.8 min/wk higher among those whose active travel had increased (β=136.0, 95% CI 93.8 to 178.1). Results were similar when analyses were run separately for commuting and non-commuting active travel and walking and cycling.

Discussion: In this sample of UK adults, a change in active travel was associated with a commensurate change in overall physical activity. Encouragingly, there was no evidence of activity compensation.

166 Contribution of perceived built environment attributes around the worksite to active transportation and physical activity

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The built environment around the worksite has been seldom studied, but likely impacts transportation, particularly to/from and around work. The present study investigated the relation of perceived home and work built environment attributes to physical activity.

Data were from 1071 adults from who reported working away from home. Participants reported on the residential density, land use mix access, street connectivity, walking/cycling facilities, traffic safety, pedestrian safety, and crime safety around their home via the Neighborhood Environment Walkability Scale (NEWS), with higher scores expected to be related to more physical activity. Participants reported on the same constructs around their worksite, minus residential density, using a shorter version of the NEWS. Physical activity outcomes were accelerometer-derived total MVPA, and self-reported total active transportation, active transportation to/from work, and active transportation around work. Mixed-effects regressions

were employed with demographics entered as covariates and NEWS subscale z-scores as predictors. Significant results (p<.05) are reported. Mean participant age was 45 years, 46% were female, 76% were white non-Hispanic, and 69% had a college degree. Participants engaged 233±164 minutes/week of total MVPA, 104±150 minutes/week of total active transportation, 1.7±4.9 days/month of active transportation to/from work, and 8.3±13.3 times/month of active transportation around work. Home land use mix access (B=17.5) and work pedestrian safety (B=12.9) and crime safety (B=10.9) were associated *with* total MVPA. Home residential density (B=20.2) and land use mix access (B=20.4), and work land use mix access (B=10.0) were associated with total active transportation. Work land use mix access (B=0.47) and crime safety (B=-0.35) were associated with active transportation to/from work. Work land use mix (B=2.86), street connectivity (B=1.56), traffic safety (B=0.99), and pedestrian safety (B=-0.65) were associated with active transportation around work. Land use mix access, indicating areas where residential and commercial locations co-occur, was consistently associated with more active transportation, particularly land use mix around the worksite. The built environment surrounding the worksite appeared to play a larger role in active transportation to work, as compared to the home built environment. Active transportation around work was related to several attributes of the built environment around the worksite. When modifying built environment attributes to increase physical activity, attention should be paid to the areas around destinations and worksites in addition to areas around the home.

167 Associations between accessibility of public transportation and self-reported commuting physical activity

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Introduction: Daily active transportation to work or education has been shown to improve health. Public transportation users are walking and cycling to stations or stops and between intermediary destinations. Availability of public transport is therefore a determinant of active transportation and thus an important parameter when studying commuting physical activity. The aim of this paper is to examine the association between accessibility of different public transportation types and self-reported commuting physical activity in the Capital Region of Denmark.
Methods: We used data from a cross-sectional Health survey 2010 including a random sample of 91,150 inhabitants aged 16+ living in the Capital Region of Denmark. The Response rate was 52.3%. The outcome studied, self-reported duration of active commuting (walking or cycling) and active commuter (yes/no) was obtained from a questionnaire. Accessibility to public transportation was measured as walking distances from home address to destinations (bus, train and metro) and numbers of stops within 1 km were derived using network analysis in a GIS. Individual covariates included were self-reported age, gender, education-level and distance to work. Contextual factors indicating area socioeconomic status and an infrastructure connectivity measure (gamma index) were included. Linear and logistic multilevel analyses were performed taking both the individual and contextual factors into account.
Results: In Copenhagen City centre 90% of the population are active commuters, whereas only 55% in some rural areas are active commuters. Individuals living in areas with high availability of public transit (3 or 4 different types of transport within 1km) have significantly higher odds of being active commuters after adjusting for individual and contextual covariates; OR: 2,049 (95% CL: 1.594–2.634), compared to individuals with no stops within 1 km walking distance. At area level, it is 26% more likely to become an active commuter if moving from an area with low active commuting to an area with high active commuting. Duration of active transportation was not significantly associated to availability of public transportation within 1km.
Discussion: Active commuting in the adult population of The Capital Region of Denmark is positively associated with accessibility to public transportation. Studying the relationship between individual commuting and availability of transit service can be used to support both planning of transport services and improve policy incentives for a more physically active lifestyle.

168 Sociodemographic correlates of public bicycle share program use: An intercept survey of users in Montreal, Canada.

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Introduction: A small number of studies have examined correlates of bicycle share program using either convenience or population based samples. These studies show that bicycle share users tend be younger and better education than the general population. Convenience and population samples are limited because they do not consider casual users or those residing outside of the city. This study examines the prevalence and correlates of PBSP use in a representative sample of PBSP users.
Methods: A stratified random sample of stations was selected. Data from the 2008 Montreal travel survey were used to estimate the number of people entering and exiting geographic areas and compute an entry and exit kernel density for Montreal during 2 time periods (0700–1500 and 1300–1300). 411 stations were stratified as high, medium or low volume. Stations in each strata were randomly selected. Sampling quotas were derived for the estimated number of entries and exits for each station for each time period. A total of 1370 respondents (45.1% response rate) were intercepted from 78 stations (19% of all stations) at the beginning or end of their trip from June 16th–October 29th, 2011. Descriptive statistics and ordinal logistic regression controlling for clustering within stations examined socio-demographic factors associated with PBSP use.
Results: The average age of users was 33.5 years and 37.1% were female. The majority (48.8%) of respondents used the program 9 or more times per week, were yearly members (83.0%), and resided in Montreal (88.2%). Only a small percentage of respondents were tourists (9.2%). Most respondents used the program for multiple trip types including going to work (70.0%), running errands (62.4%) and social trips (62.9%). Respondents reported modal shifts from public transit (43.1%) and walking (36.5%) with only a small percentage shifting from motor vehicles (3.9%). Significant correlates of PBSP use were being aged 45–54 (OR=1.98; 95% CI=1.10–3.58), being female (OR=0.69; 95% CI=0.53–0.90), and having a household income great than $100,000 per year (OR=0.53; 95% CI=0.32–0.86).
Discussion: The present study contributes to the literature examining public bicycle share programs. The results are inconsistent with past research showing that being females and having a higher household income are negatively associated with use, while respondents aged 45–54 had greater use of the program than those aged 18–24. Researchers studying PBSP should be aware that the data collection method appears to influence the results. To ensure the robustness of results multiple data sources should be triangulated when studying PBSPs.

169 Implementation of a bicycle-sharing program: An effective way of introducing cycling as mode of transport

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Introduction: Some of the methods of promoting bicycling transport would be expanding networks for cycling, creating safe and attractive routes that connect people to local facilities, promoting public access to bicycles for short trips, and increasing bicycle parking areas. Public bicycle share programs (PBSP) have been pointed out as an effective way of introducing cycling as a mode of transport for urban areas. However, there are few studies that document the effects of infrastructure changes such as PBSP. This study examined the change in behavioral stages of cycling to university before and after the implementation of a new public bicycle share program (PBSP) and promotion of its use. The study also determines the change in prevalence and correlates of PBSP use.
Methods: An 8-month follow-up cross-sectional study was carried out among undergraduate students during the first season of implementation of the PBSP in Valencia, Spain. The sample was 173 students (68.2 % female) with a mean age of 21.3 years (SD 3.06) who attended a PBSP promotional session. The data were collected by questionnaire. Variables measured were stages of behavior change, modes of transport to university and energy expenditure, barriers to active commuting, type of residence, access to car and motorbike, distance to university, use and access to PBSP and transport-related physical activity.
Results: Results indicated a significant increase of 14.6% in the action/maintenance group and showed that 19% of the participants were PBSP users 8 months later. The behavioral stage score did not increase when students always had access to car/motorbike, lived further than 5 km from the university and had no stations within 250 m from home. Those most likely to start using PBSP were students who were in the contemplation stage, perceived fewer environmental and safety barriers to active commuting, and had one or more stations within 250 m. PBSP users expended about 257 MET·min/week bicycling to university.
Discussion: The new PBSP program attracted about 19% of a group of university students to become regular users. The biggest barriers to participation were access to a car or motorbike, living more than 5 km from campus, and not having a PBSP station near home. Findings suggest that PBSPs can be considered as useful promoters of cycling behavior.

170 Sitting in cars for commuting and adults' weight gain over four years

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Introduction: Too much sitting–including prolonged time spent sitting in cars–is adversely associated with risk biomarkers and health outcomes. Car commuting is a habitual activity that can occupy a large portion of overall time spent sitting in cars. Although studies have shown cross-sectional associations of car use with adiposity, it is unknown whether car commuting is associated with weight gain.
Methods: Data from a four-year longitudinal study conducted in Adelaide were used. Weight change was ascertained from self-reported weight at baseline (2003–04) and at follow-up (2007–08, positive values indicated weight gain). Using self-reported time spent in cars for commuting and participant's work status at baseline, participants (N=822, mean age 49 years, 61% women) were categorised into non car commuters (n=375), part-time working car commuters (n=177) and full-time working car commuters (n=270). Multilevel linear regression analyses examined associations of weight change with car-commuting category, adjusting for demographic variables and potential confounding behaviours. Analyses stratified by insufficient or sufficient levels of leisure-time physical activity (150 min/week as a cut point) were also conducted, as physical activity is known to be protective against weigh gain.
Results: Overall mean weight gain over four years was 1.62 kg. Adjusted mean weight gain (95% confidence interval) was 1.22 (0.61, 1.84) kg for non car commuters, 1.47 (0.63, 2.31) kg for part-time car commuters, and 2.14 (1.41, 2.88) kg for full-time car commuters (p for trend=0.088). For those with insufficient leisure-time physical activity, adjusted mean weight gain was 1.84 (0.94, 2.74) kg for non car commuters, 1.67 (0.51, 2.83) kg for part-time car commuters, and 2.40 (1.30, 3.51) kg for full-time car commuters (p for trend=ns). For those with sufficient leisure-time physical activity, adjusted mean weight gain was 0.57 (-0.31, 1.45) kg for non car commuters, 1.38 (0.17, 2.58) kg for part-time car commuters, and 2.02 (1.03, 3.01) kg for full-time car commuters (p for trend=0.042).
Discussion: The study found a gradient in weight gain by car-commuting category. Over four years, those who did not use cars for commuting tended to gain less weight than those who used cars daily for commuting. This relationship was pronounced among participants who were sufficiently active during leisure time. Not using cars for commuting may be protective against weight gain, particularly in combination with sufficient leisure-time physical activity. These findings provide evidence that daily car use for commuting may increase health risk.

171 Community mobilization toward active transportation: Depicting the role of grassroots projects from an evidence-based approach

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Introduction: Sedentary transportation modes have negative health (e.g. obesity) and environmental consequences (e.g. air and noise pollution). Transforming built environments to increase connectivity and mixed-and use shows promise in promoting active transportation. Although urban planners, engineers, and other municipal workers play a central role in transforming built environments, the role of community groups and civil society who provide a voice for the community is poorly understood. We describe the evidence-based approach used to understand the contribution of grassroots projects in promoting healthy built environments in urban neighborhoods in Montreal Canada.

Methods: The project was part of a larger initiative named "Healthy Canada by Design"—a Canadian coalition of health units, planning organizations, and non-governmental organizations that came together to unite existing and emerging cross-sector efforts to promote healthy built environments by integrating the latest research into policy. The Montreal-based arm of the coalition conducted a four-pronged project consisting of 1) analyzing grassroots projects throughout the Island of Montreal, 2) diagnosing street- and intersection-level pedestrian potential through audits in two lower income neighborhoods, 3) describing the process of implementation of grassroots projects and their potential effects on community mobilization and built environments through interviews with key informants in the same two lower income neighborhoods, and 4) sharing knowledge gleaned through the project with stakeholders to identify actionable recommendations.

Results: We identified 134 community organizations who ran 183 grassroots projects aimed at built environments between January 1st 2006 and November 1st 2010. During the summer of 2010, data were collected by 3 trained auditors in 529 street segments and 540 intersections in two lower income neighbourhoods where 14 grassroots projects were being lead. Interviews were also conducted with 29 respondents representing community groups and their municipal and institutional partners. Information was gleaned on the territorial reach of projects, the characteristics of urban form that are amenable to intervention by community groups, and the objectives, implementation process, barriers/facilitators, and nature of collaborations in grassroots projects. Expert meetings including urban planners, engineers, academics, community organizers, and public health officials allowed for the identification of actionable recommendations which were disseminated during local dissemination events.

Discussion: The expert forums and the dissemination activities allowed for the emergence of a dialogue between actors involved in transforming built environments and highlighted the need for collaboration across sectors to transform evidence into action.

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172 Adaptations in physical performance from childhood to senescence

KEYNOTE

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The challenges associated with maintaining an active lifestyle change across the lifespan. To characterize these adaptations, the presentation will describe several cross-sectional studies that identify factors constraining physical performance at three time points from childhood to senescence: 1) children during the initial years of puberty; 2) middle-aged adults who have not yet experienced substantial declines in muscle strength; and 3) the decrease in mobility exhibited by healthy older adults. In a cross-sectional study of 72 healthy children (39 boys and 33 girls; 8–14 yrs), we found that the differences in daily levels of physical activity between girls and boys at three Tanner stages (T1–T3) were strongly associated (R^2>0.85) with neuromuscular characteristics (leg strength and endurance) for both sexes and with percent body fat for the T3 girls (Rudroff et al. submitted). In contrast to the association between muscle strength and physical activity in children, middle-aged adults (51±6 yrs) exhibited longer times (65.7±8.6 s vs 59.3±6.0 s) to complete a test of manual dexterity (Grooved pegboard test) than young adults (26±4 yrs), despite there being no differences between the two groups in hand strength (handgrip, pinch grip, and index finger abduction). Moreover, multiple regression analysis identified steadiness as the better predictor of dexterity than the strength measures (Marmon et al. *Med Sci Sports Exerc* 43: 560–567, 2011). The capacity to modulate muscle activation continues to decline with advancing years and is manifested as a greater reliance on coactivation of agonst and antagonist muscles with a reduced capacity to incorporate feedback control in the performance of voluntary actions. Healthy older adults (74±3 yrs), for example, prefer to accommodate changes in mechanical stability by increasing agonist-antagonist coactivation rather than adopting the strategy used by young adults to modulate spinal reflex pathways (Baudry et al. *J Neurophysiol* 103: 623–631, 2010). Moreover, participation in physical activity by older adults can be further compromised by heightened sensations of fatigue that are unrelated to measures of performance fatigability. These studies demonstrate that in addition to the development and maintenance of muscle mass, physical performance capabilities across the lifespan are equally dependent on the capacity to provide appropriate activation signals to the involved muscles.

173 Sedentary behavior and vascular health. The cardiovascular risk in Young Finns study

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Introduction: We have earlier shown that sitting (sedentary behavior) per se is unfavourably associated with various cardiometabolic biomarkers and metabolic syndrome in adults. Therefore, we investigated whether leisure-time sedentary behavior is also associated with vascular intima-media thickness (IMT) and distensibility, surrogate markers of atherosclerosis. Their association with sedentary behavior has not been studied earlier.

Methods: 1084 women and 909 men aged 30–45 participating in the Young Finns study in 2007 were included in this study. Ultrasonography was used to assess carotid IMT (N=1738), distensibility (N=1731), and brachial flow-mediated dilatation (FMD, N=1728). Data on total leisure-time sedentary behavior (i.e. time spent watching TV, computing, reading, listening to music/radio, etc), physical activity (leisure-time, and active commuting), occupational physical strain, and smoking were collected with a questionnaire. Food frequency questionnaire was used to study diet composition, energy intake, and alcohol consumption. Linear regression analyses were used to study the association between leisure-time sedentary behavior and vascular ultrasonographic measurements.

Results: Increased total leisure-time sedentary behavior was not associated with carotid IMT and distensibility (p<0.7 in all) in multivariable analyses adjusted with physical activity, occupational physical strain, energy intake, diet composition, alcohol, smoking, age, and BMI.

Discussion: In a healthy, adult population leisure-time sedentary behaviour is not associated with ultrasonographically measured IMT, distensibility and FMD in a cross-sectional setting. Long-term follow-up studies will ultimately verify *the role of* sedentary behaviour in vascular health.

174   Television and cardiometabolic risk in children and adolescents

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Introduction: Watching television is a sedentary pastime often accompanied with the consumption of high calorie foods. Although television viewing is associated with higher body mass index in youth, it is unknown if cardiometabolic risk develops from excessive television use. This study investigated the association between television use and the presence of cardiometabolic risk factors in youth.

Methods: The sample included 380 5–18 year-old children. Children self-reported age, sex, race (black or non-black), physical activity (days/week), frequency of sugar-sweetened beverage consumption (days/week), television in the bedroom (yes/no), and television viewing (hours/day), with parental assistance. Television viewing was dichotomized as high (>2 hours/day) versus low (≤2 hours/day), based on American Academy of Pediatrics recommendations. Waist circumference at the iliac crest and blood pressure with a standard mercury manometer were measured in clinic. Serum triglycerides, glucose, and HDL cholesterol were obtained from a fasting blood sample. Children were classified as having elevated cardiometabolic risk based on the 2011 U.S. National Heart Blood and Lung Institute guidelines (≥3 of the following risk factors: waist circumference ≥90th percentile; systolic or diastolic blood pressure ≥90th percentile; glucose ≥100 mg/dL; triglycerides ≥75 mg/dL for 5–9 year-olds or ≥90 mg/dL for 10–18 year-olds; HDL ≤45 mg/dL). The odds of elevated cardiometabolic risk associated with television watching (>2 hours/day) and having a television in the bedroom were estimated by logistic regression, and results are presented as odds ratios and 95% confidence intervals. Covariates included age, sex, race, physical activity, and sugar-sweetened beverage consumption. Analyses were repeated for each individual risk factor.

Results: A total of 7.6% of the sample had ≥3 cardiometabolic risk factors. Sixty-five percent reported watching >2 hours of television daily, and 66% reported having a television in the bedroom. In multivariate-adjusted models, watching >2 hours/day television was significantly related to high waist circumference (1.9, 1.1–3.2) and high triglycerides (1.9, 1.1–3.3). Having a television in the bedroom was significantly related to elevated cardiometabolic risk (2.8, 1.0–7.4), high waist circumference (2.4, 1.4–4.2), and high triglycerides (2.4, 1.4–4.3).

Conclusion: Having a television in the bedroom was associated with a 2.7 greater odds of elevated cardiometabolic risk among youth. Television in the bedroom and watching >2 hours/day of television were associated with greater odds of elevated waist circumference and elevated triglyceride levels, despite controlling for physical activity and sugar-sweetened beverage consumption. Parental education to reduce television viewing could protect youth against the development of obesity and an adverse cardiometabolic profile.

175   The effects of different intensities of exergaming on children's vascular health

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Introduction: Current evidence suggests that sedentary screen based media may increase physical inactivity, obesity and, consequently, cardiovascular risk. Whilst new-generation active console games ("exergaming") are starting to replace traditional sedentary gaming activities, it is currently unclear whether these offer a healthier alternative. Specifically, it is not known whether exergaming produces a response that stimulates adaptations in vascular health. In this study we hypothesised that high-intensity exergaming (Xbox 360–Kinect) would induce larger changes in heart rate (HR), energy expenditure (EE) and flow-mediated arterial dilator function (FMD), compared to low-intensity gaming.

Methods: Fifteen children (8♂, 10±1yr, BMI 18.1±2.3kg/m^2) participated in a within-subjects cross-over study. Participants undertook 3 separate sessions in a counterbalanced order consisting of an exercise test and 2 gaming sessions. High exergaming (HE, Kinect Sports-Hurdles) and low exergaming (LE, Kinect Sports-TenPin bowling) were played for 15 minutes, as per manufacturer specifications. FMD was measured before and immediately after exergaming to assess effects on vascular health. Actihearts were used to measure energy expenditure and HR during game play.

Results: The increase in HR in response to HE (144±11bpm) was greater than that associated with LE (104±10bpm, p<0.05). This pattern was reinforced by the EE data (HE 291.4±58.0 J/min/kg, LE 71.3±35.4 J/min/kg, p<0.05). FMD decreased after HE (p<0.05), but there was no significant change following LE.

Discussion: This study suggests that HE exergaming induces larger HR and EE responses that LE exergaming, and that this translates into a greater acute effects on vascular function. As FMD predicts cardiovascular events in humans and is a valid surrogate for arterial health, this study suggests that repeated bouts of HE exergaming may provide a substrate for beneficial vascular adaptation and decreased future CV risk in children.

176   Cardiorespiratory fitness and TV viewing in relation with metabolic risk factors in youth

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Introduction: The purpose of this study was to examine whether adolescents whom have high levels of cardiorespiratory fitness (CRF) coexist with low levels of television (TV) viewing and presented a better metabolic risk profile compared to their low fit and high TV viewing counterparts.

Methods: A total of 372 students (aged 12–15 years old) comprised the sample of this study. Anthropometric data (height, body mass, waist circumference) were collected. Body mass index (BMI) was also calculated. CRF was calculated based upon shuttle run test. Questionnaire was used to estimate weekly TV viewing. Participants were then categorized in one of 4 categories profiles according they accomplish scores that allow them to be classified in health or above health zone by gender and age (Fitnessgram) along with the 2h/day cut-off point with regard TV viewing: low TV-Fit, high TV-Fit, low TV-Unfit and high TV-Unfit. The blood pressure [BP], fasting total cholesterol [TC], low density lipoprotein-cholesterol [LDL-C], high density lipoprotein-cholesterol [HDL-C], triglycerides [TG] and a metabolic risk score (MRS) were also examined.

Results: Logistic regression analysis indicated that high TV-unfit were almost 3 fold as much to likely be assigned to MRS group (OR: 2.85, 95% CI: 1.08–7.50) compared to their low TV-fit group counterparts (reference group).

Discussion: Our data showed that high TV-Unfit group was associated with an increased risk for metabolic risk in adolescents even after adjustment for sex and maturation.

177 Body composition and television viewing among high school adolescents in the Tlokwe Local Municipality, South Africa: The PAHL-Study

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Background: Information regarding body composition and television viewing in South African children is sparse. The purpose of this study therefore, was to determine the relationship between body composition and TV viewing among adolescents attending high schools in the Potchefstroom area of the North-West province of South Africa.

Methods: Baseline data within the 5 years Physical Activity Longitudinal Study (PAHLS) study consisted of 154 learners (58 boys and 96 girls) aged 14 are studied. All the learners underwent anthropometric measurements of height, weight, and two skinfolds (triceps and subscapular). Percentage body fat (%BF) was calculated from the two skinfolds according to Slaughter's et al. (1988) equation. Children were classified into three groups namely normal, overweight and obese according to BMI cut-off point suggested by Cole et al. (2000, 2007). Pearson correlation coefficients were used to determine the relationship between television viewing and body composition.

Results: The results show that the group that views TV for more than 3 hours had high BMI (21.27kg/m^2) and body mass (51.54kg). The group that views TV for 1–2 hours had low BMI (18.36kg/m^2) and body mass (44.79kg). There was a statisitcal significant relationship between BMI and body mass (p=0.001). A significant positive relationship between body mass and TV viewing (r=0.56; p=0.05) in overweight group was found, whilst in the obese group strong significant positive relationship was observed between percentage body fat and TV viewieng (r=0.94; p=0.01).

Conclusion: It can be concluded that adolescents who viewed TV more than 3 hours are heavier and fatter. In both overweight and obese adolescents fatness was significantly associated with TV viewing. In the view of public health regarding the consequences of too much TV viewing and overweight/obesity, it is therefore recommended that strategic intervention programs aimed at addressing too much of TV viewing and overweight/obesity program early are urgently needed so as to prevent the risks for chronic diseases of life style later in life.

178 Do changes in physical activity, fitness, adiposity or diet influence insulin resistance in boys and girls? The LOOK study

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Introduction: A quarter of all apparently healthy Australian children will develop type 2 diabetes or impaired glucose control in adulthood and early attention to increased insulin resistance (IR) may help prevent this disorder. There are many cross-sectional studies describing relationships between IR and physical activity (PA), cardiorespiratory fitness (CRF) and adiposity in preadolescents, but few longitudinal studies, which provide direct effects on a child and so more clinical relevance. There are fewer still longitudinal studies which include measures of energy and macronutrient intake and no reports of the pattern of change in IR in children through to age 12. In this report we document this pattern and investigate how changes in PA, %BF and diet influence a child's IR.

Methods: In this prospective cohort study, 370 boys and 345 girls were assessed at ages 8.1 (SD 0.3), 10 and 12 years for fasting blood glucose and insulin, objectively measured %BF, PA, CRF, dietary intake and pubertal development.

Results: Between the ages of 8 and 12, the median homeostatic model of IR (HOMA-IR) doubled in *boys* and increased 2.5 times in girls, being 9%, 27% and 49% greater in girls at 8, 10, and 12 years. By age *12*, 23% of boys and 31% of girls possessed borderline or elevated IR. Longitudinal data over the four years showed that when a child decreased by 1%BF, IR was improved by approximately 2% (95% CI 0.04–4); and in the boys, but not girls, IR improved by 3.5% (95% CI 0.5–6.5) when PA increased by 1000 steps/day. Cross-sectional data indicated that children with higher CRF had lower IR (p=0.01 boys p=0.03 girls) but IR was not associated with total energy, fat, carbohydrate or sugar intake in boys or girls at cross-sectional or longitudinal levels (p>0.5 for all).

Discussion: IR increases progressively throughout pre-adolescence, but to a greater degree in girls. It is responsive to changes in %BF, and in boys to PA, but did not appear to be influenced by total energy, fat and sugar intake. Given that a quarter of these children are likely to develop a form of metabolic dysfunction in later life, early attention to IR seems warranted. These data suggest that preventive medical strategies aimed at controlling IR might benefit by reducing %BF, particularly in girls, and increasing PA in boys.

179 Effects of prolonged sitting and physical activity on markers of cardiometabolic risk in healthy children and youth: A pilot study

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Introduction: It has recently been reported that a single day of uninterrupted sitting may result in deleterious changes in markers of cardiometabolic risk among adults. The purpose of the present randomized crossover study was to determine whether a single day of sitting (with or without short walk breaks or structured physical activity) would result in increased levels of insulin, glucose or lipids among healthy children and youth aged 10–14 years. Methods: Participants included 2 males and 5 females who experienced 3 conditions in random order on separate days, with at least 7 days between each session. The Sedentary (SED) condition consisted of 8 hours of uninterrupted sitting. The Sedentary With Breaks (SWB) condition was similar to the SED condition, but participants performed a 2 minute walk-break at 30% of VO_2peak every 20 minutes throughout the day. The Sedentary With Breaks and Physical Activity (SWBPA) condition was similar to the SWB condition, but in addition to walk-breaks participants also performed 2 separate 20 minute bouts of structured physical activity at 60% of VO_2peak. Participants were provided with identical standardized meals at all three visits, which were based on each individual's resting metabolic rate and directly measured physical activity, with breakfast and lunch providing 25% and 40% of estimated daily needs, respectively. Blood samples were taken in the fasted state before breakfast, and every 90 minutes throughout each experimental condition. Incremental area-under-the-curve (iAUC) for insulin, glucose, triglycerides, HDL- and LDL-cholesterol was compared across the three conditions using a mixed effect model with random intercept.
Results: Participants had an average age of 12±1 years, body mass index of 18.7±5.3 kg/m^2 and HOMA-Insulin Resistance score of 0.85±0.35 at baseline. We observed no significant differences in the iAUCs between the three conditions for insulin (p=0.43), glucose (p=0.95), triglycerides (p=0.31), LDL- (p=0.55) or HDL-cholesterol (p=0.84).
Discussion: Results from this pilot study suggest that uninterrupted sitting may not result in significant increases in markers of cardiometabolic risk in healthy children and youth or that these markers are not sensitive to acute changes in this age group. Future studies employing larger samples or individuals at increased risk for metabolic disturbances are needed to more fully investigate the relationship between acute bouts of sedentary behaviour and markers of cardiometabolic risk in the pediatric population.

180 Estimated replacement effects of accelerometer-derived physical activity and self-reported sleep duration on chronic disease biomarkers

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Introduction: Across a 24-hour day, time is disproportionately distributed between sleep, sedentary time (sitting or lying with low energy expenditure), light-intensity activity, and moderate-vigorous intensity activity (MVPA). Individually, physical activity and healthful sleep (~8 hr/night) are beneficially associated, while sedentary time is detrimentally associated, with health outcomes. The relationship between these behaviors may also be important, with preliminary evidence suggesting physical activity and healthful sleep are related. However, the magnitude and direction of these relationships, and their impact on health outcomes, are unclear. This study explored the impact of alternating the time spent in these different behaviors (sleep, sedentary time, light-intensity time, MVPA time) on chronic disease biomarkers.
Methods: Data from the cross-sectional, 2005–2006 US National Health and Nutritional Examination Survey (NHANES) were analyzed, adjusting for the complex sampling design. Adults aged 30 to 74 years with 4+ days of accelerometer data and self-reported sleep duration were included in analyses (N=3,238). Adults with sleep disorders and pregnant/lactating women were excluded. Cardiovascular (Framingham Risk Score and homocysteine levels), adiposity (body mass index and waist circumference), inflammatory (C-reactive protein), insulin resistance (HOMA-IR and HOMA-B), and hyperinsulinemia biomarkers were examined. Isotemporal substitution methods were used to estimate replacement effects for accelerometer-derived activity (MVPA: >1951 cpm; light-intensity: 100–1951 cpm; sedentary: <100 cpm) and reported sleep time (duration, sleep onset latency) variables on selected biomarkers.
Results: After adjustment for study covariates (age, gender, ethnicity, income, smoking, depression, and energy intake) and time spent in other activities, replacing 30 min/day of sedentary time with 30 min/day of MVPA was associated with improved levels for all biomarkers (p<0.02 to 0.0001) with the exception of homocysteine. Replacing 30 min/day of sedentary time with 30 min/day of extended sleep duration was associated with improved cardiovascular (p<0.04 to 0.01), insulin resistance (p<0.05 to 0.0004), and hyperinsulinemia (p=0.03) biomarkers, but not adiposity or inflammatory biomarkers. Light intensity activity and sleep onset latency replacement effects were equivocal across biomarkers.
Discussion: On average, replacing sedentary time with accelerometer-derived MVPA or self-reported sleep duration, even after controlling for other activities, was associated with improvements in a range of important biomarkers associated with cardiovascular disease and diabetes. Future research should explore these replacement associations longitudinally using objective methods to assess sleep parameters.

181 | Impact of health behaviors during adolescence on health complaints in adulthood

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Introduction: We aimed to identify the prospective associations between health behaviors at age 13 on health complaints at age 30.
Methods: We used data from The Norwegian Longitudinal Health Behavior Study (NLHB), in which participants were followed from the age of 13 to 30. Linear regression analysis was employed to examine the impact of smoking, alcohol use, diet, and physical activity at age 13 on the level of health complaints at age 30.
Results: Alcohol use (b=.15, p=.01) and physical activity (b=-.15, p=.005) at age 13 were associated with health complaints at age 30. A near significant association was found for healthy dietary behavior (b=-.10, p=.06). After controlling for health complaints at age 13, only physical activity (b=-.14, p=.008) remained a significant correlate of health complaints at age 30.
Discussion: Health behaviors during early adolescence constituted potential risk factors for the development of health complaints in adulthood. This knowledge should be considered by policy makers, preventative services, and health-care professionals.

182 | Parental perception of children's physical activity and cardiovascular health outcomes

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Introduction: Children's physical activity levels and body mass index (BMI) percentiles are related to various cardiovascular health outcomes, including cholesterol levels. From the literature, we know parents routinely overestimate their child's physical activity and underestimate their child's weight. However, we do not know if these parental estimates of child's physical activity and weight are related to their child's cardiovascular health outcomes.
Methods: The Coronary Artery Risk Detection in Appalachian Communities (CARDIAC) Project is a US school-based surveillance project that screens public-school children in all counties of an Appalachian state. For 5th grade students, this screening includes checking the child's BMI percentile, blood pressure, Acanthosis Nigricans and conducting a fasting lipid profile. This study connects these screening results to a follow-up survey sent to participating 5th grade parents in 8 counties during the 2010–2011 school year (N=74 children with valid lipid values). Parents were asked whether their child was more, less, or equally physically active when compared to other children of the same age and gender.
One-way ANOVAs with Bonferroni post-hoc pairwise comparisons compared these parental perceptions with the child's BMI percentile and cholesterol levels. All screening and survey procedures were approved by the University Institutional Review Board (IRB).
Results: Only 9 parents perceived their child as less active, whereas 24 parents perceived the child as equally active and 41 as more active than other children the same age and gender. Parents who perceived their child as less active had children on average with significantly higher non-HDL cholesterol (123.78 versus 103.5 and 104.34; p=0.042), BMI percentile (80.93%ile versus 73.36 and 50.64; p=0.001), and log-transformed triglycerides (p=0.003). HDL cholesterol approached significance (p=0.054).
Discussion: These results demonstrate that while parents might not accurately classify their child's activity, there is a relationship between parental perception of child physical activity and their child's cardiovascular health outcomes. The relationship between higher average cholesterol levels and BMI percentile with the parents' perception of physical activity indicates that parental perceptions may be more accurate than previously anticipated and should be taken into account when designing interventions aimed at increasing children's physical activity.

183 | How physically active are youth with disabilities compared to youth without disabilities?

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Introduction: To reach health benefits the recommendations for youth are to accumulate ≥60 minutes of physical activity (PA) per day of at least moderate-to-vigorous intensity (MVPA). Previous studies have suggested that youth with disabilities (YWD) reach recommendations to a lower extent and are generally less physically active than youth without disabilities (YWOD), but studies have used different methods and results are inconclusive. The aim of the present study was to assess habitual PA in YWD with an objective method (accelerometer) and to compare that to YWOD.
Method: Habitual PA was assessed with an ActiGraph® GT1M accelerometer in 29 boys and 18 girls, 8–10 and 14–16 years old with physical disabilities as cerebral palsy and spina bifida, autism spectrum disorder, hearing impairment/deafness and intellectual disability. Outcome variables were: total PA (mean counts/minute [cpm]), time spent sedentary (minutes in <100 cpm/day) and time spent in MVPA (min/day). For comparisons with YWOD, accelerometer assessments of 445 girls and 357 boys from the Swedish part of the European Youth Heart Study, in the same age groups as YWD, were used.
Results: YWD were significantly less physically active (lower cpm, less MVPA) and more sedentary than YWOD in all four age and sex groups, except in boys 14–16 years, where no significant difference was seen for cpm or MVPA, but for sedentary, with YWD being more sedentary. Fewer girls of YWD than of YWOD met recommendations in the age groups 8–10 years (YWD=80% and YWOD=100%) and 14–16 years (YWD=23% and YWOD=59%). For boys, there were no significant difference between YWD and YWOD in the age groups 8–10 years (YWD=100% and YWOD=98%) or 14–16 years (YWD=47% and YWOD=70%).
Discussion: YWD were generally less physically active than YWOD. This result is in line with most previous accelerometer studies. YWD were also more sedentary than YWOD, which have, to the authours knowledge, not been shown previously with accelerometer. Furthermore, the proportion of girls and older boys in YWD meeting recommendations is low. The low PA in YWD is of concern, since apart from general health benefits of PA, engaging in PA gives important additional health benefits for YWD, such as prevented functional decline and increased social inclusion. Further studies using objective measures as accelerometer examining PA level and factors influencing PA level in different groups of YWD are warranted as well as interventions aiming to increase PA in YWD, especially in girls.

184   People with traumatic brain injury are physically inactive and have reduced cardiorespiratory fitness

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Introduction: Traumatic brain injury (TBI) is the leading cause of disability in young adults, and subjective measurement of physical activity would indicate that they are more physically inactive than the general population. However the reliability and validity of subjective measurement of physical activity in this cognitively impaired population has not been determined. In addition, physical activity has not been objectively measured. Aims: 1) To determine the reliability of a subjective measure of physical activity (questionnaire) and to determine its validity with an objective measure of physical activity (accelerometer) in adults with TBI; 2) To objectively measure physical activity and cardiorespiratory fitness in adults with TBI; 3) To determine the relationship between physical activity and cardiorespiratory fitness in adults with TBI.
Methods: A descriptive prospective study recruited a convenience sample of 30 ambulant community-dwelling adults with severe TBI. Participants completed the Physical Activity Scale for Individuals with a Physical Disability (PASIPD) on two occasions one week apart, and wore an accelerometer (Actigraph GT3XE) for the 7 days between completing the PASIPD. They also completed a peak cardiorespiratory fitness test with gas analysis to measure peak oxygen uptake (VO$_2$peak).
Results: Participants were predominantly males (67%) in their early thirties approximately three years post injury. The PASIPD test-retest reliability was excellent (Intraclass Correlation Coefficient=0.85) and the correlation with the accelerometer was weak, but similar to other able-bodied and patient populations (activity counts R=0.298). From subjective measurement of physical activity (PASIPD), levels of physical activity were low (mean (SD) PASIPD 12.5 (8.8) MET hours/day), and all participants reported activity in more than one domain of physical activity. From objective measurement of physical activity (accelerometer) and cardiorespiratory fitness, two participants met the national physical activity guidelines and participants were on average well below average fitness compared to age-matched able-bodied data (mean (SD) peak VO$_2$peak 30.4 (7.6) ml/kg/min). There was a moderate relationship between objective measurement of physical activity and cardiorespiratory fitness (R=0.660), indicating that the fitter participants were more likely to be physically active.
Discussion: These findings support the use of an accelerometer to objectively measure the amount of physical activity and the PASIPD to subjectively measure the domains of physical activity in adults with TBI. Adults with severe TBI are generally physically inactive and very unfit. Due to this increased risk of morbidity and mortality, interventions to increase physical activity and cardiorespiratory fitness need to be investigated.

185   Habits of life of people with Down Syndrome in Brazil

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In education perspective for an active lifestyle, the adherence to physical activity practice is considered an important health behavior for the comprehension of phenomena related with the implementation of health promotion programs for people with Down Syndrome (DS). This study has objective to describe the characteristics and life habits of the population with DS aged seven years-old or more in the South region of Brazil. This research is characterized as a cross-sectional epidemiologic study. A total of 2187 individuals were studied (54.7% men), with ages between seven and 64 years. It was observed that 39% (n=852) of the individuals related some associated illness. It was verified that 12.5% (n=242) of the individuals are able to read and write. It was observed good autonomy in the accomplishment of the activities of daily life (ADL), around 90%, whereas the instrumental activities of daily life (IADL) are carried out with more difficulty. In relation to leisure activities, 45.3% (n=908) have preference for watching television. It was observed that 13.5% (n=296) use computers. In terms of physical activity practice, 65.8% (n=1482) are physically inactive. In the physical fitness and somatic evaluation, 1249 children and youth with DS of ages between 10 and 20 years were studied (53.6% males). In terms of BMI, it was verified that 56.9% are in the overweight or obesity categories, with more risk in girls. Preventive actions will help handling the relative factors for activities and social programs, that can facilitate and promote the acquisition of healthy habits, stimulating and associative and happy life, that includes recreation, physical and cultural activities.

186   Aerobic fitness, functional exercise capacity and muscle strength of adults with intellectual disability.

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Introduction: Public health campaigns focus on decreasing sedentary behavior and increasing health-related physical activity. However, scant direct information is available on the aerobic fitness, functional exercise capacity and muscle strength of people with intellectual disability. In part, this may be due to them being a difficult-to-test population because of comprehension and acquiescence with standard strength and fitness assessments. To aid health-related campaigns targeted towards people with intellectual disability it is important to identify accessible assessment methods to gain accurate knowledge on the aerobic fitness and muscle strength of this population. The purpose of this trial is twofold; to establish accessible assessment methods and to collect descriptive data.
Methods: Preliminary data has been collected on 29 adults with intellectual disability (45% with Down Syndrome) between 27 and 53 years of age. Participants undertook a series of physical assessments, selected to be accessible to adults with intellectual disability. A submaximal exercise aerobic fitness (cycle) test was used to determine aerobic fitness, a six-minute walk test assessed functional exercise capacity and muscle strength was assessed using handgrip force, squat strength, elbow flexion and extension.
Results: Compliance data show that our suite of assessments was largely successful in yielding satisfactory data. Most participants were able to comply with the assessment protocols. Compliance ranged from 79% for the cycle test to 100% for the six-minute walk test. A VO$_2$peak could be calculated from the cycle test results for 20 of the 29 participants, with a mean of 25.16. On the six-minute walk test participants walked a mean distance of 85.09 m/min. A major challenge in assessing the participant's aerobic fitness and functional exercise capacity was around their perception of physical exertion and the desire to stop once they began to tire. Anthropometric measures revealed that 90% of participants were classified as overweight or obese.

Discussion: The results provide encouraging compliance data on the utility of our assessment approaches with this population. Our data likewise offer accurate, directly-measured information on the current physical activity and fitness of adults with intellectual disability. This information will help policy makers and disability service providers gain an understanding of the actual fitness levels of this population and subsequently identify their need for a more active lifestyle. This information will be beneficial to exercise professionals working with disability service providers to assist in developing and evaluating suitable physical activity programs for people with intellectual disability.

187　Determinants of daily physical activity in inactive Parkinson's disease patients

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Introduction: Research shows that Parkinson's disease (PD) patients experience reductions in their daily physical activity. Physical activity can have positive effects on functional capacity, health and quality of life of PD patients. Therefore, especially sedentary PD patients should be encouraged to be(come) more physically active in daily life. In order to develop tailored interventions for physically inactive PD patients, more knowledge about determinants of their daily physical activity is needed.

Methods: Daily physical activity of 586 PD patients who reported themselves to be physically inactive was measured with the Direct-Life accelerometer for 7 consecutive days. Primary outcome measure was daily energy expenditure in kilocalories. Demographic characteristics (e.g. age, gender), disease specific characteristics (e.g. disease severity, disabilities from PD, daily dose of levodopa), and psychological characteristics (e.g. anxiety, depression, self-efficacy) were measured by questionnaires. Physical fitness was measured with the 6-minute walk test (6-MWT). Linear regression analysis was conducted to identify determinants of daily physical activity.

Results: In total, 329 patients had sufficient accelerometer data for further analyses. Median daily energy expenditure was 498 kcal (IQR 280). Age, daily dose of levodopa, 6-MWT and the total score on the Unified Parkinson's Disease Rating Scale (UPDRS) explained 28% of the variance in daily physical activity (p<.001). Higher age, more disabilities from PD, lower dose of levodopa and lower physical fitness was associated with less physical activity.

Discussion: The variance in physical activity in sedentary PD patients is considerable and could partly be explained by age, disabilities from PD, physical fitness and medication. Although more determinants need to be identified, aiming interventions at optimal physical fitness and medication could have positive effects on the level of daily physical activity in physically inactive PD patients.

188　Determinants of physical activity participation in adults with cystic fibrosis

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Introduction: Cystic Fibrosis (CF) is a complex, progressive, life-limiting disease predominantly affecting children and young adults. Regular participation in physical activity is strongly encouraged in those with CF as aerobic fitness has been shown to be an independent predictor of survival, and associated with improved quality of life (QOL). In children with CF anaerobic power, aerobic capacity, QOL and nutrition have been identified as predictors of physical activity participation. Following puberty, participation in physical activity declines in girls with CF. With the increasing life expectancy of people with CF, coupled with the emergence of unique disease factors within the adult CF population, it is insufficient to assume that treatment-disease relationships that exist in childhood will continue in adulthood. We aimed to identify clinical and demographic features associated with moderate intensity physical activity participation in adults with CF.

Methods: Adults with CF and stable respiratory health completed clinical assessments of grip strength (hand-held dynamometry), muscle power (vertical jump height), exercise capacity (Modified Shuttle Test-25 (MST-25)) and QOL. Participants proceeded to wear an activity monitor (Sensewear Pro3 armband) to assess daily habitual physical activity participation. Relationships between time spent in moderate intensity physical activity (≥4.8 and <7.2 METs) and markers of strength, power, exercise capacity and QOL were assessed using Spearman rank order correlations. Wilcoxon signed-rank test was used to assess differences in time spent in moderate intensity activity between males and females.

Results: Fifty-two adults with CF (26 male), mean age 28 years (range 19–51 years) with mean FEV1 67% predicted (range 32–110% predicted) completed clinical assessments. Fifty participants provided activity monitor data from a mean 5.4 (SD 0.1) assessment days. Two participants had insufficient activity monitoring data for inclusion. Time spent in moderate intensity physical activity was most strongly correlated with exercise capacity (r_s=0.49, p=0.0002), followed by grip strength (r_s=0.44, p=0.001) and muscle power (r_s=0.40, p=0.003). Time spent in moderate intensity physical activity was significantly greater in males (Median 39.4 minutes/day) than females (Median 22.3 minutes/day), Z=-3.49, p=0.0005.

Discussion: In this group of adults with CF we identified some similar determinants for physical activity participation as those previously identified in children and adolescents with CF, including ongoing reduction in physical activity participation in females. Identifying factors that influence physical activity participation in adults with CF may be useful in developing innovative strategies targeted to improve fitness and function in this population.

189 Exercise rehabilitation programs for chronic non-specific low back pain: A comparison of Pilates exercise and general aerobic exercise

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Introduction: Low back pain is a serious global health problem, exhibiting epidemic proportions and affecting 80–85% of people over their lifetime. Exercise is a first choice treatment for chronic low back pain (CLBP). However, there is a lack of consensus as to which is the most effective type of exercise. Neither is there a complete understanding of how different exercise modalities, such as general or specific exercise, affect the broader psychological aspects of CLBP. Whether a particular modality of exercise will elicit a greater effect on improvements in mental health of CLBP patients is unknown. Whether those improvements in mental health best explain improvements in disability and pain is uncertain.
Objectives: The objective of this study was to investigate the effect of Pilates (a specific exercise) compared to cycling (a general aerobic exercise) on disability for individuals with CLBP and to evaluate the effect of these exercise types on psychological factors that influence the chronicity of low back pain.
Methodology: Sixty-four individuals (18–50yrs) with CLBP were randomized to Pilates (core specific) or cycling (general aerobic exercise). Disability (ODI), pain (VAS), pain catastrophising (PCS), fear avoidance beliefs (FABQ), anxiety and depression (HADS) were measured pre and post an 8-week intervention. ANCOVA was used to examine between group differences, T–tests to examine within group differences and regression models to examine relationships between changes in measured variables. Effect sizes and 95% confidence intervals were calculated. Statistical significance was set at $P<0.05$.
Results: Pilates specific exercise group reported statistically and clinically significant improvements in disability compared with the general aerobic exercise group ($P=0.046$). Both exercise modalities showed improvements in pain ($P=0.01$), pain catastrophising ($P=0.03$ and 0.01) and depression ($P=0.03$ and 0.02). Pilates specific exercise modality showed improvements in fear avoidance beliefs regarding physical activity ($P=0.04$). The general aerobic exercise group found improvements in anxiety ($P=0.04$). Improvements in disability for the Pilates specific exercise group resulted from improvements in current pain and anxiety, with improvements in depression best explaining observed improvements in current pain.
Conclusions: Pilates specific exercise appears superior to general aerobic exercise for treatment of CLBP. Pilates and cycling produce different mechanisms of action on the psychological factors that influence chronicity in low back pain. Of interest to clinical practitioners is the statistical and clinical significance of the Pilates specific exercise intervention for reduction in disability, improvements in pain intensity, fear avoidance beliefs, depression and pain catastrophising.

190 The effect of self-directed exercise program on physical function of older adults with frailty

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Introduction: Frailty is a common syndrome in older adults. Frailty is associated with increase of morbidity and reduced functional ability. However, few studies have introduced an exercise intervention for frailty. The purpose of this study was i) to investigate the effect of elastic band training, and ii) to evaluate the efficacy of self-directed group exercise as a follow-up after supervised exercise on physical function of frail older adults.
Methods: A total of 41 subjects were initially recruited in this study and 17 of older adults with frailty (≥65 years old) whose SPPB (Short physical performance Battery) score is below 9 were randomized into two groups; elastic band exercise group (EX, n=8) and non-exercised control group (CON, n=9). Exercise training was performed 1 hour twice a week for 18 weeks. For the first 8 weeks, participants exercised under the supervision. During the remaining 10 weeks, as a self-directed group exercise, participants trained themselves following the video which demonstrated examples of the same exercises instructed by the supervisor. Physical function including SPPB, grip strength, stair climbing, sit & reach, and leg isokinetic strength and physiological function including exercise self-efficacy scale were measured at baseline, after the 8-week exercise program, and upon completion of the 18-week exercise program, respectively. Body composition was also measured by DEXA (Dual Energy X-ray Absorptionmetry) before and after exercise intervention.
Results: Eighteen weeks of elastic band training significantly increased the most of factors of physical function as followings: SPPB (P=.022); right knee flexion at 60°/s (p=.022); left knee flexion at 60°/s (p=.034); right knee extension at 120°/s (P=.022); left knee extension at 120°/s (p=.003); right knee flexion at 120°/s (P=.039) and left knee flexion at 120°/s (p=0.11). Arm lean mass was also significantly increased.
Despite physical function were not statistically different between EX and CON from the first 8-week supervised exercise program, after the follow-up self-directed group exercise for the remaining 10 weeks, physical functions were significantly improved in EX compared to CON in which physical functions were substantially decreased.
Discussion: These results shows that 18 weeks of elastic band training significantly improved physical function of older adults with frailty and also suggest that self-directed group exercise was effective to increase physical function.

191 Chronic disease, physical activity and sitting time in middle-aged Australian males: Findings from The 45 and Up Study

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Introduction: Compared to females, males experience a range of health inequities including higher rates of chronic diseases such as diabetes and cardiovascular disease. Although physical activity (PA) and sitting time have been established as distinct factors that can impact on chronic disease, research on each of these factors and their independent associations with chronic disease in middle-aged Australian males is limited.
Methods: A sample of 63,048 males aged 45–64 years was drawn from the baseline dataset of The 45 and Up Study–a longitudinal cohort study on healthy ageing with 266,848 participants from across New South Wales, the most populous state in Australia. Baseline data on self-reported chronic disease (heart disease, cancer, diabetes, high blood pressure, combined chronic diseases), PA (Active Australia Survey), sitting time, and a range of covariates were used for cross-sectional analyses. Fully adjusted odds ratios (AOR) and 95% confidence intervals (CI) were calculated using binary logistic regression.

Results: There were robust crude associations between PA and all chronic diseases included in this analysis. In fully adjusted models, participants reporting 300 to 539 minutes of PA and ≥540 minutes of PA in the previous week were significantly less likely to report having diabetes (AOR=0.81, 95% CI=0.69, 0.96; AOR=0.70, 95% CI=0.60, 0.84, respectively), compared to those reporting no PA. Participants reporting ≥540 minutes of PA were also significantly less likely to report having cancer (AOR=0.81, 95% CI=0.67, 0.98) than those reporting no PA. Compared to those sitting <4 hours/day, participants reporting 4 to <8 and 8 to <11 hours were significantly more likely to report having any chronic disease (AOR=1.07, 95% CI=1.02, 1.13; AOR=1.10, 95% CI=1.04, 1.17, respectively), and participants reporting ≥11 hours/day were significantly more likely to report having high blood pressure (AOR=1.09, 95% CI=1.01, 1.17). Participants who reported 8 to <11 hours and ≥11 hours of sitting were also significantly more likely to report having diabetes than those reporting <4 hours/day (AOR=1.19, 95% CI=1.07, 1.33; AOR=1.23, 95% CI=1.08, 1.40, respectively). Discussion: These findings demonstrate that higher levels of PA are significantly associated with both diabetes and cancer in middle-aged males, independent of potentially confounding factors. Higher volumes of sitting time were also associated with reporting any chronic disease, diabetes, and high blood pressure in this population group. These findings support the promotion of PA and reduced sitting time in middle-aged males.

192 Social media and other information technology platforms for sports medicine and injury prevention

SYMPOSIUM

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The aim of this symposium is to describe some examples of the use of social media and other information technology platforms for sports medicine and injury prevention. This will include discussion of blogging, Facebook and other social networks, Twitter and smartphone apps. The symposium will be delivered by four speakers who are active users of social media. It will deliver a series of related talks and discussion about the value of these new communication media for sports medicine and injury prevention professionals, including clinicians, program implementers and researchers.

Paper 1:   What's the deal with Twitter and Facebook? Friend or foe for the busy clinician?
Paper 2:   Mobile apps for sports injury prevention and treatment
Paper 3:   Sports Medicine Australia and social media for social good in the promotion of sports injury prevention
Paper 4:   Embracing social media for research promotion and dissemination
Paper 5:   Tips and pitfalls when using social media platforms for team medical staff

193 What's the deal with Twitter and Facebook? Friend or foe for the busy clinician?

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Introduction: Social media today is in a more advanced 'stage' than the internet was at the turn of the century. Just as the web's influence has grown, most analysts predict that social media will only become more pervasive. This presentation aims to discuss social media in the context of sport science/medicine and introduce the concept to clinicians wondering whether they should devote precious moments to social media. At the end of this presentation, the hope is that clinicians at various stages of understanding of social media will be in a better position to know whether or not they want to pursue this communication channel.
Methods: After a brief introduction to Facebook and Twitter, I will share examples where clinicians have made use of social media to filter new clinical information.
Discussion: In reference to new clinical information, the clinician is a 'receiver' of social media information and Twitter can serve as a 'flag' as to which papers are getting a lot of attention. Twitter can also serve as a signpost to what is being posted on your favourite blogs. That means you can protect your time to just visit those blogs of particular interest. Twitter allows you to scroll through about 60 messages a minute – it is a very efficient method for 'scanning' the news. Facebook can provide similar benefits. Another potential benefit of social media is to 'market' services. However, just as television advertising is annoying, folks who see Twitter as a channel to 'blast' innocent 'followers' are quickly 'unfollowed'. As the term 'social' suggests, there is a need to 'engage' – provide value – for the 'followers'. Popular twitter accounts such as @ScienceofSport (13,000 followers) provide a lot of information without 'selling' a product. The popular twitter accounts are usually linked to a blog – so that the authors can expand their thoughts. Putting this in a clinical perspective, if a clinic is trying to build up clientele in a certain area, say foot and ankle injuries – it would need to 'serve' the target community. 'Service' might look like blogs about treatment for foot and ankle conditions, prevention ideas, interviews with clinicians or patients who have interesting and helpful things to offer.

194   Mobile apps for sports injury prevention and treatment

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Introduction: There is an abundance of sports medicine literature on effective rehabilitation protocols and preventive programs for a variety of injuries in various sports. In line with trends in other areas of medicine, mHealth in relation to sports medicine is gaining momentum with a number of apps being presented for different platforms. However, it remains unknown whether these apps are based upon best-evidence or merely preach best-practice. Therefore, our aim was to review and summarize the content of available sports injury prevention and sports injury rehabilitation apps.
Methods: The US iTunes store was searched (March 12, 2012) within the categories 'health & fitness', 'sports', and ' medical' for apps on injury prevention and rehabilitation using the keywords 'injury', 'prevention', and 'rehabilitation'. Information on content, user rating, and price was extracted from iTunes. Apps were categorized by goal (prevention versus rehabilitation) and body region. For each category Cochrane reviews were searched to provide information on best evidence. If no Cochrane reviews were available other systematic reviews were sought. App content was summarized and correlated against the ascertained best evidence.
Results: The search in iTunes yielded 228 iPhone apps and 97 iPad apps across all app-categories. Only 20 unique iPhone apps specifically dealt with prevention of sports and physical activity related injury, whereas this number was 4 for the rehabilitation of sports and physical activity related injury. For the iPad these numbers were respectively, 2 and 4. While only 4 applications specifically mentioned the containment of scientific evidence, about 60% of all reviewed apps contained best available evidence. While there was no specific mentioning of the uptake of evidence it remains elusive whether the app authors included evidence on purpose, or whether apps were built around the authors best -practice, coincidentally correlating to best evidence. In contrast, about 40% of all reviewed apps did not contain best available scientific evidence and in some cases even contained messages contrary to the evidence. The latter is of special concern while these apps are used by lay-persons seeking information and help for a (sports related) medical issue.
Discussion: The number of apps targeting sports and physical activity related injuries is low. In addition, available apps have insufficient evidence-based content. While the number of apps on these topics is bound to grow in the near future, research is needed to rate, develop, improve and evaluate these apps.

195   Sports Medicine Australia and social media for social good in the promotion of sports injury prevention

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The not for profit sector has been an early adopter of social media and has forged the way in promoting largely intangible products to the community. Like many organisations, Sports Medicine Australia has taken a conservative approach to the adoption of social media, largely through mediums such as Facebook at a local level and Twitter at a national level. Whilst it has now been in this space for the past two years, the importance of the medium is ever growing and has recently embarked on a co-ordinated expansion in its social media strategy and for the first time a dedicated resources to co-ordinate these efforts. To date the focus has been on driving traffic to the website and the anticipated exponential exposure to issues that would otherwise be promoted through traditional media. This has been regarded as quite successful despite the lack of genuine co-ordination and limited activity to date. SMA still sees itself as a relative newcomer to the medium, notwithstanding over 1000 influential twitter followers which it has managed to attract with very little effort and a host of Facebook friends and 'likes' and through its fairly traditional and conservative approach which is reflective of the organisation's history and the industry in which it operates. This symposium presentation will outline some of the successes (and failures) experienced by SMA in its endeavour to expand its social media presence and to outline some of the expansions on other social media anticipated in the near future.

196   Embracing social media for research promotion and dissemination

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Introduction: Social media is becoming a popular communication tool and its value in promoting the outcomes of research is becoming increasingly recognised. However, many researchers are yet to use it in their own information gathering activities or to disseminate the outcomes of their work.
Methods: This talk will describe experiences over the past 12 months of using Twitter, LinkedIn and blogging on journal websites. It will summarise some of the approaches that can be used with these social media tools and show how to encourage interaction amongst researchers, practitioners and general public.
Results: Research findings and papers can be more widely disseminated through social media (e.g. Twitter) than just relying on journal alerts and responses to this output can be received quickly and generate further interest in your work. Blogs are increasingly being used by journals in place of Letters to the Editor and Editorials in paper-based journals and allow for commentary to be published promptly. Being a member of a professional network, such as LinkedIn, can lead to new research collaborations and discussions.
Discussion: A major challenge for researchers is the dissemination of their work to the people who need to see it and this needs to be more than just other researchers. In both sports medicine and injury prevention, it is critical that research findings are also disseminated broadly to clinicians and other practitioners, such as health promotion experts and coaches. Social media provides a powerful tool for research dissemination that should be harnessed to improve practices and uptake of research evidence.

197   Tips and pitfalls when using social media platforms for team medical staff

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Introduction: Professional sport is part of the entertainment industry. Just as it is almost impossible to work in professional sport without having a strategy for dealing with the general/mainstream media, it may soon be the case that a social media presence will be almost obligatory for team medical staff in the future.

Methods: Interesting social media case histories including Twitter exchanges involving team medical staff will be presented to illustrate some of the benefits and some of the risks of being active in this setting.

Results: It is quite clear that any comments made on Twitter are "on the record" and can easily be re-quoted in the mainstream media, even as headlines, if a journalist finds the content interesting. Twitter however gives the medical staff some power in that there is no demand to answer uncomfortable questions on the spur of the moment and be quoted out of context–the journalists only can use exactly what you Tweet and there is time to reflect before you post. Twitter does allow lobbying and comment on an issue to be achieved in a more focused manner than when using traditional media platforms. (Public) exchanges can be made between team medical staff and players on Twitter, giving the fans an insight as to the important care that the team medical staff provides. When working with a professional sporting team, a similar guideline applies as for traditional media–the team physician needs to take on the advice and wishes of the player and coaching staff as to whether to deliberately play down or play up an injury (or even keep it totally secret). It is not a faux pas to release player injury details to the public and fans if this suits the player and coaching staff, but it can be if the reverse applies.

Discussion and conclusion: It has been a traditional viewpoint of medical staff to avoid the media with the view that it is too risky to interact with them. However, this conservative stance leaves medical staff in the unfortunate situation that they are only ever noticed in times of disaster (and therefore looking like they are contributing to, rather than helping to resolve, the crisis). Whilst there are many land mines to avoid when engaging with social media for team medical staff, there is an opportunity to publicly set the agenda about how valuable a good medical team is at helping to keep players on the park. Engagement of the team's fans by keeping them in the loop also can help achieve marketing and financial goals of the organization. There is also the incidental ability to lobby on topics like physical activity promotion and sports injury prevention.

198   Age and gender variations in light-intensity physical activity (LIPA) and relationships with sedentary time and MVPA in US adults

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Introduction: Device-based activity measurement has highlighted the modest contribution (<5%) made by moderate-to-vigorous intensity physical activity (MVPA) to adult's waking hours. In contrast, sedentary time (predominantly sitting in front of screens at home, at work, and in automobiles) accounts for 55% of waking hours among US adults. These percentages vary with gender and age, with MVPA being highest in men and younger adults whilst sedentary time is greatest in older adults ($\geq$70yrs). However, little is known about variations in the remaining portion of waking hours – light-intensity physical activity (LIPA). Using objective, device-derived data, employing distinct ten year age categories, we examined the frequency and relationships of LIPA with sedentary time and MVPA.

Methods: We performed cross-sectional analyses of 7,210 (3,639 men, 3571 women) participants aged $\geq$20yrs from the 2003/04 and 2005/06 US National Health and Nutrition Examination Survey (NHANES). Participants were included if they had at least 1 valid day of accelerometer wear, defined as $\geq$10hrs valid wear. Non-wear time was calculated as $\geq$60 consecutive minutes of 0 counts per minute (cpm), allowing $\leq$2min of up to 50cpm. Sedentary time was defined as <100cpm; LIPA 100–1951cpm; and MVPA $\geq$1952cpm.

Results: LIPA activity did not significantly differ across the 20–29, 30–39 and 40–49 age categories in men and for the 30–39 and 40–49 age categories in women, accounting for approximately 42% of waking hours. The least amount of LIPA was observed in older adults, accounting for 29% and 31% of waking hours for men and women, respectively. LIPA was highly negatively correlated (r: -0.97 to -0.998) with sedentary time in both men and women across all age groups, whereas, MVPA was moderately negatively correlated with sedentary time for men (r: -0.56 to -0.42) and for women (r: 0.24 to 0.43).

Discussion: These findings build on previous observations by highlighting the large portion of the day contributed to by LIPA, and the decline in overall physical activity (LIPA and MVPA), particularly among older adults. The near perfect inverse correlation observed between LIPA and sedentary time suggest that future public health preventative strategies targeting the reduction in sedentary time may be facilitated through an emphasis on LIPA, and to a lesser extent, MVPA.

199 | Correlates of objectively measured sedentary to light intensity activity among young adults

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Introduction: The growing evidence of the independent associations of sedentary behavior to health has drawn attention to the potential of developing policies and interventions focusing on reducing sedentary time. These programs should focus on known correlates of sedentary behavior specifically rather than correlates of MVPA. Thus, our objective was to determine correlates of sedentary to light intensity activity (<3.0 METs) in young adults through the examination of demographic and psychological variables.

Methods: Baseline cross-sectional data from the Energy Balance study was used to assess 199 adults (115 females), 21–35 years of age. Duration of low intensity behaviors was measured with the SenseWear Mini Armband over 10 consecutive days. Low activity was considered the daily average of all sedentary to light intensity activities <3.0 METs during waking hours. Psychological variables were gathered through questionnaires. Cardiorespiratory fitness (CRF) was assessed by maximal exercise treadmill test. Height, weight, waist circumference (WC), and % body fat measure by DXA were collected. Pearson's correlations and multiple linear regression analyses stratified by gender were used to evaluate associations between potential correlates with low intensity activity.

Results: Women spent more time in inactive behaviors than men (15.20±1.39 hrs/d vs 14.75±1.40 hrs/d vs p=0.028). African Americans had significantly higher amounts of low intensity activity for both men and women (p<0.0001). Psychological constructs including profile of mood-states (POMS), perceived stress score (PSS), and dissatisfied body image were correlates of low intensity activity for women (POMS r=0.20, p=0.037; PSS r=0.20, p=0.037, body image r=0.32, p=0.0006). No psychological constructs correlated with low intensity activity for men. After adjusting for age, race, and BMI, perceived stress (p=0.01) and mood-state (p=0.03) remained significantly associated with low intensity activity among women.

Discussion: Our data indicate that both modifiable and non-modifiable factors were associated with low intensity behavior, and these variables differed between men and women in our sample. The results suggest that when developing physical activity interventions focusing on inactive individuals, it is important to consider the potential factors that may influence inactivity. It may be important to target interventions toward specific demographic populations. In addition, within our study sample, psychological constructs influenced the level of sedentary and light intensity activity. Further research examining aspects of these variables should be done to further understand their associations with low-intensity physical activity.

200 | Self-reported and objectively assessed sedentary time in relation to multiple socioeconomic status indicators and area deprivation in adults

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Introduction: Sedentary behaviour (sitting) is an emerging independent risk factor for cardiometabolic disease. Previous work of ours has shown that socioeconomic position (SEP) relates to recreational screen time in adults but little is known about how SEP relates to other types of sedentary behaviour and total sedentary time. The aim of this study was to assess the associations between SEP (including area-level deprivation) and multi-domain self-reported and objectively-assessed sedentary time.

Methods: The sample comprised 1980 adults aged 16 yrs and over who participated in the 2008 Health Survey for England (HSE08). HSE08 collected information on television time, non-television leisure time sedentary time, occupational sitting/standing, accelerometry-measured total sedentary time, and physical activity. We examined the multivariable associations between three SEP indicator (household income, Registrar General's social class, education), Index of Multiple Deprivation, a 5-point composite SEP position scale and each sedentary time indicator using generalised linear models that took into account the complex survey design and were adjusted for age, sex, BMI, self-reported health, long-standing illness, smoking, car ownership, alcohol , physical activity, accelerometer wear time and other SEP indicators.

Results: Multivariable analyses showed that all three SEP indicators were inversely associated with daily television times (i.e. the lower the SEP the higher the television times), although the association with social class was less consistent. All three SEP indicators were directly associated (i.e. the higher the SEP the higher the sedentary time) with occupational sitting/standing and total (accelerometry-measured) sedentary time. Area deprivation was inversely associated with television time but in a non-linear fashion. There was a strong cumulative effect of SEP (based on the composite SEP position scale) with those in the lowest SEP spending an additional 56 minutes (95% CIs: 38 to 75) each day on TV compared to those in the highest socioeconomic position (p<0.001 for linear trend). Cumulative SEP score was directly associated with all other sedentary behaviour indices with those in the lowest SEP group spending 27 (10 to 46, p=0.008), 97 (73 to 121, p<0.001), and 56 (39 to 72, p<0.001) fewer minutes/day in non-television leisure time sitting, occupational sitting/standing, and accelerometer-measured sedentary time, compared to those in the top SEP group.

Discussion: The association between socioeconomic position and sedentary behaviour in adulthood varies by sedentary time indicator. Low socioeconomic position is linked with higher television but with lower total sedentary behaviour and occupational sitting/standing times.

201   Examining the role of acculturation in the physical activity experiences and behaviours of South Asians living in Canada

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South Asian Indians are recognised as being at high risk of cardiovascular disease, diabetes and obesity, as well as being less likely to engage in preventative health measures, such as physical activity (PA), compared to European Canadians or other western born individuals.

Purpose: The aim of this research was to examine the PA experiences and behaviours of South Asians living in Canada, specifically identifying the barriers, constraints, and motives to participation and outlining the influence that acculturation to mainstream Canadian culture has on these experiences and behaviours.

Methods: A random sample (N=204) of Punjabi speaking South Asian adults (18yrs+) living in Calgary, Canada completed a computer assisted telephone interview (CATI) survey about their PA experiences/behaviours and the influence that migration and acculturation to mainstream Canadian culture may have on these experiences/behaviours. Interviews were held in either English or Punjabi, depending on participant preference.

Results: Bivariate logistical regression analysis showed that years in Canada was a significant predictor of sufficient PA (OR=1.04, 95% CI:1.01–1.07), suggesting that people were approximately 4% more likely to achieve sufficient levels of PA for every year that they were in the country when controlling for age, gender, and other acculturation measures.

Discussion: Given the current focus on promoting physical activity as a strategy for preventing and managing chronic disease, a comprehensive understanding of these PA experiences and behaviours will aid in the development of future culturally-tailored interventions for the South Asian community living in Canada and other western countries. Based on our findings, targeting new migrants with physical activity initiatives may assist with increasing and sustaining physical activity participation.

202   Correlates of physical activity among women in South Kerala, India

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Introduction: Regular physical activity (PA) provides many health benefits especially in the prevention of chronic diseases. Literature is sparse on the factors influencing physical activity at intrapersonal, inter-personal, community and environmental level among communities in India and this study explores the gaps in knowledge so as to aid in physical activity intervention development.

Methods: A mixed method approach was employed with initial qualitative research using four focus group discussions. An open-ended approach was utilized using an emergent study design. Findings that emerged out of the formative research were included in the subsequent cross sectional survey to determine the correlates of PA, among 1364 women aged 18–60 years, selected by multi stage random sampling from two administrative blocks of Trivandrum, capital city of Kerala.

Results: Focus group discussions revealed that factors that influence physical activity were based on the interaction between various factors at personal level (knowledge on the benefits of PA, presence of chronic disease, child care/domestic responsibilities, motivation and skills), interpersonal/social (spouse/family support, peer support),Community/institutional factors (culture and gender norms, lack of opportunities for physical activity in terms of places to walk free of traffic congestions that are safe , convenient time),and built environmental/ policy level factors (lack of spaces for recreation, escalating traffic congestion and vehicle density). Findings from cross sectional survey were consistent with some of the findings from qualitative research. Factors that are positively associated with physical activity were spouse/family support (OR 1.4; 95% CI 1.00–2.06), support from friends and neighbors (OR 1.9; 95% CI 1.4–2.7), exercising member in the family 0R 3.5; 95% CI 2.46–5.05), knowledge of the benefits of PA (OR 1.82; 95% CI 1.3–2.5), advice from health professionals (OR 1.7; 95% CI 1.3–2.4), presence of chronic conditions among the family members (OR 1.85; 95% CI 1.0–3.2) and presence of having Diabetes/Hypertension (OR 3.1; 95% CI 2.1–4.6). Factors negatively associated with PA were poor access to facilities (OR 0.6 ; 95% CI 0.4–0.8), exercising seen as a positive behavior (OR 0.6; 95% CI 0.3–0.9), presence of sidewalks (OR 0.72; 95% CI 0.5–1.04) and heavy traffic (OR 0.7; 95% CI 0.4–0.9).

Discussion: These findings suggest that multiple factors at different levels influence physical activity among women in South India and it suggests considering the positive and negative factors when developing an intervention to promote physical activity.

203   Association between sedentary time and physical activity in Brazilian adults: Vigitel 2007

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Introduction: There are few studies available on physical activity (PA) and sedentary behavior in developing countries. Objective: To describe the association between sedentary behavior (watching television – TV) and PA practice during leisure-time and commuting in Brazilian capitals in 2007.

Methods: This analysis is based on data from the Telephone-based Surveillance of Risk and Protective Factors for Chronic Diseases (VIGITEL) accounting for an annual sample of approximately 54,000 individuals. We analyzed PA indicators during leisure-time and commuting, and sedentary behavior was determined by time spent watching TV.

Results: Most people reported watching TV (82.0%) and of these, almost one third (30.3%) watched 3–4 times a week. Among respondents who reported watching TV, the majority (55.4%) watches two or more hours per day. Men were more active in leisure-time (22.0% vs 15.5%) and commuting (11.9% vs 7.8%). In the leisure domain, there was no association between the variables; however, in the commuting, the time of PA practice decreased in both sexes as increased the time spent watching TV, but the decline in PA levels was more significant among women.

Discussion: The low prevalence of active Brazilians during leisure-time and commuting is worrisome and the sedentary behavior watching TV negatively influences the active commuting, especially in females.

204 Associations between distance from facilities and activity patterns in rural Australian communities

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Introduction: Previous studies and government surveys show rural residents are less likely to meet physical activity (PA) recommendations and more likely to be classified as sedentary than metropolitan residents. In metropolitan areas proximity to facilities is positively correlated with PA through mechanisms such as increased use of active transport. Indices used to classify remoteness of residence in rural areas are usually not sufficiently accurate to establish if this relationship is present in rural areas. The aim of this study was to investigate the relationship between distance to the post office (DPO), as a higher resolution measure of location of residence, and PA and sedentary time in rural areas.
Methods: Data from 1219 participants of the Physical Activity in Rural Communities (PARC) study were used. The sample consisted of 497 men and 697 women (age range 19–71 years). DPO was measured by asking participants to estimate the distance to the nearest post office and this was split into four categories (<=1km, 2–4km, 5–10km and > 10km). PA was measured with a detailed physical activity recall question that asked for time spent in activities of different intensities. These times were multiplied by energy expenditure values for similar activities from the compendium of physical activities and summed to give a nominal daily measure in met minutes. Sedentary time was measured using the same question and summing the responses in the various domains covered. Linear regression analyses were used to examine the associations between DPO and PA and sedentary time. Analyses were adjusted for sex, education, type and level of employment, age and BMI.
Results: To account for the non-normal distribution, PA was LN transformed. In the unadjusted model there was no significant association between DPO and PA. After adjustment for confounders there was a significant difference in PA between participants in the 5–10km category for DPO compared to those in the 10+ category (9.3% lower PA, p=0.038). No significant associations were found between DPO and sedentary time.
Discussion: The hypothesis that PA would increase, and sedentary time decrease, with decreases in DPO (principally by increased active transport) was not supported by these results. This may be because the relationship present in Metropolitan areas does not exist in rural areas but could also reflect the fact that PA was measured as a daily overall total. Separating both PA and sedentary time associated with different domains may yield different results.

205 Factors facilitating and inhibiting implementation of easy accessible sporting programs

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Introduction: The organized sport sector has been identified as a potential setting for physical activity promotion. In The Netherlands, ten national sporting organizations were funded to develop and implement easy accessible sporting programs, especially for the least active population groups. A total of fourteen programs were implemented during a three year implementation period. For a successful implementation of these sporting programs, insight into factors facilitating or inhibiting implementation was needed.
Methods: The study consisted of four phases. Phase one: In annual face-to-face interviews, representatives of the ten sporting organizations were asked about factors facilitating or inhibiting implementation of their programs. The results were yearly used by the Dutch Olympic Committee to facilitate implementation of the programs. Phase two: The most important factors were grouped according to implementation phase (concept development, organizational preparations, recruiting local sporting organizations, recruiting participants, local implementation, securing program for future). Phase three: The results were presented and discussed during a meeting with representatives of all ten sporting organizations. Factors were eventually added or removed. Additionally, it was discussed how to deal with these factors. Phase four: Based on the meeting, a final overview of factors was made, incorporating advise how to deal with these factors.
Results: Although factors varied by sporting program, there were some factors that were commonly mentioned. Important facilitating factors were: a program meeting the needs of potential participants (concept development), a program that is easy to perform locally (local implementation), an enthusiastic and persistent project coordinator (organizational preparations) and collaboration with other organizations (e.g. recruiting participants). Not complying with these factors, inhibited implementation. Factors that were specifically mentioned as inhibiting factors were: implementing a costly program (recruiting local organizations) and a conservative attitude of local organizations (recruiting local organizations).
Discussion: The overview of factors, as well as the accompanying advise, can be used by sporting organizations when developing and implementing easy accessible sporting programs. This will facilitate development and implementation of current and future sporting programs.

206 Perceived health and physical activity domains among adults from three Brazilian cities

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Introduction: Studies suggest a positive association between perceived health and physical activity (PA). PA participation differs among domains. However, few studies have explored this association among physical activity domains.
Objectives: To identify differences in the association between perceived health and PA domains among adults from three cities of Brazil.
Methods: Cross sectional phone surveys were conducted in Recife, Curitiba, and Vitória (n=6,166) in 2007, 2008 and 2009, respectively. PA was measured using IPAQ long version. PA domains were: total PA (TPA), moderate and vigorous PA (MVPA), walking for leisure, walking for transport, and bicycling for transport. All PA domains were dichotomized for meeting PA recommendations (cut-off 150 min/week). Perceived health was measured by the question: how do you rate your current health? Response options were: poor, fair, good, very good, and excellent. Three categories of perceived health were created: poor, good, and very good/excellent. Multivariable analysis tested the associations between PA and perceived health using logistic regression. All models were adjusted by age, years of education, BMI, marital status, gender, and any diagnosed chronic disease.

Results: The proportions of respondents meeting PA recommendations through PA domains were 55.7%, 19%, 15.2%, 26.8%, and 6.4%, in TPA, MVPA, walking for leisure, walking for transport, and bicycling for transport, respectively. Adjusted regression analysis suggest that good perception of health was positively associated with met the PA recommendation in TPA (aOR: 1.4; 95% IC: 1.1–1.8), MVPA (aOR: 1.7; 95% IC: 1.2–2.4), and walking for leisure (aOR: 1.4; 95% IC: 1.0–2.0). Likewise, very good/excellent health perception was positively associated with met the PA recommendation in TPA (aOR: 2.5; 95% IC: 1.9–3.2), MVPA (aOR: 4.1; 95% IC: 2.9–5.6), and walking for leisure (aOR: 2.2; 95% IC: 1.6–3.0). PA domain of transport, walking and bicycling, was not significantly associated with health perception.

Discussion: The results of the study indicate that PA effects on health could be differentiated across PA domains. Leisure time PA and total PA were significantly associated with self-perception of health, in the expected direction. The lack of association between PA for transport and health perception indicate that this particular domain has not a positive health effect in the sample. These findings suggest that leisure time PA would yield greater health benefits and therefore, health promotion efforts should be focused on this specific PA domain.

Conclusions: Results suggest that specific domains of PA may affect health outcomes in varying ways.

207 Association between population size of residential city and steps/day – Analyses of the Japanese national survey

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Introduction: Recent research highlights the importance of environment as a determinant of physical activity. Degree of urbanization is assumed to be related to physical activity via environmental attributes. However, association between urbanization and physical activity in Japan has been underreported. In the present study, we examined the associations between population size of residential city and step-determined physical activity using the data of the Japanese national survey.

Methods: Cross-sectional data from the National Health and Nutrition Survey of Japan 2006, including 3190 men and 3691 women aged 15 years or older, were analyzed. The survey was conducted on a single day between Monday and Saturday in November using pedometer, AS-200 (Yamasa Co. Ltd., Tokyo, Japan). Logistic regression models were used to calculate odds ratios (OR) for walking 10000 steps/day (s/d) or more by population size of residential city (S1: 12 metropolitan cities; reference, S2: ≥150000, S3: ≥50000, S4: <50000, S5: towns and villages) adjusting for age.

Results: Mean (standard deviation) age was 53 (17) for men and 53 (17) for women. Mean steps were 7499 (4499) s/d for men and 6766 (3852) s/d for women. Mean steps by population size of city were S1: 7883 s/d, S2: 7703 s/d, S3: 7450 s/d, S4: 7199 s/d, and S5: 7112 s/d for men and S1: 7081 s/d, S2: 6986 s/d, S3: 6487 s/d, S4: 6636 s/d, and S5: 6625 s/d for women. Adjusted ORs (95% CIs: confidence intervals) for walking ≥10000 s/d were S1: reference, S2: 0.91 (0.71–1.16), S3: 0.83 (0.65–1.05), S4: 0.78 (0.56–1.08), and S5: 0.65 (0.50–0.85) for men and S1: reference, S2: 0.93 (0.73–1.19), S3: 0.78 (0.61–1.01), S4: 0.76 (0.53–1.08), and S5: 0.82 (0.62–1.07) for women.

Discussion: Step-determined physical activity tended to be higher among residents living in cities of larger population. This tendency was clearer in men than in women. One of limitations of this study was that some of 12 metropolitan cities still included sparsely-populated areas. This could be a cause of underestimation of step counts difference related to urbanization of residential city. However, the results suggested the extent of physical activity variation among differently urbanized cities.

208 The 2013 Australian Health and Physical Education Curriculum: Implications for and challenges to health promotion

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Introduction: In 2013, the Australian Curriculum: Health and Physical Education (HPE) will be released for national implementation. The HPE curriculum represents potentially the most far-reaching health promotion policy for Australia's children and young people. This presentation has two aims: 1) to introduce the proposed key ideas driving the new HPE curriculum and 2) discuss the extent to which the HPE curriculum may contribute to the national health promotion agenda.

Discussion: The "Shaping Paper" that outlines the Australian Curriculum HPE was informed by contemporary research across a number of disciplines (e.g. health promotion; exercise science), national and international best practice in the HPE field, and a series of advisory panels and national fora. Its key ideas are that HPE should: take a strengths-based approach; focus on educative outcomes; develop health literacy skills; value learning in, about and through movement; and include an inquiry-based approach. However, a contentious question is, "should or will the curriculum serve the national health promotion agenda for children and young people?" While recent Australian health reports argue for schools and schooling to play such a role (e.g. NHHRC, 2009), some educators disagree with this remit (e.g. Tinning, 1996). This presentation will highlight what aspects of health promotion the proposed HPE curriculum may be seen to address such as health literacy, socio-ecological approaches to health in/equality and understanding the significance of regular physical activity. It will then suggest what might be considered limitations to the policy's engagement with health promotion goals such as its emphasis on learning rather than valuing outcome measures of health-related behaviours. What comprises the final Australian Curriculum: HPE has implications for how schools will interface with health and sport organisations and services, what school-based research is valued, and ultimately the health knowledge, practices and values of Australians.

209 A look into physical education requirements and policy around the world

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Introduction: Participation in physical activity tracks from childhood and adolescence into adulthood suggesting that the time to act is early in life in order to realize the many health benefits of physical activity. One strategy that has been deemed effective in increasing physical activity levels in children and adolescents in both high-income and low- and middle-income countries is the implementation of high-quality school-based physical education (PE).Given the proven value of this approach in increasing population levels of physical activity in this age group, it is important to understand current policies related to PE requirements in schools. Therefore, the purpose of this paper is to describe the policies currently in place for mandating PE as a part of primary or secondary school curricula in countries around the world.
Methods: Data on school-based PE were collected through the United Nations Educational, Scientific, and Cultural Organization website, World Data on Education. Information on whether or not PE classes were included in the national school curriculum in each country were gathered separately for primary (grade levels 1–8) and secondary (grade levels 9 and above) education. In the case of a positive answer, whether or not the number of days per week is pre-defined and/or minutes per week in PE are set forth, was determined.
Results: Data on number of minutes per week in PE were available for 161 nations at the primary level and 155 at the secondary level. For information on class periods per week, data for 126 countries at the primary level and 136 at the secondary level were obtained. Two countries do not require PE during primary school, while 18 do not mandate PE during secondary levels of schooling. All high-income countries necessitate PE while 5.0 % of upper-middle income nations, 17.8% of lower-middle income, and 27.6% of low-income countries do not.
Discussion: This study reveals persistent gaps in PE requirements especially in lower income countries. While the presently available information regarding PE in schools lends a hand in understanding global policies, a surveillance system designed specifically for monitoring the existence, quality, and implementation of PE polices is needed to more accurately evaluate the effects of such policies on physical activity and health. This information is imperative as policy makers and school administrators make decisions regarding how much, how often, and what type of PE programs will be instituted.

210 Developing university-community linked physical activity programs through quality physical education pre-service teacher training

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Introduction: Physical education (PE) programs in schools play a pivotal role in breaking down barriers to participation in physical activity (PA) which in turn impacts on the success of the Australian Government's preventative health and social inclusion agendas. As children spend around 40% of their waking time in schools, PE and the PA opportunities it presents can make a significant difference to a child's daily PA levels. One of the growing concerns in education systems throughout Australia is the decline in the number of trained teachers to deliver appropriate PE programs (Australian Government, 2009). Primary schools, in particular, have a number of issues in delivering developmentally-appropriate PE programs. These issues include a lack of generalist teacher training in PE, the 'crowded curriculum' and poor resourcing. This research aimed to 1) develop a sustainable PA program consisting of community-based teaching in the 1st year PE programs that could be implemented annually across metropolitan and regional primary schools in Victoria; 2) examine the impact of the program on pre-service teacher PE teaching efficacy and 3) explore the outcomes of a mentoring program whereby 4th year pre-service teachers provided feedback to 1st year students about their teaching of PE.
Methods: The university-school linked PA program was implemented across two universities and within 18 primary schools throughout Victoria within government and catholic sectors. Participants completed a survey pre and post intervention
(n=122) and a sub sample (n=25) participated in five focus groups with 1st and 4th year undergraduate PE students and Critical Incident Reports were analysed using content analysis to identify emerging themes using NVivo.
Results: Qualitative findings suggest pre-service teachers felt the program provided a valuable PA opportunity for primary students, the program empowered and fully supported their teaching through the mentoring program and pre-service teachers felt more confident in their ability to deliver PE lessons as a result of being involved in the program. Additionally paired t-tests revealed significant differences between pre and post intervention pre-service teacher self-efficacy for teaching items for both 1st year (Pre Mean=4.94 SD 0.73, Post Mean=5.45 SD 0.63) and 4th year students (Pre Mean=5.16 SD 0.63, Post Mean=5.97 SD 0.48) both at the $p<001$ level.
Discussion: The university-school linked program continues to run several years post its introduction within both universities and all participating schools and provides an excellent model of sustainable PA opportunities for primary age children.

211 Changes in physical activity levels, lesson context, and teacher interaction during physical education in Australian schools

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Introduction: No Australian studies have examined student physical activity (PA) participation, the time spent in key lesson contexts, and the social support for participation in physical education (PE) classes over time. This study describes changes in PA, lesson context and teacher interaction in PE over the first two years of secondary schooling in NSW schools.
Methods: Grade 7 students from six schools with a very high proportion of students from culturally and linguistically diverse backgrounds (62% from CALD) were randomly observed in 2008 (n=81 observations) and then followed up over the same period in 2009 (n=51 observations) using systematic direct observation (System of Observing Fitness Instruction Time).

Results: Over the 12 month period there was no reduction in the PE time spent in moderate-to-vigorous physical activity (MVPA) (MD=-4.8%; p=.777) and vigorous physical activity (VPA) (MD=-7.9%; p=.009). Significant declines occurred in percentages of PE time spent in management (MD=-8.8%; p<.0001) and in the time that teachers spent promoting PA (MD=-20.7%; p<.0001). There were no statistically significant increases in PE time spent in fitness (MD=3.5%; p=.191) and game play (MD=3.1%; p=.199). At the school type level, co-educational schools experienced the largest decline and lowest levels of MVPA (MD=-18.7%) and coeducational and all girls schools had the largest decline in promotion of PA (MD=-25.7%; 21%) respectively.

Discussion: Although it appears NSW secondary schools are able to reduce the amount of time they spend managing students during PE, it is the decline in VPA and teacher promotion of PA that is of concern because both participation in PA and promoting PA are considered essential to the rationale for the inclusion of PE in NSW high school curriculum. Further research is needed to ascertain whether PE instruction could be improved by focussing on skill instruction and fitness in a games-based PE instruction model as evidence from this study shows predominant focus on game play may not be placing sufficient emphasis on providing students the skills and fitness required to engage in VPA. Increasing teacher promotion of PA during PE is recommended and this may need to occur in the form of professional development/learning programs for teachers or enhanced teacher training courses.

212 Physical activity in children and adolescents during physical education lessons, in private and public schools

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Introduction: There's scientific consensus that physical activity (PA) plays an important role in the treatment of overweight and obesity. Contribution of moderate to vigorous PA (MVPA) in Physical Education (PE) lessons could be an important contributor to the total amount of MVPA during the day. In this context, the Physical Education class should be the ideal place to provide appropriate physical activity intensities to each age, but might depend of the PE lessons context.

Purpose: To compare the MVPA in the PE lessons, in public and private schools, by gender and type of activities.

Methods: The sample comprised 131 youngsters [boys (61) and girls (70)], 11–16 years old, from 7th to 9th grade, from public and private schools. Height, Body mass and fat (%) was measured and, BMI was calculated. The GT1M (Actigraph) was used as an objective measure of MVPA, and was placed around the waist during the PE lessons (45 and 90 min. duration). A MVPA Zscore adjusted to the duration of the PE lesson was calculated.

Results: As main results we found that: 1) Physical education classes have a low level of intensity compared to the ideal standard for these ages, and genders in this study; 2) In 45 minutes classes there's no significant differences between MVPA by gender (17,0±5,0; 15.2±5,7; boys and girls), but in 90 minutes classes boys are more active (42,5±5,5; 36,7±7,2 boys and girls; p<0.05); 3) There were no statistically significant differences in MVPA between normal weight (16.1±5.4; 39.5±7.5) and obese (15.7±5.6; 38.6±5.6) students, during 45 and 90 minutes lessons, respectively; 4) There were statistically significant differences in MVPA during the 45 (17.2±4.7; 14.9±5.9; p<0.05) and 90 minutes classes (41.8±6.4; 36.8±6.9; p<0.05), between public and private schools.

Conclusions: The lessons of the private schools were more intense and active than the public schools. Total amount of MVPA in PE lessons are more effective in private schools, independently of a 45 or 90 minutes PE lesson. It would be interesting to know in the future the different determinants of the PE lessons intensity in private and public schools

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213 Effects of a specialized school physical education program on bone structure and strength: A 4-year randomised controlled trial

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Introduction: Physical activity programs incorporating specific weight-bearing exercises have proven effective for enhancing bone mineral accrual during growth, but the effects of more generalized school-based physical education (PE) on bone health remains unclear. In addition, few long-term studies have used pQCT to characterize changes in bone strength and its determinants (bone structure and volumetric density) in response to exercise. This study investigated the effects of a specialist taught school PE program on bone mass, structure and strength and muscle mass and size in primary school aged children.

Methods: This was a 4-year randomized controlled trial involving 365 boys and 362 girls in grade 2 aged 8 (SD 0.3) years from 29 primary schools in Canberra, Australia. All children received 150 min/week PE from classroom teachers but in 13 schools 100 min/week was replaced by two specialized PE classes that emphasized more vigorous exercise and games combined with static and dynamic postural activities involving muscular strength and function. Measurements in grades 2, 4, and 6 included DXA total body BMC and lean mass (LM), pQCT measured bone density, structure and strength at the radius and tibia (4% and 66% sites) and muscle CSA and pubertal development (Tanner stage).

Results: In girls, the 4-year gains in cortical area at the mid-radius and mid-tibia were on average, 9.6% (P<0.05) and 5.0% (P=0.08) greater in those who received the specialized compared to common-practice PE, with the relative increase being most apparent in the last 2-years. These results were independent of bone length, weight, pubertal status and the random effect of school. In boys, there was a greater exercise-induced increase in cortical bone density at the mid-tibia throughout the intervention (2.4% vs 1.3%, P<0.05). However, neither of these benefits translated into significant improvements in bone strength in the specialized PE group. There was also no evidence of any beneficial effects of specialized PE on trabecular bone density at the distal radius or tibia or whole body LM or regional muscle CSA.

Discussion: This study showed that generalized PE conducted twice weekly by specialist physical educators through grades 3 to 6 of primary school can have a positive effect on the structure and density of cortical bone at peripheral skeleton sites. However, these benefits did not translate into significant improvements in bone strength which suggests that more specific bone loading activities may need to be incorporated into PE classes to maximize skeletal benefits during growth.

214 Preliminary findings of the E.A.S.Y. (Encouraging Activity to Stimulate Young) Minds feasibility study: A curriculum-based physical activity integration program in the primary school

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Introduction: Although schools have been identified as important institutions for the promotion of physical activity among children, the crowded curriculum has impacted upon the quality and quantity of physical activity opportunities provided. Consequently, schools need to explore novel strategies for physical activity promotion throughout the school day. One less utilised strategy is the integration of physical activity into other subjects (e.g. Mathematics, English) using movement-based learning experiences. This study aims to examine the feasibility of a movement-based learning intervention and its impact on educational outcomes including on-task behavior.

Methods: The study design was a randomized controlled trial (n=27) in one school with a wait list control group (n=27). E.A.S.Y. Minds is a 6-week school-based program for Grade 5/6 students. Measurements were taken at pre, midpoint and post intervention. Key outcomes included: objectively measured physical activity levels (not reported here), and on/off task behavior within the school day which was observed using a momentary time sampling procedure and children's preferred learning styles were identified using a Barsch learning styles inventory and intelligence strengths assessed using the multiple intelligences checklist for upper primary school students. Feasibility was determined by examining retention rates, attendance in sessions and satisfaction with the program (questionnaire completed by teachers and students).

Results: Retention (100%) and attendance (93%) were both high and results indicate very high overall satisfaction with the program with scores ranging from 4.20 (program timing), 4.67 (program delivery), 4.68 (program content) to 4.37 (program impact) out of 5.00 on the 20 question post intervention survey. Intervention group students on class behavior increased from 68% pre intervention to 92% during the physically active lessons and 83% immediately following the intervention. The control class showed no significant change (64%–67%). Additional results on children's sedentary time within the school day and the overall effect of integrated physically active lessons on school based physical activity levels will be discussed.

Discussion: The EASY Minds program was feasible and demonstrated important improvements in educational outcomes following a movement-based integration program. The successful feasibility trial will now be used to inform the larger RCT to determine the effect and translation of the E.A.S.Y. Minds program within the primary school setting.

215 Correlates of break-time physical activity in South African primary school learners: SOPLAY

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Introduction: There are concerning trends for a decline in time spent in physical activity and physical education and increased sedentary time in South African schoolchildren. 'HealthKick' is a primary school-based intervention for low-income settings that aims to promote healthy eating and physical activity through Action Planning. We were particularly interested in school break-time, as a possible target for intervention. Factors that have previously been shown to positively influence physical activity during break-time include: playground markings and renovations, teacher supervision and the availability of loose equipment.

Aims: This study was a quasi-experimental, post-test only, control-group design and aimed to test whether or not physical activity during break-time was greater in intervention schools that had participated in Action Planning. A secondary aim was to determine the extent to which the school environment influenced physical activity during break-time in South African schools.

Methods: The System for Observing Play and Leisure Activity in Youth (SOPLAY) was carried out in eight of the HealthKick schools (4 intervention and 4 control). Visual scans were conducted by multiple observers in pre-selected target areas, noting the activity of each individual within a target area, (sitting, standing, eating, walking, or playing). Observers also noted information about the school environment, including whether the area was usable, accessible, and supervised, if organised activity was taking place, and the availability of equipment.

Results: There were no differences between intervention and control schools. Approximately 31% of learners were sedentary, 14% were eating, with 29% and 26% involved in moderate or vigorous play, respectively. Supervision during break was associated with a significantly lower proportion of learners engaged in vigorous play (P<0.04, 24% vs 28%) and a greater number of learners eating their lunch (17% vs 11%). Finally, learner density (number of learners per area scanned) was significantly and inversely associated with physical activity. Only 17.6% of learners in low density areas were sedentary compared to 49.6% of those in high density areas; conversely 28.2% of learners engaged in vigorous play in low density areas, compared to only 13.5% in high density areas (P<0.001).

Conclusions: Physical activity during break-time in these South African primary schools was adversely affected by over-crowding and teacher supervision. The results suggest that educators were more involved in 'crowd control' than the promotion of physical activity during break-time, and that interventions may be targeted at the school policy environment to reduce these barriers to physical activity.

216 Contribution of primary school physical education class to daily moderate-vigorous physical activity

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Introduction: The link between regular physical activity (PA) in childhood and good health is firmly established. However the majority of children do not perform enough PA to maintain good health. There is limited data on the degree to which primary school physical education class (PE) allows children to accumulate moderate-vigorous physical activity. The purpose of the study was to assess the contribution of primary school PE to daily MVPA in 9-year old Irish children.

Methods: 112 (70 F) children had their PA assessed on two school-days using a tri-axial accelerometer. On one day the children had PE, while on the other they did not. The order of the PE day and non-PE day was randomised. Accelerometer PA data was converted to minutes MVPA using the methods of Mattocks et al. (2007). Written informed consent was obtained from the parent/guardian of each child. The study was approved by the relevant institutional review board. T-tests were used to identify differences between PE and non-PE days.

Results: All results are mean, 95% CI. There was a significant difference in minutes of MVPA on PE days (31.1, 29.2–33.1) compared to non-PE days (20.8, 18.9–22.8) (P<0.05). Boys accumulated significantly more minutes MVPA than girls on PE days (33.7, 31.1–36.3, versus 29.6, 26.9–32.3) (P<0.05) but not on non-PE days (21.9, 17.8–26.1, versus 20.2, 18.1–22.3) (P>0.05). The difference in MVPA on PE days compared to non-PE days was greater for boys than girls (11.7, 7.0–16.4, versus 9.4, 7.0–11.8) though not significant (P>0.05). None of the children studied fulfilled current PA recommendations of 60 minutes MVPA per day.

Discussion: Participation in PE class significantly increased the amount of MVPA accumulated by the children in this sample. However the children did not undertake sufficient MVPA to meet current recommended levels for health and therefore warrant intervention.

217 After school hours activities of young Australian school children: Low levels of outdoor play and peer interaction

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Introduction: This research was part of a larger study known as the Sydney Playground Project (SPP), which aims to increase physical activity and social skills in primary school children by means of a low-cost innovative playground intervention. The aim of this part of the project was to investigate what children aged 5–7 years in Sydney do after school hours. Our focus was on whether children spent time indoors or outdoors, who they were with, and the parents' perceptions of the children's levels of physical movement, intensity and involvement.

Methods: Experience sampling method (ESM) was used to obtain the data. We asked parents/carers of 221 children, (119 boys, 102 girls; mean age 6.0 years) to keep a palm pilot close by for four week days. On those days, the palm pilot delivered three brief surveys at random times between 1530–1900. The intention of the survey was to find out 'What your child is doing now' and the details of these activities (full details of the protocol can be found at http://www.biomedcentral.com/1471-2458/11/680).

Results: Baseline survey data relating to after school activities indicated 55% of the time was spent indoors in pastimes involving low levels of physical activity. Children were engaged in higher levels of physical activity when outdoors and/or with peers, but these respectively accounted for <20% and <10% of survey occasions. The major contributor to children's pastimes was screen time (television or computer, 22%).

Discussion: Our findings are considered in the context of opportunities for children to play outdoors with peers after school hours. We examine some of the pressures on parents and others to keep children safe, which may, paradoxically, lead to children engaging in sedentary pastimes with limited peer interaction, hence increasing the risk of later physical and mental health problems.

218 State of the art reviews: The measurement of physical activity using mobile phones

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Introduction: More and more companies are designing technologies that promote healthy lifestyles. In particular, the mobile phone is becoming an increasingly important platform for the delivery of content promoting physical activity. Despite this, little research concerning physical activity assessments via mobile phones providing objective measurements has been carried out. The purpose of this review is to provide an overview of the methods and technology currently being used to measure physical activity patterns.

Methods: The review is based on a full search of the literature identified through a search of PubMed, Web of Science, and IEEE explore between the years 2007–2012. The search was restricted to articles involving the general population containing the following keywords: mobile phone, smartphone, application and exercise or physical activity. Studies selected by the keyword search were considered appropriate for final inclusion if they met the following criteria: Studies with mobile phone applications to promote healthy lifestyle (increase physical activity or decrease sedentary behaviour), specifically measured physical activity as a primary or secondary outcome. Of the initial 33 articles identified by the keyword search, 23 met all the inclusion criteria and were retained for the final review.

Results: The studies analyzed were quite varied; we thus attempted to group and summarize them according to their most salient features. Only 17 studies relied upon internal features of the mobile phone to assess the levels of physical activity. The other 6 studies were focussed on an external sensor device. These 6 studies evaluated the efficacy of this external sensor device that included a self-monitoring component such as a physical activity log or pedometer. The studies evaluated physical activity that included advice or physical activity prescriptions, offered as the sole method. The majority of studies included outcome assessments between 3–12 months, and many of them included some kind of follow-up contact.

Discussion: Newer technologies and approaches being used to promote physical activity include global positioning system, interactive games and the use of camera phones. However, accurate measurement of physical activity involves the use of accelerometers. The availability of these sensors in mass-marketed communication devices creates new opportunities to promote physical activity, a task easier and cheaper in comparison with external sensors. A wide range of applications is also possible. This includes automatic customization of the mobile device's behaviour based upon user activity and generating a daily activity profile to determine if a user is following a healthy activity programme.

219 Raw tri-axial acceleration data improves the recognition of physical activity type in children and adolescents

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Introduction: Pattern recognition approaches to accelerometer data reduction have emerged as a viable alternative to conventional regression-based methods. We have previously demonstrated that artificial neural networks (ANNs) can be used to predict children's physical activity type in using processed single axis data (1 Hz) (ActiGraph GT1M). In the present study, we sought to determine if using features in the raw acceleration signal, from 1 or 3 axes, could improve the performance of our activity type ANN.

Methods: 52 children and adolescents (mean age 13.7±3.1 y, 28 boys, 24 girls) completed 12 activity trials that were categorized into 8 activity classes: lying down, sitting, standing, household chores, walking, running, basketball, and dancing. During each trial, participants wore an ActiGraph GT3X+ tri-axial accelerometer on the right hip. We evaluated 4 ANN models: 1) single axis processed data (1 Hz) (ANN_P1); 2) tri-axial processed data (1 Hz) (ANN_P3); 3) single axis raw acceleration signal (30 Hz) (ANN_R1); and 4) tri-axial raw acceleration signal (30 Hz) (ANN_P3). Each ANN model was trained on the following features: 10th, 25th, 50th, 75th, and 90th percentiles and the lag-one autocorrelation. Features were extracted over 10 sec data segments. ANNs were trained, tuned, and tested using a variant of the k-fold cross-validation approach. The nnet library in R was used to implement the ANNs. Accuracy was evaluated by calculating the percentage of time segments correctly classified.

Results: Classification accuracy, averaged over all 8 activity classes, for the ANN_P1, ANN_P3, ANN_R1, and ANN_R3 was 68.6%, 79.3%, 85.1%, and 85.2%, respectively. The ANN_P1 model exhibited acceptable accuracy (>80%) for sitting, walking, running, and basketball, but poor accuracy for lying down (0%), standing (0.1%), household chores (62.4%) and dancing (50.1%). Of note, 85% of the standing time segments were misclassified as sitting. The use of tri-axial processed data (ANN_P3) improved accuracy for standing (57.8%), household chores (79.1%) and dance (81.4%), but had little impact on lying down (0.2%). The ANN_R1 model provided a high level of accuracy for all activity classes (75.9% (household)–96.7% (running)) with the exception of standing (55.1%) and dancing (72.9%). The use of raw tri-axial acceleration signal (ANN_R3) improved the accuracy of these two classes to 58.5% and 76.2%; and only 5% of the standing time segments were misclassified as sitting.

Conclusion: The use of raw tri-axial acceleration data significantly improves the recognition of sitting time and other physical activity types in children.

220 Using SenseCam to categorise type and context of accelerometer-identified episodes

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Introduction: To investigate the feasibility of wearable cameras to objectively categorise the type and context of participants' accelerometry-identified episodes of activity.

Methods: Adults were given an Actical hip-mounted accelerometer and a SenseCam image capturing device (worn via lanyard). The onboard clocks on both devices were time-synchronised. Participants engaged in free-living activities for 3 days. Accelerometer data were cleaned and exemplar episodes of sedentary, lifestyle-light, lifestyle-moderate, and moderate-to-vigorous physical activity (MVPA) were identified. Using associated SenseCam images, each accelerometer episode was categorised according to its context and Physical Activity (PA) compendium code.

Results: There were 212 days considered from 49 participants from whom SenseCam images and associated accelerometer data were captured. Using SenseCam images, context attributes were coded for 386 randomly selected episodes. Across the exemplar episodes, 12 categories that aligned with the PA Compendium were identified, and 114 subcategory types were identified. 21% of episodes could not be categorized; 59% were outdoors versus 39% indoors; 33% of episodes were recorded as leisure time activities, with 33% transport, 18% domestic, and 15% occupational. 33% of the exemplar episodes contained direct social interaction and 22% were in social situations where the participant wasn't involved in direct engagement.

Conclusions: SenseCam images offer an objective method to capture a spectrum of activity types and context across 79% of accelerometer-identified episodes of activity. Wearable image capture represents the best objective method currently available to categorise the context of accelerometer-defined episodes of activity in free-living conditions.

221 Validity and reliability of a smart phone-based physical activity monitoring application

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Background: Accelerometers are accurate and useful for monitoring Physical Activity in healthy people as well as chronic disease patients (e.g. Diabetics, Coronary Heart Disease and Chronic Obstructive Pulmonary Disease patients) and may help motivate patients to comply with rehabilitation. However, they are expensive and not always user-friendly. Similar motion sensors are embedded within the majority of newer mobile phones, which are widely accessible.

Aim: This study investigated whether the built-in accelerometers within popular Android-based mobile phones may be valid and reliable for monitoring a range of physical activities.

Method: An Android mobile phone application to record real time tri-axial acceleration was developed using Phonegap (v.0.9.6) as framework. The tri-axial micro-electro-mechanical accelerometer (BMA 150, Bosh) integrated within two mobile phones (HTC Wildfire and HTC Desire HD) was compared to an accelerometer (ActiGraph GT3X). All three devices were fixed to a rigid plastic tablet placed over the right hip of the participants. Seven healthy adults performed, for seven times, a protocol of seven physical activities (A1–7) differently paced by a metronome (A1: sit-stand, 15bpm; A2: sit-stand, 30bpm; A3: walk, 50bpm; A4: walk, 70bpm; A5: walk, 100bpm; A6: run, 150bpm; A7: walk down/up stairs, 40bpm). Absolute values of 3D acceleration signals were summed and averaged over each time period. Statistical analysis was performed using SPSS (v.19.0). Reliability was evaluated using Intra-class Correlation Coefficients (ICC). Concurrent validity was assessed using the Pearson correlation.

Results: Among the activities, the ICC ranged from 0.84 (A5) to 0.97 (A4) for the HTC Wildfire, and from 0.82 (A1) to 0.98 (A4,6) for the HTC Desire HD. Both phones have shown significant correlation (p<0.01) with the ActiGraph in all activities. The Pearson correlation coefficient, among the activities, ranged from 0.77 (A3) to 0.95 (A5) for the comparison HTC Wildfire vs ActiGraph GT3X, and from 0.44 (A2) to 0.96 (A5) for the comparison HTC Desire HD vs ActiGraph GT3X.

Conclusion: Mobile phone accelerometers appear to be reliable and valid for measuring a number of activities ranging from sit-stand to walk stairs. Further research using larger samples is needed to confirm these results in clinical and non-clinical populations. Further development of this application will involve the analysis of the acceleration signals for the codification of an algorithm capable to detect the activity patterns in accordance to the positioning (e.g. belt, pocket or bag), mobile phone (e.g. model, brand or operating system), or transport type (e.g. bus, metro or train).

222   What is 'Cadence' and why do we need an unambiguous definition?

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Introduction: Cadence–the rate of stepping–can be used to represent the intensity of a stepping bout. Recently, the number of steps taken in a minute epoch (step accumulation) has been used as a proxy of stepping rate and reported as cadence. This interchangeable use of terms assumes that the majority of the time within the minute epoch is spent stepping. We investigate the differences between these two outcomes for a group of healthy adults, providing evidence for the need to clarify terminology in this area.

Methods: We defined actual cadence (AC) as the number of steps within associated stepping time (steps/min), and step accumulation (SA) as the number of steps within a defined time period (steps/min). The physical activity (mean 6.8 days, range 4–7 days) of 117 adults (39M/78F), mean age 46y (range 23–82y), was recorded using the activPAL™ physical activity monitor, allowing the detection of stepping and associated stepping time. All data was subdivided into minute epochs and AC and SA were calculated for every minute. The distribution of AC and SA was examined and compared.

Results: 797 days of data with over 36,000 minutes within which steps were taken and over 1.2 million steps were included in the analysis. On average 310mins (SD=73mins) contained stepping each day. Mean AC (76 step/min) was twice that of mean SA (34 step/min). Only 12% (SD=7%) of minutes with stepping demonstrated continuous stepping for the full minute. 52% of minutes with stepping had a SA of less than 20 steps/min, which was below the magnitude of all AC values recorded.

Discussion: The results demonstrate that AC and SA are not interchangeable for the population studied. The reason for this is that only a small proportion of minutes with stepping were continuous stepping without breaks. Importantly the majority of minutes with stepping contained less than 20 steps, indicating many periods of short stepping bouts within the everyday activity of this population. This makes the concept of step accumulation difficult to interpret as the actual cadence of the steps taken cannot be directly determined from step accumulation.

It is suggested that describing the number of steps within a fixed duration is not the same as reporting the cadence of stepping, and should not be reported using that terminology. We suggest that the outcome measure being presented should be clearly defined and that step accumulation might be used when the duration of stepping has not been taken into account.

223   Peak cadence indicators and cardiovascular disease risk factors in children and adolescents

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Introduction: The National Health and Nutrition Examination Survey (NHANES) accelerometer data have been used to describe peak cadence (i.e. an indicator of natural best daily effort in terms of steps/min) for children and adolescents. The purpose of this study was to determine the relationship between peak cadence and cardiovascular disease (CVD) risk factors in children and adolescents.

Methods: Accelerometry data were available for analysis from 1,817 children and adolescents aged 8–18 years. The age- and sex-specific standards set by the National Institutes of Health Heart, Lung, and Blood Institute for elevated CVD risk were used to determine the presence of risk for HDL-C, triglycerides, body mass index, and blood pressure. Fasting glucose was not included since it was not uniformly collected. Participants were divided into 3 groups based on number of undesirable risk factors (0, 1, and 2+) and 3 age groups (8–11, 12–14, and 15–18 years). Peak cadence indicators derived from accelerometry data included peak 1-min cadence (the steps/min recorded for the highest single minute in a day), peak 30-min and 60-min cadence (the average of the highest steps/min recorded for the specified number of minutes, not necessarily consecutive). SAS PROC SURVEYREG was used to analyze associations between peak cadence indicators and the number of undesirable CVD risk factors.

Results: For participants with 0 risk factors the peak 1-, 30- and 60-min cadences were 120, 88, and 74 steps/min, respectively; for those with 1 risk factor they were 115, 84, and 71 steps/min, and for those with 2+ risk factors they were 111, 81, and 68 steps/min. Thus, there were decreasing trends with more undesirable risk factors for lower peak cadence levels for all indicators (all p<0.002). In 8–11 year old children a larger number of disordered risk factors was prevalent in those with lower peak 60-min cadences (p=0.02). This inverse relationship was also observed in the 12–14 year adolescents for all peak cadence indicators (all p<0.01). In 15–18 year old adolescents, the inverse relationship was observed only for the peak 1-min cadence (p=0.04).

Discussion: Peak cadence is an indication of natural best free-living effort. All peak cadence indicators were significantly related to CVD risk factors in 12–14 years olds. In 8–11 year olds the relationship appeared to be governed more by the ability to sustain a higher natural effort, whereas for 15–18 year olds it was more related to relatively higher achievement of a burst of ambulatory activity.

224 Capturing the pattern of activity: Exposure variation analysis of accelerometer data

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Purpose: Physical activity, in particular moderate to vigorous physical activity (MVPA), and sedentary behaviour (SB) are known to impact on health. Less well established is how patterning of activity affects health. Capturing the complex time pattern of activity using accelerometry remains a challenge. Occupational health research suggests Exposure Variation Analysis (EVA) could provide a useful tool. The purpose of this paper is to 1) explain the application of EVA to accelerometer data, 2) demonstrate how EVA thresholds and derivatives could be chosen and used to examine adherence to MVPA and SB guidelines, and 3) explore the validity of EVA outputs.
Methods: EVA reduces a complex time-line of exposure into a two-dimensional matrix showing combinations of exposure level (in categories) and duration of uninterrupted sequences (in categories). Data from 4 individuals with different daily activity patterns were collected to demonstrate the applicability of EVA. EVA outputs were also compared for accelerometer data collected from 3 occupational groups with known different activity patterns: seated workstation office workers, standing workstation office workers and teachers. Standard accelerometer data collection procedures were used. Data processing by a custom LabVIEW program calculated EVA matrices and derivatives aligned to common guidelines.
Results: Data from one individual is presented in a time-based line graph form in conjunction with the resultant EVA matrix and EVA graph. Line graphs and related EVA graphs for 3 further individuals highlight the use of EVA derivatives for examining compliance with MVPA and SB guidelines. For the seated office workers, standing office workers and teachers, analyses confirm no difference in bouts of MVPA but very clear differences as expected in extended bouts of SB and brief bursts of activity, thus providing evidence of construct validity of the EVA approach.
Conclusion: The major advantage of EVA is its ability in a single analysis to simultaneously capture the time pattern of activity at various levels of intensity according to the choice of the researcher. Whilst presented here with four levels of intensity, sedentary, light, moderate and vigorous, EVA could be utilised with dichotomous data such as sitting vs standing, or adjusted to match future refinements of activity guidelines. EVA offers a unique and comprehensive generic method that is ideal for processing large quantities of accelerometer data. EVA is able, for the first time, to concisely capture the time pattern (both frequency and intensity) of activity, and can be tailored for both occupational and public health research.

225 Validation of 7days recall WEB for physical activity measurements using doubly labeled water

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Introduction: Traditional self-reported questionnaires are less valid, and analysis time are required compared with a Web-based physical activity measurements. Interactive online communication has the potential to facilitate the data collection, and to improve the measurement accuracy. We developed Web systems of automatically delivered e-mail and Web sites. Seven Days Recall (Sallis et al.1985) was improved to "7daysRecall WEB ver." We used illustrations and quizzes to determine the intensity of activity in the correct category. The purpose of this study is to examine the validity of Web-based physical activity measurements with reference to doubly labeled water (DLW) method.
Methods: Twenty healthy subjects (25–61 years, 10 males and 10 females) were applied to a study participation. Subjects responded to e-mail sent at 20:00 every night before bedtime daily for a week, using IT device that familiar to their. The total energy expenditure (TEE) was expressed by "the basal metabolic rate (BMR) × 24h average METs × 1.1 ÷ 0.9 × 4.184 × 10^{-3}". Validity as a reference, TEE, activity energy expenditure (AEE), and physical activity level (PAL) were calculated for per week by DLW methods. AEE and PAL was calculated based on the Basal metabolic rate (BMR) expired gas analysis.
Results: The Pearson's correlation between the $TEE_{7daysRecall\ WEB}$ and TEE_{DLW} was r=0.590 (P=.006). AEE and PAL of 7daysRecall WEB, AEE and PAL of DLW, were not significant correlation of r=0.202 and r=-0.085, respectively. The mean $TEE_{7daysRecall\ WEB}$ was 11.08 MJ (SD 2.82), while the mean TEE_{DLW} was 10.53 MJ (SD 2.58). The mean of $AEE_{7daysRecall\ WEB}$ and AEE_{DLW} was 5.40 MJ (SD 2.20) and 4.85 MJ (SD 1.61), while the mean $PAL_{7daysRecall\ WEB}$ and PAL_{DLW} was 1.96 (SD 0.32) and 1.84 (SD 0.19), respectively. In which measurement item, there was no significant difference between the 7daysRecall WEB and DLW methods. Average input time using IT devices was 6 min 38 sec in 7daysRecall WEB.
Discussion: 7days Recall WEB validity was comparable with previous 7days physical activity records. It is suitable for epidemiological studies, because input time is short and simple in operation. Our systems is superior in terms of physical activity can be measured at the same time a lot of people, because the Internet will lead to cell phones, smartphones, such as a personal computer without having chosen a device be available.

226 Council on Environment and Physical Activity: International experiences, evidence and advocacy

SYMPOSIUM

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The Council on Environment and Physical Activity (CEPA) was organised at the 3rd ICPAPH (Toronto). Its aim is to help researchers from different countries in different disciplines to conduct rigorous research *on physical activity and the environment and to inform local policy on planning and transport. Seven work groups were formed during the Toronto meeting, and these groups have been* working on particular issues involving physical activity and the environment. This 90-minute symposium will showcase activities and findings from CEPA, and discuss new research directions in order to further advocate for evidence-based environmental and policy changes to support physical activity internationally. Below are topics to be discussed in the symposium.

1. Evidence for advocacy: International Physical Activity and Environment Network
   Presenter: Jim Sallis (USA), Ester Cerin (Hong Kong)
2. CEPA activity highlights: Findings from South America
   Presenter: Rodrigo Reis (Brazil), Diana Parra (USA)

3. CEPA activity highlights: New projects on children and older adults
   Presenter: Erica Hinckson (New Zealand), Ester Cerin (Hong Kong)
4. How best to use research evidence to influence policy
   Presenter: Billie Giles-Corti (Australia), Takemi Sugiyama (Australia)
5. Discussion: Where to from here?
   Presenter: Neville Owen (Australia), Ilse De Bourdeaudhuij (Belgium)

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227 | We will never understand the obesity epidemic or how to deal with it, unless we better understand energy imbalance

The Coca-Cola Company Sponsored Session

S. Blair[1]* ▪ **G. Hand[1]** ▪ **J. Hebert[1]** ▪ **E. Archer[1]** ▪ [1]University of South Carolina

Introduction: Over the past few decades, obesity prevalence has been increasing around the world.
While the causes of this epidemic are complex and poorly understood, it is indisputable that persistent weight gain is caused by chronic positive energy imbalance via increases in caloric intake or decrements in energy expenditure or some combination of the two. Nevertheless, both the scientific literature and lay press focus primarily on energy intake as the cause of obesity while dismissing documented decrements in energy expenditure. Many have stated that "the obesity epidemic is due to people eating too much, because physical activity has not changed in recent decades".
Methods: We examined the bias engendered by an overemphasis on diet by performing Google key word searches and investigated the causes of energy imbalance via an extensive literature review of data from several countries. We also evaluated trends in energy intake and expenditure from a variety of assessment methods for both diet and physical activity. Additionally, we considered the influence of increases in body size on energy expenditure, and expressed the data in kcal/kg/day, instead the typical approach of evaluating kcal/day.
Results: The Google search revealed a bias emphasizing diet to the exclusion of physical activity; the number of hits for several terms—
"eating too much", 393 million; "obesity" 90 million; "diet and obesity", 66 million; "sugar and obesity", 19.4 million; "physical inactivity", 3 million; "physical inactivity and obesity", <3 million. Data on dietary trends in the U.S. showed that there may have been an increase in kcal/day over the past 40 years. However, when these data were adjusted for increases in body weight in the population, the increases in caloric intake were not sufficient to account for increases in resting metabolic rate and increases in routine daily activities caused by higher body weights. Trends in sugar consumption over the past 25+ years in Australia and the United Kingdom revealed flat or declining rates, despite substantial increases in obesity over the same time period. Other data show large declines in energy expenditure from multiple domains (e.g. occupational, transport, domestic activities).
Discussion: Our results do not support that the obesity epidemic is due to increased dietary intake, and that there is a consistent bias that ignores total energy expenditure. To develop effective strategies to manage the obesity epidemic, we must focus our attention on both sides of the energy balance equation and not continue to ignore energy expenditure.

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228 | Understanding both sides of the energy balance equation

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Introduction: Increases in body weight result from energy imbalance. Secular trends in body weight gain reflect a chronic imbalance in which caloric intake is larger than energy expenditure. Despite simplistic recitation of the physical laws of thermodynamics governing the loss or gain of energy stores, it is known that utilization and storage of food energy in excess of metabolic need is mediated by complex biologic and physiologic processes. Of interest, the balance of energy intake and expenditure can be maintained at differential levels that can have dramatic effects on energy stores as well as metabolic and cardiovascular health. The purpose of this presentation is to describe the methodology used in the ENERGY BALANCE STUDY to measure energy intake and expenditure and to discuss the rationale for enhancing measurement of energy balance by "triangulating" multiple methods for each component.
Methods: The ENERGY BALANCE STUDY is an observational project that follows 400 healthy women and men, ages 21 to 35 years with a body mass index (BMI) of 20 to $35kg/m^2$. Anthropometric, physiological, psychometric, and performance measures, obtained quarterly, allow for quantification of energy intake, expenditure, and storage. Techniques to quantify energy expenditure include accelerometry, doubly labelled water, and self-report instruments. For intake assessment, we use three 24-hour dietary recalls. Energy intake and energy expenditure measurements occur during a common two week period. Measurements of energy stores include body weight as well as specific anatomical "compartments" obtained from dual x-ray absorptiometry (DXA). All measurements are done at baseline and repeated every three months.
Results: Energy expenditure and energy intake data from 200 participants measured repeatedly over a period of six months will be used to illustrate the interactions of physical activity, energy intake, and resting metabolic rate on body weight and body composition.
Discussion: A positive energy balance over time results in increased energy storage. However, the mode, amount, and intensity of physical activity (a significant component of energy expenditure) can have an effect on the distribution and type of energy storage. Energy intake is also an important contributor to energy balance. The quality and quantity of intake can have a dramatic effect on the distribution and type of energy storage. These complex interactions will be discussed in the context of energy balance, body composition and weight management.
This study was supported through an unrestricted research grant from The Coca-Cola Company.

229   Influence of exercise intensity and energy flux on health outcomes

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Recently published physical activity guidelines provide the public with targets for the amount and intensity of physical activity needed for good health. The key recommendation within these guidelines is that adults "*should do at least 150 minutes a week of moderate-intensity, or 75 minutes a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity*". The guidelines recognize that, by comparison to vigorous physical activity (VPA), about half as many calories are expended with an equivalent duration of moderate physical activity (MPA). Because the guidelines indicate that 75 minutes of VPA is equivalent to 150 minutes of VPA, they insinuate that there are little or no added health benefits of VPA other than the shorter time frame needed to expend the appropriate amount of energy. In other words, the benefits of engaging in VPA are attributed to the greater energy flux or energy expenditure per unit of time, and do not relate to the intensity per se. Emerging evidence would suggest otherwise, that for a given dose or volume of exercise, exercise intensity and/or energy flux may have positive and independent effects on body weight and regional adiposity. Current knowledge regarding whether exercise intensity or the rate at which energy is expended is associated with differences in energy balance and/or regional changes in adiposity is the focus of this presentation.

230   How much is enough? The effect of exercise repetition on the force frequency characteristics of eccentric exercise used for tendinopathy rehabilitation

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Introduction: Eccentric exercise (EE) is a commonly used treatment for Achilles tendinopathy. While vibrations in the 8–12 Hz frequency range generated during eccentric muscle actions have been put forward as a *potential mechanism for the beneficial effect of EE, optimal loading parameters required to expedite recovery are currently unknown. Alfredson's original protocol employed 90 repetitions of eccentric loading, however abbreviated* protocols consisting of fewer repetitions (typically 45) have been developed, albeit with less beneficial effect. Given that 8–12 Hz vibrations generated during isometric muscle actions have been previously shown to increase with fatigue, this research evaluated the effect of exercise repetition on motor output vibrations generated during EE by investigating the frequency characteristics of ground reaction force (GRF) recorded throughout the 90 repetitions of Alfredson's protocol.
Methods: Nine healthy adult males performed six sets (15 repetitions per set) of eccentric ankle exercise. GRF was recorded at a frequency of 1000 Hz throughout the exercise protocol. The frequency power spectrum of the resultant GRF was calculated and normalized to total power. Relative spectral power was summed over 1 Hz widows within the frequency rage 7.5–11.5 Hz. The effect of each additional exercise set (15 repetitions) on the relative power within each widow was investigated using a general linear modelling approach.
Results: The magnitude of peak relative power within the 7.5–11.5 Hz bandwidth increased across the six exercise sets from 0.03 in exercise set one to 0.12 in exercise set six ($P<0.05$). Following the 4th set of exercise the frequency at which peak relative power occurred shifted from 9 to 10 Hz.
Discussion: This study has demonstrated that successive repetitions of eccentric loading over six exercise sets results in an increase in the amplitude of motor output vibrations in the 7.5–11.5 Hz bandwidth, with an increase in the frequency of these vibrations occurring after the 4th (60th repetition). These findings are consistent with findings from previous studies of muscle fatigue. Assuming that the magnitude and frequency of these vibrations represent important stimuli for tendon remodelling as hypothesized within the literature, the findings of this study question the role of abbreviated EE protocols and raise the question; can EE protocols for tendinopathy be optimized by performing eccentric loading to fatigue?

231   Specific hip muscle atrophy with acetabular labral tears

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Introduction: Acetabular labral tears are a source of hip and groin pain in active individuals and are thought to be a precursor to hip osteoarthritis. Currently, limited evidence exists to guide appropriate physiotherapy management for this population of patients. Identification of which hip muscles are affected by labral tear pathology may help to develop effective exercise programs to treat these patients. However, there is little information in the literature about individual hip muscle size in patients with labral tear pathology. This study aimed to investigate hip muscle size and symmetry in patients with acetabular labral tears compared to healthy subjects.
Methods: 12 participants (8 females, 4 males), aged 20 to 53 years, with a unilateral acetabular labral tear were recruited from an orthopaedic practice prior to undergoing hip arthroscopy. 12 healthy participants matched for age and gender were recruited from a general university population. Magnetic resonance imaging was used to examine the lumbo-pelvic region of all participants. Muscle cross-sectional areas of the piriformis, iliacus, psoas, gluteus minimus, gluteus medius, upper gluteus maximus and lower gluteus maximus muscles on both sides were measured. Repeated measures ANOVA was used to examine differences in hip muscle size between groups (labral tear vs healthy) and between sides (dominant vs non-dominant leg).
Results: Gluteus medius muscle cross-sectional area was found to be significantly different between groups ($p<0.01$) with muscle size found to be smaller in the labral tear group. For the lower gluteus maximus muscle, a significant interaction effect of group and side was found ($p<0.03$) with muscle cross-sectional area on the dominant leg found to be smaller in the labral tear group. No differences were found for the other hip muscles ($p>0.05$).
Discussion and Conclusions: The results suggest that not all hip muscles are affected equally by the presence of acetabular labral pathology. Specific atrophy of the gluteus medius muscle, which is important in hip joint and pelvic stability, and the lower gluteus maximus muscle, which contributes to hip extension and absorbing ground reaction forces in gait, may alter hip joint function. Further research needs to investigate if motor control and strength in these muscles is also affected. Clinicians treating patients with acetabular labral tears may need to prescribe exercises targeted to the specific muscle dysfunction observed.

232   Patellar tendon stiffness is responsive to load intensity but not contraction type among healthy young men

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Introduction: There is some evidence that isolated eccentric muscle contractions (eccentric training) are effective in managing patellar and Achilles tendinopathy. The underlying mechanisms of eccentric training are not known and may include a differential or greater response of the muscle, tendon or nervous system with eccentric contraction, or even a specific effect on pain mechanisms. The aim of this study was to investigate the effect of contraction type and load intensity on patellar tendon stiffness response among healthy participants.

Method: 38 healthy men between 18–35 years old were recruited and randomized into four groups: control (n=9), concentric training (n=9), eccentric low load training (n=10) and eccentric high load training (n=10). Each group performed progressive loaded leg extension training three times per week for 12 weeks, with 5 seconds of time under tension for each contraction. Exercises were monitored and 5 repetition maximum (RM) measured once per week. Load was equalized in the eccentric low load and concentric training groups (80% of concentric 1 RM). Load was higher in the eccentric high load group (80% of eccentric 1 RM). Patellar tendon elongation was measured in vivo with ultrasound during a maximal isometric voluntary contraction and used to calculate tendon stiffness.

Results: All participants completed the exercise program and compliance was between 81–100%. Mean 5 RM performance increased significantly in all exercise groups but increase was significantly greater in the eccentric high load groups ($p<.05$). Patellar tendon stiffness increased in all exercises groups over the 12 week intervention period (mean±SD change: concentric=+738±859 Nm, eccentric low=+714±885, eccentric high=+1121±971) but this change was only significantly different to the control group (-11±327) in the eccentric high load group ($p<.05$).

Discussion: Although all exercise groups could be classified as 'high' load, patellar tendon stiffness only increased in the most intense group (80% of eccentric 1 RM). No increase in patellar tendon stiffness was identified at the lower intensity (80% of concentric 1 RM), regardless of contraction type. Contraction type may be less important than load-intensity for increasing tendon stiffness. Increased tendon stiffness may not explain improved patellar tendinopathy symptoms with eccentric training as load-intensity of studies in the literature may not be great enough, although the response of painful/pathological tendon may be different.

233   Conservative management of Achilles tendinopathy: A mixed methods study, integrating a systematic review and clinical reasoning

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Introduction: The conservative management of Achilles tendinopathy requires clinicians to combine clinical reasoning with the underpinning evidence base. This study aimed to produce a multi-faceted description of clinical practice and guide future research by combining an inclusive review of the current literature with a narrative of expert physiotherapists' clinical reasoning.

Methods: Electronic databases PubMed, ISI Web of Science, PEDro, CINAHL, Embase, and Google Scholar were searched for papers published up to November 2011 evaluating conservative management for mid-portion Achilles tendinopathy. Further searches of reference lists and citation tracking were also completed. Each study was scored using the PEDro scale, with a score of >8/10 considered of excellent quality, 5–7/10 good, and <4/10 poor. Evidence for each treatment modality was then graded according to the number and quality of supporting studies: 'strong,' 'moderate,' 'limited,' 'conflicting, or 'no evidence'. Clinical reasoning was explored in a purposive sample of consenting experienced physiotherapists using semi-structured interviews until data saturation. Interviews were analysed using the framework method to reveal emerging themes, with this data then being used to illustrate the systematic review data.

Results: Initial searching yielded a total of 3497 studies. Forty seven of these met the inclusion criteria. In total, 11 separate treatment modalities were identified, with strong evidence supporting eccentric exercises and extra-corporeal shockwave therapy (ESWT) and moderate evidence for low-level laser therapy, and concentric exercises. Limited evidence was found for foot orthoses and therapeutic ultrasound. Taping and soft-tissue mobilisation studies were only identified by case studies/series rather than randomised controlled trials. There was conflicting evidence for topical glyceryl trinitrate. Framework analysis of semi-structured interviews revealed common themes which highlighted that physiotherapists were frequently utilising eccentric exercises, based on their strong evidence base. Manual therapy was also frequently applied, and foot orthoses prescription was often considered. Barriers to translating the research into practice included heterogeneous outcome measures employed in different studies, over-stringency of traditional evidence synthesis approaches and lack of access to primary research reports.

Discussion: The graded evidence combined with qualitatively analysed clinical reasoning produced a novel guide for clinicians conservatively managing mid-portion Achilles tendinopathy. Additionally, these findings allow experienced clinicians to review the evidence base and reflect on their clinical reasoning. Key areas for future research include evaluating the efficacy of foot orthoses, manual therapy, aetiological factors, how to manage different stages of presentation such as reactive or degenerative tendinopathy and eccentric exercise protocol adaptation.

234 Muscle morphometry of the individual hamstring muscles in semi-elite AFL Players: Preliminary findings from a longitudinal study

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Introduction: Hamstring strains in the Australian Football League (AFL) have a high incidence (15%) and recurrence rate (34%) with lateral hamstring injuries most common (83%). Retrospective studies have found significant muscle volume asymmetries ≤23 months post hamstring injury; however examination of the association between hamstring strains and muscle asymmetry has not been investigated prospectively. This study presents baseline data from a longitudinal study focusing on individual hamstring morphometry in uninjured and injured semi-elite AFL players. Methods: Bilateral, contiguous 5mm axial magnetic resonance (MR) images of the hamstring muscles were acquired from 26 male semi-elite AFL players (23±4 years, 6±4 years playing history at semi-elite level; uninjured [N=16], self-reported previous hamstring injury [N=10]). Manual segmentation procedures for the MR images were extensive with reliability analyses conducted using Coefficients of Variation (CV) and Dice Coefficients. Slice sampling and statistical shape modelling (SSM) approaches were also explored as a means of increasing the clinical applicability and efficiency of morphometric analyses. In the uninjured players, "normative" unilateral and bilateral volume ratios were calculated for hamstring muscle pairs e.g. biceps femoris short head (BFSH): biceps femoris long head (BFLH) ratio as well as for a medial vs lateral muscle group comparison e.g. BFSH + BFLH: semitendinosus (ST)+semimembranosus (SM) ratio. Results: Manual segmentation of axial MR images was shown to have high reliability for determining hamstring muscle volumes with CV's ranging from 1.1% for SM to 2.7% for BFSH. Baseline normative muscle ratio data for the various muscle pair comparisons are presented as median (interquartile range 25%–75%) values with preferred kicking leg defining dominance. The following ratios were found; BFSH:BFLH$_{dominant}$ 0.53(0.46–0.62), BFSH:BFLH$_{non-dominant}$ 0.50(0.47–0.58); ST:SM$_{dominant}$ 0.98(0.91–1.03), ST:SM$_{non-dominant}$ 0.95(0.86–1.02). The normative muscle ratios for the medial vs lateral muscle group comparison were BFLH+BFSH:ST+SM$_{dominant}$ 0.68(0.64–0.70), BFLH+BFSH:ST+SM$_{non-dominant}$ 0.65(0.62–0.71). In a first series of analyses, SSM was able to accurately classify players with injured vs non-injured BFLH. Conclusion: The current hamstring muscle morphometric data in uninjured players provides valuable "normative" data for future prospective studies into hamstring strains. The large differences in the volume ratios between the BFLH and BFSH maybe of potential importance in (re)injury of the hamstrings as may the smaller overall lateral vs medial muscle group volume (~30%) given the predominance of lateral hamstring strains. Information provided by SSM on shape parameters in relation to muscle injury may provide information of further clinical interest.

235 Hip and groin MRI and US findings in elite asymptomatic Australian football players

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Introduction: Hip and groin pain is a common injury at the elite level of Australian football with musculoskeletal imaging playing an important role in diagnosis. Radiology findings in athletes without pain are important as they increase diagnostic accuracy and improve the ability to interpret findings with clinical relevance. Several MRI studies exist that report on findings in asymptomatic athletes. However, recent advances in the understanding of enthesopathy and the potential contribution of the hip joint in the development of groin pain warrants further MRI investigation in asymptomatic athletes. When considering pathologies associated with groin pain ultrasound (US) may be a more relevant diagnostic tool for some structures including the adductor tendons, inguinal ligament and conjoint tendon. Ultrasound studies are less frequent in groin pain research with the exception of hernia studies. The purpose of this study was to examine US and MRI findings in asymptomatic Australian football players and to compare findings with the development of hip and groin symptoms in the following season. Methods: Sixty-three Australian football players from two AFL clubs completed US and MRI imaging during the 2011 preseason. At the time of imaging all players were free of groin pain symptoms. All images were independently reviewed by two radiologists with 19 and 15 years of clinical experience. Throughout the season, players were tracked for onset of symptoms by club medical staff and compared against pre-season imaging findings. Results: Enthesopathy was reported in 29% (18/63) of players analysed and in 29% (18/63) of players a pubic symphysis defect was reported. Cam lesions were present in 29% (18/63) of players and hip joint capsule thickening was observed in 11% (7/63) of players. Correlations between reported findings and injury episodes during the season will also be presented. Discussion: When interpreting imaging in athletes with hip and groin pain the findings of enthesopathy, pubic symphysis defects and cam lesions in uninjured athletes should be considered. Ultrasound appears to be a useful tool in visualising hip joint capsule thickening that may develop prior to a cam lesion. The US findings in this study suggest that US may be a viable alternative for assessing the hip and groin compared to MRI and CT that has been preferred historically. Including imaging as a component of pre-season screening may be useful in identifying athletes at risk of hip and groin injury.

236 Medio-lateral knee position during knee flexion tests is predictive of hip kinematics during running

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Introduction: Knee injuries, including Iliotibial band syndrome (ITBS) and patellofemoral pain syndromes (PFPS), are prevalent in distance runners. Current literature links altered hip and knee kinematics during running with these injuries. Quantitative measurement of hip and knee kinematics is difficult within the clinical setting. Thus clinically feasible tests that are predictive of hip and knee kinematics during running may be beneficial. Mediolateral knee position during a clinical test involving knee flexion (mini-squat) is predictive of peak internal hip rotation during the test, but its relationship with hip and knee kinematics during running is not known. The purpose of this study was to determine if five clinical tests of knee control are predictive of hip and knee kinematics during running.

Methods: Twenty runners with no musculoskeletal injuries, who ran at least 10 km per week, volunteered for this study (31.5±8.9 years, 178.5±4.8 cm, 75.5±9.4 kg). Participants performed five clinical tests of knee control, which were recorded with a high definition camera in the frontal plane. The tests were: single leg mini squat (SLMS), single leg squat on step (SLS), forward lunge (Lunge), single leg hop for distance (SLH) and triple hop for distance (TRH). A clinician assessed and scored each performance on a 4 point scale according to their mediolateral knee position (over, medial or lateral relative to the foot). Three-dimensional running kinematics were obtained during treadmill running at 4 m/s. The hip and knee kinematics calculated were: peak internal hip rotation (HIR), peak hip adduction (HAD) and peak knee abduction (KAB) during the stance phase of running. Pearson correlations between the knee position scores of each clinical test and hip and knee kinematics were performed. A forward stepwise regression was used to determine which clinical test was the strongest predictor of each kinematic variable. An alpha level of 0.05 was set.
Results: Larger HIR during running was correlated with a more medial knee position during the SLH, lunge and TRH. The knee position score of the SLH was the strongest predictor of HIR. Knee position score of the clinical tests were not correlated to either HAD or KAB during running.
Discussion: Assessment of knee position during the SLH, lunge and TRH could be used in situations where measurement of running kinematics is not available to infer HIR during running. The SLH should be used primarily for assessment of knee position because it is the best predictor of HIR during running.

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237   Effect of foot orthoses on ankle kinematics and kinetics in male runners with Achilles tendinopathy

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Introduction: Achilles tendinopathy (AT) is a common injury among male runners, affecting the longevity of sporting careers and participation in exercise. Abnormal rearfoot biomechanics are thought to be risk factors for AT, but their role is not well established. There is evidence to suggest that people with AT have altered eversion kinematics at the rearfoot, which may result in disproportionate loading across the medial and lateral aspects of the Achilles tendon. Altered ankle dorsiflexion mechanics have also been discussed as a cause of AT, where the tendon may be placed under a greater load in the sagittal plane. The purpose of this study was to evaluate the immediate eversion and dorsiflexion kinematic and kinetic effects of foot orthoses in runners with AT.
Methods: Thirteen adult males (age 42 yr±10, weight 78 kg±12, height 178 cm±6) with midportion AT symptoms, running >20 kilometres per week, were recruited. Confirmation of AT pathology was performed using diagnostic ultrasound. Three dimensional kinematic and kinetic data were collected using a Vicon motion analysis system and AMTI force plates during the stance phase of shod running gait for two conditions: i) with prefabricated semi-rigid foot orthoses, and ii) no orthoses. Each participant completed at least five overground running trials per condition at a controlled running speed. Data processing was completed in Workstation and BodyBuilder software to determine: peak rearfoot eversion angle, rearfoot eversion excursion, peak ankle dorsiflexion angle, peak plantarflexion moment and plantarflexion impulse. Statistical analyses were performed using a paired samples t-test with SPSS software (version 19). An alpha level of 0.05 was set.
Results: The ankle eversion excursion was significantly reduced with use of foot orthoses (11.9 deg±4.3) compared to footwear-only (13.4 deg±4.3; p=0.03). No differences between conditions were observed for the other variables (p>0.05).
Discussion: Our data demonstrate that the immediate use of foot orthoses reduces rearfoot eversion motion in male runners with midportion AT during the stance phase of running. This change results in kinematic parameters similar to those in asymptomatic runners, which may have a beneficial treatment response. Other elements of frontal and sagittal plane mechanics were not altered. Further studies are required to evaluate the long term biomechanical effects of foot orthoses in people with AT and its role in improving pain and function outcomes across both genders.

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238   Built environment features in the home and worksite neighborhood are associated with cardiorespiratory fitness

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Introduction: Most built environment (BE) research has examined environmental characteristics around the home and self-reported physical activity. The current study examines the independent and joint associations of objectively-measured BE features around the home and worksite and cardiorespiratory fitness (CRF), an objective marker of habitual physical activity that is causally related to long-term health outcomes.
Methods: This cross-sectional analysis included 9,248 adults (71% male; 94% White; 84% college graduate) aged 20–88 years who completed a preventive medicine examination at the Cooper Clinic in Dallas, Texas in 2000–2007 while living in 12 counties in the Dallas-Ft. Worth and Austin, Texas areas. 4,956 participants with work addresses in the study areas were included in sub-analyses examining worksite environments. CRF was measured from total duration on a maximal exercise treadmill test. Walkability characteristics (residential density, land-use mix, intersection density, percent vegetation, km of sidewalks, average speed limit) within 800-meter network buffers, exercise facilities within 1600-meter network buffers (e.g. number of parks, public and private exercise facilities) and distance to the closest city center (in km) were derived around addresses using geographic information systems. Generalized estimating equations were simultaneously adjusted for demographic characteristics (age, gender, race, marital status, children in home), body-mass index, and all other home- or work- BE variables. Unstandardized beta estimates were reported. To assess joint effects of home-work environmental features on CRF, tertiles of BE variables significantly associated with CRF around both the home and work were combined into nine-category variables ranging from the lowest tertiles to highest tertiles for both home-work BE variables.
Results: In the home-BE models, residential density (beta=-0.013), intersection density (beta=0.006), percent vegetation (beta=0.506), number of private exercise facilities (beta=0.033), and distance to the closest city center (beta=-0.004) were significantly associated with CRF. In the work-BE models, intersection density (beta=0.006), percent vegetation (beta=0.812), average speed limit (beta=0.028), and number of private exercise facilities (beta=0.019) were significantly associated with CRF. In fully adjusted models, participants in the highest tertiles for intersection density and number of private exercise facilities around the home and work had, on average, 0.33 (SE=0.10) and 0.40 (SE=0.08) higher mean levels of CRF than those in the lowest tertiles of these home-work BE characteristics, respectively.
Discussion: Objectively-measured BE features around the home and worksite were independently and jointly associated with CRF. Future studies should examine the influence of non-residential and residential environments on physical activity using more robust study designs and diverse populations.

239 Greener neighbourhoods, healthier lives? Evidence from Britain

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Introduction: If physical activity (PA) is an important mechanism linking exposure to green space with better mental and physical health, the well-known decline in PA across the lifecourse would suggest that the association between green space and health weakens with age. Few studies, however, have examined this hypothesis. This study examined the interaction between green space, physical activity, and mental health across the lifecourse.
Methods: Multilevel models were used to analyse males and females over 15 years old, resident within urban neighbourhoods for a minimum of 12 months, in the British Household Panel Survey bi-annually between 1998 and 2004 (person-years: male=13,896, female=16,786). The outcome variable was the General Health Questionnaire, and green space was measured as the percentage total land-cover of green and natural environment within neighbourhoods. Leisure time PA was self-reported as 'at least once a week', or 'infrequent/never'. Other explanatory variables included age, economic activity, household tenure, marital status, qualifications, income, smoking status, social support, and neighbourhood satisfaction.
Results: Compared to males in the least green neighbourhoods (0–33%), those in the greenest areas (66–100%) reported significantly better mental health consistently across the lifecourse (coefficient (β): -0.33 (95% confidence interval (95% CI): -0.62, -0.04)). While no main effect for green space on mental health was observed for females, there was a significant interaction between green space and age. Females in the greenest and least green neighbourhoods reported similar levels of mental health across the lifecourse. In contrast, females in neighbourhoods with a moderate level of green space (34–66%) had increasingly better mental health from age 50 onwards. Regular leisure time PA was associated with better mental health for males (β=-1.02, 95% -1.19, -0.85) and females (β=-0.86, 95% CI=-1.03, -0.69). Males, though not females, were significantly more likely to participate in PA at least once a week if they lived in a greener neighbourhood (Odds Ratio=1.13, 95% CI=1.01, 1.27). PA among males and females declined by age, regardless of green space. Controlling for PA led to a significant attenuation in the association between green space and mental health across the lifecourse for males in the greenest neighbourhoods only.
Discussion: At a time when the provision of local green space is increasingly promoted as a potential lever for better health, this study suggests that the relationship with mental health varies by gender, is not consistent across the lifecourse, and is not always beneficial.

240 Neighbourhood green space and leisure time sedentary behaviour - in a Danish population

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Introduction: Leisure time sedentary behaviour, including TV-viewing, is an independent risk factor for all-cause and cardiovascular mortality. Furthermore TV-viewing has been positively associated with CVD biomarkers, e.g. waist circumference, blood pressure, cholesterol and blood sugar. Studies from US and Australia finds that features of neighbourhood such as access to forest and recreational resources are associated with level of physical activity. Whether there is an association between sedentary behavior and such physical features of neighbourhood is unknown. The aim of this study is to examine the association between accessibility to green space and sedentary behaviour in a Danish population. The hypothesis is that high access to neighbourhood green space is associated with less individual time spend on sedentary leisure time activities.
Methods: Health survey data from The Capital Region of Denmark used in the analyses included a random sample of 95.150 inhabitants ages 16+. Response rate is 52.3%. Information on sedentary behaviour and socioeconomic factors are derived from a questionnaire survey 2010. As a tool to measure accessibility to green space we use geographical information system (GIS). Information on the geographical factors is obtained from existing geographic databases provided by the National Survey of Cadastre. Proximity and density of green space are calculated for each participant. Logistic multilevel regression analysis taking neighbourhood and individual factors (age, gender, education, employment) into account is performed.
Results: 41 % percent of the respondents are sedentary more than 3.5 hours per day in their leisure time. Individuals living in areas with high density of and low proximity to green space had a significantly lower odds of being sedentary more than 3.5 hours per day after adjusting for individual level factors; OR 0.927 (95% CL: 0.863–0.995), compared to individuals living in neighbourhoods with low density and high proximity.
Discussion: Among adult inhabitants of The Capital Region of Denmark, sedentary leisure time behaviour of 3.5 hours or more per day was more frequent in neighbourhoods with low density of and high proximity to green space. Studying how the environment interacts with individual sedentary behaviour is important in order to plan and target future public health interventions aimed at reducing individual sedentary leisure time behaviour.

241 The influence of neighbourhood relocation on sitting time: Results from RESIDE

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Introduction: Neighbourhoods designed to promote walking may also be important for reducing residents' sitting time. This study examines whether objective and perceived changes to the built environment impact on residents' self report sitting time after relocation.
Methods: The RESIDential Environments (RESIDE) study is a longitudinal study of people moving into new neighbourhoods (n=74) in Perth, Western Australia. Participants completed a questionnaire before moving to their new neighbourhood (T1, n=1816) and at 36 months (T3, n=1047) after relocation. Items included self report week day and weekend day sitting time and neighbourhood perceptions (NEWS). Objective environmental measures (e.g. street connectivity, land-use mix, residential density, greenness, access to destinations) were collected at each time point using Geographic Information Systems and change variables were generated. Linear regression examined the influence of changes to the built environment between baseline and 36 months follow up on self-report mean week day and weekend day sitting time. Analyses were stratified by gender with adjustment for baseline socio-demographic and work characteristics, and sitting time.

Results: Mean weekend day sitting time remained constant between baseline and follow up, whereas week day sitting time decreased by approximately 34 minutes for men (p=0.001) and 22 minutes for women (p=0.007). For men, changes in perceived crime safety, and objectively measured land-use mix and residential density were associated with changes in week day sitting (p<0.05). However, in fully adjusted models, only increased residential density caused a decrease in week day sitting time (β=-79.05; p=0.020). For women, a perceived increase in crime safety corresponded with a reduction in mean week day sitting, albeit non-significant (β=-27.57; p=0.094).

Discussion: Neighbourhood relocation influenced week day, but not weekend day sitting time, which was stable across time points. For men, moving to a neighbourhood with greater residential density caused a reduction in sitting; however there was no corresponding association for women. Overall, few environmental changes influenced sitting, and it is likely that the change in the physical environment after relocation was not sufficient to significantly impact sitting time. Nonetheless, the process of changing neighbourhoods has reduced sitting time, and may have altered week day routines associated with work, travel, child care and social participation. Future research might examine how changes in the built environment, in combination with changes in the social environment, influence residents' sedentary behaviour.

242 Associations of neighbourhood walkability and its components with residents' leisure time spent in cars

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Introduction: Prolonged time spent sitting in cars is associated with obesity and premature mortality. These findings reinforce the need for relevant environmental and policy approaches to reduce automobile-based sedentary behaviour, but there is limited evidence to inform such initiatives. We examined associations of neighbourhood walkability and its components with adults' leisure time spent sitting in cars.

Methods: Participants (n=2523) were recruited from 154 urban Census Collector Districts (CCDs) in Adelaide. Participants reported minutes spent driving or riding in a car during their leisure time in the past week. Neighbourhood walkability, which consisted of dwelling density, intersection density, land use mix, and net retail area ratio, was determined objectively for each CCD. Multilevel logistic regression was used to examine associations of neighbourhood walkability and its components with longer time spent in cars during leisure time (30 min/day or more), adjusting for age, gender, education, work status, marital status, having child/ren in the household, income, and car ownership.

Results: Participants who lived in low walkable neighbourhoods (below the median on the composite walkability measure) were significantly more likely to spend longer time in cars, compared with those in high walkable neighbourhoods (OR=1.49, 95% CI=1.26–1.77). In a model that included all the specific walkability components, participants living in neighbourhoods in the lowest net retail area ratio (NRA) quartile (i.e. total retail floor area much smaller than total retail land area) had 1.36 times (95% CI=1.04–1.79) higher odds of spending longer time in cars, compared to those living in neighbourhoods in the highest NRA quartile. Participants living in neighbourhoods in the second lowest dwelling density quartile also had 1.33 times (95% CI=1.00–1.75) higher odds of spending longer time in cars, compared to those living in neighbourhoods in the highest dwelling density quartile.

Discussion: This study found that residents of high walkable neighbourhoods tended to spend less time sitting in cars. In particular, higher net retail area ratio, which is an indicator of tightly-spaced commercial areas (e.g. less on-site parking spaces), was associated with less time in cars. The findings suggest that a compact neighbourhood with high-density retail areas may be effective in reducing time spent in cars. Further research is needed to examine more specific attributes of neighbourhood retail areas that may be relevant to active transport (e.g. relationships with public transit stops, size of catchment area, location of car parking) in order to inform future development of new neighbourhoods and redevelopment of existing neighbourhoods.

243 Physical activity and sitting time as mediators of the association between neighborhood environmental perceptions and weight status in African adults

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Introduction: Growing evidence suggests the importance of environmental interventions for increasing physical activity and controlling obesity, but it remained unclear to what extent physical activity and sedentary behaviors mediate the association between neighborhood environmental factors and higher risk of overweight/obesity. This study aimed to investigate the mediating effects of physical activity and sedentary behaviors on the associations of neighborhood environmental factors and body mass index (BMI) among African adults.

Methods: Cross sectional analysis of anthropometric measurements of height and weight and self reported environmental and physical activity data were collected on 1411 African adults (40 % female) of diverse socioeconomic status in Maiduguri, Nigeria. Primary outcome was Body Mass Index (BMI). The product- of- coefficient test of mediation was performed using generalized linear models to assess the mediating effects of Moderate-to-Vigorous Physical Activity (MVPA), walking, total PA and sitting time on the associations between 16 perceived environmental factors and BMI.

Results: Walking and total physical activity significantly mediated the association between BMI and perception of higher residential density ($\alpha\beta$=-0.025 and -0.037, respectively), absence of garbage ($\alpha\beta$=-0.046 and -0.076, respectively) and more safety from crime at night ($\alpha\beta$=-0.044 and -0.083, respectively). In addition, walking, MVPA and total physical activity significantly mediated the association between BMI and perception of better aesthetics ($\alpha\beta$=-0.035, -0.022 and -0.071, respectively). Walking and total physical activity mediated 6.5% to 20.0% of the associations between environmental factors and BMI, and sedentary time did not mediate any of the associations.

Conclusion: Physical activity behavior is a potential mediator of environmental factors- BMI associations. Replication of similar findings in future prospective studies in other African populations can provide guidance for interventions that are relevant for obesity control and prevention in the African context.

244 Assessing the relationship between the workplace environment and employee physical activity and nutrition behaviours

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Introduction: Few studies have investigated links between the workplace environment and employee health risk factors. The aim of this study was to assess if there is any relationship between environmental attributes of physical activity and healthy eating within the workplace and individual health indices.

Methods: A 120-item audit tool, designed to measure the physical activity and nutrition environments in the New Zealand workplace, was implemented in 23 worksites of one organisation across New Zealand. In addition, 321 of 922 eligible employees (34%; 137 male, 184 female; 18–65 years) from the audited worksites completed an online health risk assessment (HRA). Partial correlation coefficients explored the association between environmental attributes of the worksite and employee physical activity and nutrition-related behaviours.

Results: At best, trivial associations were found between physical elements of the worksite and employee physical activity and nutrition behaviours, specifically in two of the nine domains of the workplace measured. These were the consumption of breakfast and the presence of an onsite cafeteria (r=0.1; CL 0.0–0.2), and meeting the physical activity recommendations and worksite travel provisions (r=0.16; CL=0.06, 0.28).

Discussion: While associations between behaviour and the work environment were not detected here, this may be due to homogeneity in the sample, or other more salient factors existing outside of the workplace environment (but not measured by the tool) may be more salient to employees. These need to be investigated in more depth. Utilising the tool in a number of heterogeneous workplaces, or in a longitudinal manner and tracking changes over time, may provide more meaningful results.

245 Moderate and vigorous physical activity among 10–16 year old children living in a diverse ethnic minority community: Does the built environment matter?

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Introduction: Moderate to vigorous physical activity (MVPA) has a range of social and health benefits among children. Ethnic minority children and children with low Socio Economic Status (SES) often engage in less organized sports than Danish children with high SES. However little is known about objectively measured MVPA among ethnic minority groups in Denmark. Based on baseline data from the When Cities Move Children study, this study investigates the association of the built environment, socio-demographic and social support variables on children's daily physical activity.

Methods: Participants were 291 children from four schools in a diverse ethnic minority community in Copenhagen, Denmark (10–16yrs). Physical activity data were obtained using accelerometers (Actigraph GT3X, 30 sec epoch) and Evenson cutpoints were used to determine mean daily time in MVPA. Exposure variables were based on questionnaire data, registry data, GPS/GIS derived variables and accelerometer data. Data were analyzed in STATAmp 12 using a 3-level mixed multilevel model to examine both unadjusted and adjusted models.

Results: Among the participants 45% were boys, 42.5% had at least one parent who did not work and 64.3% had at least one parent with an ethnic minority background. The adjusted analyses showed that boys engage in significantly more minutes of daily MVPA than girls (boys: 57.8, girls: 36.9, p<0.001) and that boys from a Danish ethnic family accumulated significantly less minutes of daily MVPA compared to boys from an ethnic minority family (p<0.001). Girls in grade 7 (13–14yrs) accumulated the least minutes of MVPA (p<0.05). Being in a class with a high average mean MVPA was significantly associated with higher individual MVPA among both boys (p<0.001) and girls (p<0.05). None of the included built environment variables were significantly associated with MVPA in the adjusted model.

Discussion: This study contradicts the notion that ethnic minority boys are less physically active than Danish boys. Anecdotal work so far confirms the hypothesis that these boys are bound to spend the majority of their leisure time outdoors in their local community due to crowding in their home while girls are confined to the home to stay out of trouble and help in the home. Further analyses based on available GPS data on these participants will provide more insight, leading to new documentation on the association on outdoor time and physical activity level as well as new knowledge on which built environment variables may be relevant for this group of children.

246 Evidence informing change in Australian Football

SYMPOSIUM

Australian Football League

Australian Football is a game enjoyed by people all over the World, with average AFL attendance of 34,893, 650,373 AFL club members, 790,905 participants at community level and 2537 community clubs. Total player payments at AFL level total $159 million, and the AFL Grand Final is consistently the most watched annual sporting event in Australia, with 3.5 million viewers in 2011. Accompanying the growth of the game has been a significant growth in AFL club football departments in the coaching, administration, player welfare, sport medicine and sport science disciplines. In each of these areas, there are numerous examples where evidence is used to inform decision making and change. The presentations delivered as part of this session aim to illustrate how evidence is used across different parts of the industry, including injury prevention, treatment and rehabilitation, physical preparation and recovery, monitoring of game trends and law making. Perspectives covered will include those of the administrator, sports physician, physiotherapist, former player and laws of the game committee member.

Paper 1:   Twenty years of injury surveillance in the Australian Football League: Implications and evidence for change
Paper 2:   Evidence upon which injury prevention and rehabilitation strategies have been developed
Paper 3:   Evidence of game demands and strategies to prepare players
Paper 4:   Changes in laws and interpretations based on game information and trends
Paper 5:   AFL research program strategy for 2012–16

247   Twenty years of injury surveillance in the Australian Football League: Implications and evidence for change

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Introduction: AFL injury surveillance has been ongoing for 20 seasons, with all causes of missed games through injury in players/teams accounted for over the past 15 seasons. There has been a gradual move from descriptive surveillance to more analytical research.
Methods: The definition of an injury is one which resulted in a match being missed. The major units presented each season, in a public release, are injury incidence (new and recurrent injuries per club per season) and injury prevalence (matches missed per club per season). The twenty years of injury reports, encompassing 308843 player weeks, were reviewed to summarise major trends in the injury profile.
Results: The most prevalent and common (of the 12767 new and 1900 recurrent injuries) injury in the AFL has consistently been the hamstring strain in every season of the survey. On average there are 6 hamstring injuries per club per season causing 20 weeks to be missed. The other two injury categories most consistently in the top three for injury prevalence are groin injuries and knee ACL injuries. The major trends and achievements of the 20-year-survey period were: 1) ongoing compliance of all teams and annual public release 2) the centre circle rule change to reduce risk of ruck PCL injuries 3) appreciation that grass/ground condition are a risk factor for ACL injuries 4) long-term reduction of recurrence rates for muscle strains in particular 5) low rates of head and neck injuries in second decade compared to first 6) reduction of hamstring injuries in 2011 after introduction of the substitute rule.
Discussion and conclusion: The AFL injury surveillance system is one of the world's leading systems in professional sport. Real change has been effected as a result of the survey. The injury survey definition is useful at monitoring trends in injuries and recording the incidence of important musculoskeletal injuries. The major strength of the injury definition is excellent reliability.

248   Evidence upon which injury prevention and rehabilitation strategies have been developed

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Introduction: As detailed in the earlier presentation on the AFL Injury Survey, there have been changes in the AFL injury profile over the past decade. Approaches to injury prevention, treatment and rehabilitation have benefited greatly from high quality research both in Australia and overseas, including some research funding by the AFL Research Board. Fortunately, a significant amount of this research has been targeted at injuries which are commonly associated with participation in Australian Football. These common injury categories include hamstrings, groin pain, knee ACL and shoulder injuries. Such injuries are either significant in terms of incidence (as in the case of hamstring strains), or in terms of prevalence (as in the case of knee ACL). A range of techniques are used in injury prevention activities, including jumping and landing training in the case of the knee ACL injury prevention, eccentric strength training in the case of hamstring strains, and game specific training which has become a competition-wide trend that has implications for the approach to most injury categories and the way they are managed.
Discussion and conclusion: The range of evidence-based injury prevention and rehabilitation strategies used by AFL clubs will be presented from the perspective of a physiotherapist, with a particular focus on hamstring strains, groin pain, knee ACL and shoulder injuries.

249   Evidence of game demands and strategies to prepare players

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Introduction: Just as there has been a significant growth in the industry and club football departments, there has also been a shift in the demands of the game as a result of the way the game is played and coached, and along with that a change in the methods used to prepare players for matches and then manage the recovery process to enable them to perform in the subsequent match. This presentation will explore changes in the physiological demands of the game over a 5–10 year period, drawing on evidence that exists both in terms of the physiological demands on players as measured through GPS-data and other load monitoring techniques, along with the types of physical attributes necessary for competing successfully at the highest level. It will also evaluate changes in the performance characteristics of players over this same time period, from basic parameters such as height and weight through to more advanced metrics associated with the modern athlete profile. Finally, there will be some prediction of how these game demands and physical characteristics are likely to change both in the short, medium and long term future.
Discussion and conclusion: The requirements of the game have changed significantly over a 5–10 year period and the modern day AFL player looks very different to the player of the past. A range of data will be presented to illustrate the change in the physiological demands of the game and subsequent changes in the physiological characteristics of players.

250   Changes in laws and interpretations based on game information and trends

J. Bowden[1]* ▪ [1]Australian Football League

Introduction: The game of Australian Football is in great shape at the elite and community level, with record match attendances, TV audiences and participation levels in recent years. Some of the positive on-field trends have been influenced by continued monitoring and where necessary interventions in the form of rule and interpretation changes to enhance the appeal of the game. The charter of the Laws of the Game Committee is to keep the game entertaining and exciting, and safe to play in the confines of Australian Football being a body contact sport. The Laws of the Game process has undergone several enhancements in recent years; some of these related to the personnel associated with the Laws of the Game Committee and the appointment of a Game Analysis Manager. There has also been the introduction of a rigorous consultation and stakeholder engagement strategy. Another integral part of the Laws process is the extensive research that is fed into the process to assist the Laws Committee in their deliberations on various topics. Rule changes introduced in recent years have made the game more continuous in line with supporter expectations, to protect players from injury, and to enhance some of the traditional aspects of the game such as marking contests.
Discussion and conclusion: The Laws of the Game process is driven through evidence-based discussion and consultation with coaches, players, medical staff, physical preparation staff and administrators across all parts of the industry. The information collected is used to assist decision making when considering whether to make any modifications to the rules of the game.

251   AFL research program strategy for 2012–16

R. Smith[1]* ▪ [1]AFL Research Board

Introduction: Australian Football has established itself as a world leader with injury prevention, treatment and rehabilitation, sport science, coaching, umpiring and volunteer administrators. The AFL Research Board was formed in 1999 to administer the selection of research priorities, allocation of research funding, organization of industry sport science and medicine events and to guide individual research projects. The AFL has an organisation wide five-year strategy for the period 2012–16, and the AFL Research Board has recently undergone the process of developing its own strategy to match the objectives of the broader AFL framework. The program has been successful in translating knowledge into action and impact across a number of different areas: Developing the capacity of volunteers; Enhancing the skills of coaches; Reducing and improving treatment of injuries at elite and community level; Improving community football environments and respect for umpires; Using research as the platform for policy development and evaluation; Improving the talent pathway; and Improving the preparation of playing surfaces.
Discussion and conclusion: The process used by the AFL Research Board to determine priority research areas and the commissioning of projects in these areas will be presented, along with the recent process undertaken to develop a five-year strategy for the program for the period 2012–16.

252   Movement analysis of Australian national league soccer players using global positioning system technology

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Introduction: Understanding the movement characteristics of soccer through movement analysis is important for optimal training prescription and recovery. While a wealth of movement information exists on elite European leagues, studies on professional Australian league players are limited. There are several unique aspects about Australian league soccer which differentiate it from other national competitions, including travel, climate, skill level, and cultural factors. Therefore, it may not be ideal for Australian coaches to structure training and recovery strategies based on movement analyses completed on foreign leagues. Additional Australian-based studies are thus warranted. This study quantified and analysed movement patterns of an elite Australian soccer team during match-play. The aims of the study were to a) make game-half and positional comparisons of player movement characteristics; and b) examine the effect of evolving match status (winning, losing, or drawing) on average running speed.
Methods: Global positioning system tracking devices were worn by A-League soccer players (n=19) during eight pre-season matches. Paired samples t-tests were used to compare first- and second-half movement variables. Two separate one-way ANOVA tests were used to compare dependent variables according to 1) playing position with three levels (defenders, midfielders, and attackers), and 2) match status with three levels (drawing, winning, and losing).
Results: Total distance, average speed, high-intensity running (HIR) distance, and very high-intensity running (VHIR) distance decreased from the first half by 7.92%, 9.47%, 10.10%, and 10.99% respectively in the second half. Significant differences were found between the first and second half for medium accelerations (56.27 ± 11.65 vs 50.20 ± 13.18, $p<0.05$), medium decelerations (67.47 ± 14.33 vs 55.87 ± 14.46, $p<0.01$), and high decelerations (13.93 ± 5.45 vs 11.43 ± 5.59, $p<0.05$). Midfielders covered 11.69% more total distance, 28.08% more HIR distance, and had a 10.93% higher average speed than defenders ($p<0.05$). Attackers performed 27.50% and 30.24% fewer medium acceleration bouts than defenders and midfielders respectively ($p<0.01$). Whilst the team was winning, average speed was 4.17% lower than when the team was drawing ($p<0.05$).
Discussion: This study provides contemporary descriptive benchmarks for elite Australian soccer and introduces accelerations as a new movement analysis variable to describe high intensity activity. An overall decline in intensity in the second half highlights the importance of game-specific conditioning. Furthermore, the influence of situational factors such as match status may be used strategically to gain advantage over opposition teams.

253   Is the new FINA (Fédération Internationale de Natation) regulations valid for swimwear enacted in 2010 appropriate?

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Introduction: The Beijing Olympic Games featured swimming suits using new materials or sewing technology, and 94% of gold medallists wore such suits. At ACSMS in 2010, the new suits were clarified by a lactate curve test to show a performance difference as compared with conventional swim suits. According to FINA, the new regulation on swimming suit materials, which is limited to covering the body surface, was established in January, 2010. Herein, we examined differences in performance with these swimming suits which were sold in Japan for the London Olympic Games.
Method: Twelve Japanese male college students (5 who participated in the London Olympic Games selection meeting in JAPAN and 7 Inter-College Championships) were evaluated. These 12 athletes were divided into three groups at random, and three lactate curve tests were performed while wearing the swimming suits: A co., B co., and C co. Lactic acid was measured using Lactate Pro®(Arclay co., Japan) by the CCD enzyme electrode method. Lactate curves were described using the analysis program MEQNET Lactate Manager®(Arclay co., Japan) from the acquired value, and lactic acid velocity was computed with values of 4mmol/l. In the lactate curve test, all participants swam 200-m free style 4 times (best time +40 seconds, +30 seconds, +20 seconds, maximal effort). The rest time for each trial was 15 minutes. Immediately after swimming, lactic acid and HR were measured and velocity was computed from the time required.
Results: The mean velocity equivalents for the 12 athletes at lactic acid value 4 mmol/l were: Company A, 1.25 ± 0.03; Company B, 1.27 ± 0.03; and Company C, 1.25 ± 0.04, m/sec. The requirement to swim 200 m at maximal speed, the swimming velocity, lactic value, and heart rate were 1.9 ± 0.1 m/sec, 11.2 ± 0.3 mmol/l, and 198 ± 2.3 bpm for Company A; 1.85 ± 0.3 m/sec, 11.4 ± 0.5 mmol/l, and 1.95 ± 3.4 bpm for Company B; and 1.9 ± 0.2 m/sec, 11.5 ± 0.4 mmol/l, and 1.95 ± 4.3 bpm for Company C. Differences in mean values showed no dependence on the swimsuits.
Discussion: FINA prepared new swimming suit regulations after the Beijing Olympics. These regulations stipulate fixed effects and are considered to be useful for solving problems in records arising from athletes' swimming suit selections.

254 Effect of 5 minutes cold water immersion, warm water immersion and rest on circulating, functional and perceived indices of athlete recovery

S. Moore[1]* ▪ **D. Thompson[1]** ▪ **M. McGuigan[1]** ▪ [1]University of Bath

Introduction: The project aim was to compare recovery interventions of 5 minutes cold water immersion, warm water immersion and passive rest, in trained subjects, following intense exercise replicating the demands of game sports. Water immersion is a common practice aimed at enhancing athlete recovery from intense exercise. While the physiological effects of sustained water immersion are well understood, scientific rationale is speculatively applied to recovery of athletic performance and there is a paucity of empirical evidence supporting shorter duration immersion protocols in the order of 5 minutes.

Method: 11 trained participants completed the 90 minute Loughborough Intermittent Shuttle Test (LIST). Five minutes of COLD water immersion (9±0.30C), WARM water immersion (35±20C) and REST were compared in a repeated measures randomised cross over design. Recovery was evaluated at 2, 4 and 24 hours post exercise using circulating markers of muscle damage, muscle dynamometry, drop jump and repeated single leg hop performance tests and perceived recovery.

Results: There was a significant effect of intervention for lymphocytes (p=.01) but the pattern of decreased lymphocytes following water immersion compared to the control condition of rest was not significant (corrected p=.08). There was a time-intervention interaction for leukocytes (p=.04) but the observed decreased leukocytes at 24 hours following water immersion compared with the control condition of rest was not significant (corrected p=.20). There was a significant effect of intervention for Knee Extension (KE) Peak Torque (p=.01). Lower KE Peak Torque followed water immersion compared with the control condition of rest (p=.00), and lower KE Peak Torque followed cold water immersion compared with warm water immersion (p=.01). There was no significant effect of cold water immersion or warm water immersion on creatine kinase (CK), myoglobin, neutrophils; or variables relating to drop jump, single leg hop, perceived fatigue or perceived recovery. In terms of feeling recovered and prepared for athletic performance, there was a strong athlete preference for water immersion, and warm was more often preferred than cold.

Discussion: Athletes indicated a clear preference for water immersion over passive recovery, however there was not a substantive physiological effect of five minutes of warm or cold water immersion. Therefore 5 minutes of water immersion should not displace post-exercise activities with more certain outcomes. Further research is needed to verify efficacy and mechanisms of effect of water immersion in athlete recovery, and to explore possible effects on circulating leukocytes and the lymphocyte sub-population.

255 Effectiveness of a new evaluation index of bicycle pedaling skill – Angular Velocity Variability Index

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Introduction: For the technical evaluation of bicycle pedaling skill for beginner or novice class cyclists, it is important to know how bicycle crank are rotate. Several previous studies, crank angle were measured on a road cycle via a potentiometer or photo encoder. Alternatively, it is possible to use a motion capture device to measure the rotation state of the crank; however, this necessitates the use of a large-scale system in order to measure crank angles precisely. In this study, we use a simple sensor unit which can simultaneously measure the angular velocity of the bicycle crank and a new index was obtained. Furthermore, we examine the effectiveness of the new index about the bicycle pedaling skill.

Method: Twenty-four male subjects pedaled the road cycle which was attached to a bicycle trainer (Power Beam Pro: CycleOps) at 70, 100 rpm and preferred revolution. A wireless multi-axis sensor unit (9-axis motion sensor: Logical Products) was fixed to the bicycle crank in order to obtain the angular velocity of the bicycle crank. The angular velocity variability was acquired by averaging the angular velocity for each crank angle, and "Angular Velocity Variability Index (AVVI)" was acquired from root-mean-square error of the crank angular velocity per revolution.

Results and discussion: According to the results, AVVI has a tendency to be lower for an expert cyclist, and to be higher for beginners. AVVI depends on the crank power and the number of revolutions. However, there are several beginner or intermediate cyclists having a low AVVI. Additionally, AVVI hardly changed, although it pointed as if it changes the pedaling method. These results show the possibility that the AVVI can become an evaluation index of the pedaling skill from the viewpoint of pedaling efficiency.

256 Oxygen recovery kinetics after exercise in trained endurance and team sport athletes

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Introduction: Oxygen recovery parallels the rate of energy replenishment in muscles after exercise. To date, there have been no studies of oxygen recovery in team sport athletes such as rugby league players (RLPs) and classic measures of aerobic fitness do not adequately explain the enhanced repeated maximal performance in team sport athletes. The aim of this study was to determine whether oxygen recovery from maximal incremental and sub-maximal steady state exercise (above and below ventilatory threshold (VT)) were different between RPLs and endurance athletes (triathletes). Methods: Fifteen elite RLPs and 15 sub-elite triathletes (all male) participated. The protocol initially involved running on a treadmill at 1% grade at 8 km h^{-1} for 3 min, followed by 1 min increments of 1 km h^{-1} until volitional exhaustion. The treadmill speed was immediately reduced to 4 km h^{-1} for 5 min. Oxygen uptake was measured throughout. Of the subjects that participated in the maximal study, 8 triathletes and 8 RLPs performed (within 14 days) a series of 6-min sub-maximal bouts, with the treadmill set at 8 km h^{-1} for the first bout (below VT). The following bouts were set at the mid-point between the speed at the VT and the peak speed as determined in the previous test (heavy intensity exercise). Between tests, 5 min of active recovery at 4 km h^{-1} was used.
Results: The oxygen recovery mean response times were significantly faster for RLPs from maximal exercise (60.3±11.9 s) compared to triathletes (77.3±11.3 s) (p=0.005). There was no significant correlation between oxygen recovery mean response times and VO$_2$peak or ventilatory threshold in either group. For RLPs, oxygen recovery rates from moderate, heavy and the preceding maximal test were 54.4±9.9, 69.7±11.0 and 61.4±15.4 s. For triathletes, oxygen recovery rates from moderate, heavy and the preceding maximal test were 54.2±4.8, 67.1±8.9 and 80.6±11.4 s.
The recovery rate from maximal exercise was significantly faster in RPLs compared with triathletes (p=0.01) and there was no difference at either level at sub-maximal exercise.
Discussion: Faster oxygen recovery was demonstrated in RPLs compared to triathletes. This may indicate a possible mechanism to increase oxygen availability after maximal exercise in team sport athletes that is not evident in endurance trained athletes

257 Cerebral and muscle hemodynamics during repeated sets of unilateral knee extensions with different recovery durations

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Introduction: Muscle fatigue is task specific and can originate centrally at the supraspinal levels and peripherally within the motor unit. The relative contribution of the supraspinal and peripheral factors implicated during repeated bouts of resistance exercise with different recovery durations are poorly understood. Purpose: This study examined the: 1) acute cerebral and muscle hemodynamic responses (Cox, Cbv, Mox and Mbv respectively) during three sets of unilateral knee extensions to task failure with three different recovery durations between sets, and 2) relationship between total work index (TWi) and changes in Cox and Mox during the three sets of recovery durations.
Methods: Seven subjects (36.6±11.7 yr; 71.5±18.3 kg; 168.1±9.4 cms) completed three sets of right limb unilateral knee extensions at 80% of 1 RM on three separate occasions in random order using three recovery durations: 1 min, 3 min and duration sufficient for complete recovery of Mox (RMox). Cerebral and muscle hemodynamics were recorded simultaneously from the left prefrontal lobe and right vastus lateralis using near infrared spectroscopy. TWi was computed as: [load (kg) times number of repetitions times distance traversed for each repetition]. Delta values of NIRS variables were calculated as differences between the resting baseline values prior to the onset of each set and the corresponding maximum or minimum values of cerebral or muscle tissue respectively.
Results: TWi declined significantly (p<.05) from the first to the third set regardless of the recovery duration between sets. The largest decline was observed for the 1 min duration (57%) compared to 38% and 34% for the RMox and 3 min durations respectively. During each set, Cox and Cbv increased systematically while Mox and Mbv decreased concomitantly until task failure. TWi was significantly correlated with Delta-Cox (R2 between 21% and 59%) and Delta-Mox (R2 between 26% and 49%) when the three recovery durations or three sets were pooled. The strength of this relationship increased from the first to third set with the common variance increasing from 21% in Set 1 to 45 % in Set 3. There was a tendency for neuronal efficiency (TWi/Delta-Cox) to increase and muscle efficiency (TWi/Delta-Mox) to decrease concomitantly from the first to the third set.
Conclusions: Task failure during unilateral knee extensions was mediated peripherally but was independent of oxygen availability as Twi declined even when Mox was completely restored between sets. Neuronal (supraspinal) factors became more important during repeated sets of knee extension regardless of recovery duration between sets.

258 Water immersion recovery practice in high performance athletes: Current practice and the rationale

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Introduction: The project aim was to explore current water immersion practice of high performance athletes and the rationale. Water immersion is a common practice aimed at enhancing athlete recovery from intense exercise. The current evidence base explores a range of protocol including varied athlete profiles, temperatures, immersion times, depths and outcome measures making between-study comparisons difficult. Deciphering practice implications, applying the evidence and defining best practice is therefore speculative.
Method: In a purposive, theoretical sampling approach of expert consultation, semi-structured interviews were conducted with 8 professionals advising internationally competing athletes on water immersion recovery. Participants were of Sports Coach, Strength and Conditioning Coach and Sports Physiotherapist professions with a minimum of 5 years' experience working with internationally competing athletes; and differed in international location and sporting disciplines.

Results: Water immersion protocols typical of current practice continue to entail a variety of temperatures, depths and durations. Practice varies between professionals, sporting disciplines, training phases and competition. Rationale is analytical, and largely underpinned by speculative mechanisms seeking to achieve a desired effect. Athlete preference and resource availability are key definers of practice although experts would prefer to have their advice underpinned by scientific evidence. In the absence of supporting evidence, there was a trend to seek expert opinion and consult sources other than published research to best inform practice. The evidence is not strong enough to impose water immersion on athletes who do not like it and activities with more certain outcomes must be prioritised. Experts agreed the need to acknowledge the complexity of deciphering water immersion recovery intervention efficacy; particularly further evaluation of a spectrum of outcome measures, proposed mechanisms of effect and implications for practice.

Discussion: Experts use several levels of evidence to inform water immersion recovery practice, advocating a range of protocol grounded in several speculative mechanisms of effect, athlete preference, and resource availability. Understanding mechanisms of effect would best position experts to apply the research to individual athletes, sports and practice settings. This would facilitate definition of "best practice" water immersion protocol, which could be further defined by circumstances and resource availability.

259 The influence of contrast shower and water immersion recovery modalities on performance, physiology and psychological recovery in female netballers

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Contrast water immersion has become a popular recovery modality, however access to appropriate facilities at sporting venues or when travelling can be difficult. Contrast showers (hot/cold showers) may provide a convenient, accessible and effective alternative. Research examining the influence of contrast showers on sport performance, psychological and physiological variables is lacking. Due to the need to provide research based evidence on contrast showers and recovery on elite female athletes the purpose of this study was to explore the effect of contrast showers on performance, physiological (skin and core temperature) and psychological parameters on elite netballers following a netball specific session. Eleven elite female netball players completed three experimental sessions of a netball specific circuit followed by one of three post-exercise recovery interventions; 1) contrast water therapy (CWT, 38°C and 15°C), 2) contrast showers (CS, 38°C and 18°C) and 3) passive recovery (PAS, seated rest 20°C). In a randomized, cross-over design, repeated agility, repeated vertical jump, skin and core temperature and perception scales were measured before, immediately after, 5 hours post and 24 hours post-exercise. No significant differences ($p > 0.05$) were evident between conditions for performance. Post-exercise CWT and CS provided similar cooling effects with a decreased skin temperature (Tskin) and a 20 minute delayed drop in core temperature (Tcore) when compared to PAS. Perceptions of recovery overall were superior for CWT (18.95 ± 13.77) and CS (17.70 ± 12.98) when compared with PAS (72.80 ± 14.26). Despite no improvements in performance variables after CWT or CS, neither modality negatively influenced performance. Both CWT and CS resulted in faster cooling responses when compared to PAS. To the author's knowledge this is the first study to examine differences in core and skin temperature responses to CWT and CS. Additionally, greater perceptions of recovery were seen in CWT and CS when compared to PAS. The significance of psychological recovery should not be underestimated, as an athlete that feels less pain and has a heightened sense of well-being following recovery is more likely to perform at a higher level. In conclusion whilst both CWT and CS were deemed viable recovery modalities CS may prove to be a more accessible alternative for sporting teams.

260 Legal risk management of adverse health outcomes and injury in the fitness industry: Developing evidence informed regulation that improves safety

SYMPOSIUM

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The Australian fitness industry has a critical role to play in supporting and facilitating active and healthy lifestyles for Australians. This is central to the fight against obesity and associated health risk factors such as coronary heart disease and diabetes, as well as enhancing general health and well-being. However, while regular physical activity can prevent obesity and reduce the risk of inactivity-related diseases, overly vigorous exercise can trigger adverse health events, especially in habitually sedentary people. Additionally some programs offered by fitness providers can increase the risk of injury. This risk is heightened where there are inadequate risk management practices, including pre-exercise screening, adopted by a fitness service provider. This symposium will provide a forum to consider how Australian regulation currently controls risk management and safety standards in the fitness industry; and further, what changes can be made to this regulation, and also to fitness industry practice, to reduce the risk of adverse health outcomes and injury, and the legal liability associated with those risks.

Paper 1: The private law regulation of injuries in the fitness industry
Paper 2: The epidemiology of hospital-treated for injuries sustained in the health and fitness sector
Paper 3: No musculoskeletal pre-exercise screening for a sedentary population entering exercise programs?
Paper 4: Emergency preparedness in the health and fitness facilities in Queensland
Paper 5: How does public law manage the risk of adverse health outcomes and injury in the fitness industry?

261   The private law regulation of injuries in the fitness industry

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The focus of this paper is on private legal obligations that can arise to compensate injured customers for their losses. Specifically, the focus will be on the 1) law of negligence and 2) the Australian Consumer Law that seeks to implement uniform consumer protection laws. This paper outlines the legal rules that determine when fitness operators (and more generally, the broader recreation industry) will be held to be legally liable. The paper will consider the range of primary legal materials–statutes, regulations and case law–that make up the surprisingly complex and diverse legal liability regimes that exist under state, territory and Commonwealth law. Two important conclusions will be drawn about this legislative framework. First, it is not uniform throughout Australia, and jurisdictional differences between the different states are significant, particularly in the broad context of injuries that occur whilst a person is engaged in 'recreational activities'. The lack of uniformity means that it becomes more difficult for the fitness industry as a whole to assess the legal risks associated with careless practices, since the legal consequences may differ from state to state. Further, the uniform consumer laws do not cover industry specific Industry Codes. The various Fitness Industry Codes that have been adopted differ from state to state and territory: some are mandatory and others are voluntary; they differ in their scope and coverage; where they deal with similar matters, they do so in different terms; and, finally, those standards that relate to health and safety risks are set at a general level. Secondly, the paper will demonstrate that legal liability depends, not on compliance with very specific, mandated rules of conduct, but on the application of broad standards of reasonableness. This paper will conclude that the lack of uniformity in legal regulation adds to the cost of compliance and makes it difficult for an industry that operates across Australia, such as the fitness industry, to identify and comply with relevant standards. Although there is unlikely to be any 'one size fits all' approach to managing legal risks, legal risk management in the fitness industry is not served by differences between states and territory laws that have no obvious rationale and that create complexity and compliance costs for industry.

262   The epidemiology of hospital-treated for injuries sustained in the health and fitness sector

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Introduction: According to the Australian Bureau of Statistics, aerobics/fitness activities is the second most common sport and physical recreation undertaken in Australia. As with other activities, there can be a risk of injury to participants of fitness-related activities but the epidemiology of such injuries has yet to be described in Australia. This information is needed to underpin the development of rules and regulations, and other risk management strategies, for the delivery of safe fitness services.
Methods: Routinely collected data on all admissions to Victorian hospitals (public and private) and injury presentations to 38 Victorian public hospital emergency departments (ED) were extracted and analysed for the period 2002–2010, inclusive. Fitness activity related hospitalisations were identified through ICD-10-AM activity codes (U5600, U621, U623, U700) and relevant ED presentations through text searches for health and fitness activities. Injuries were described according to body region, injury type and mechanism of injury.
Results: Over the eight year period, there were 413 hospital admissions and at least a further 2323 non-admitted presentations to EDs in Victoria due to injuries sustained in the health and fitness sectors. Most cases were coded as 'athletic activity involving fitness equipment not elsewhere classified' (51% admissions, 58% ED presentations) or weightlifting/strength training/body building (25% hospitalisations, 36% ED presentations). In both data sets, males accounted for around 60% of all cases and were especially over-represented in the weight-lifting/strength training/body building injury cases. females were over-represented in aerobics related cases. Injuries to the upper extremity were most common in the hospitalisations (44%), and both foot (15%) and shoulder (12%) injuries were most common in the ED presentations. Fractures accounted for 36% of hospitalisations and 15% of ED presentations; dislocations/sprains/strains accounted for 21% of hospitalisations and 44% of ED presentations. Common injury mechanisms were hit/struck/crush incidents (22% hospitalisations, 28% ED) and falls (28% hospitalisations, 24% ED).
Discussion: The setting of safety standards and risk management practices for the Australian fitness industry needs to be informed by data about what injuries occur so that priority for preventive action can be directed at both the common and most severe injuries. Based on routinely collected data about hospital-treated cases in Victoria, this descriptive epidemiological study provides important data to assist with this.

263   No musculoskeletal pre-exercise screening for a sedentary population entering exercise programs?

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Objectives: To systematically review the evidence supporting the use and efficacy of pre-exercise screening tools in the fitness industry to identify adults at risk of musculoskeletal injury.
Background: The role of the Fitness Industry is evolving from a primary focus on aesthetics and fitness to a prominent role in health promotion. As such it needs to meet the increased health demands of an ageing and sedentary population. While there are well-developed pre-exercise screening tools for cardiovascular, pulmonary and metabolic risk, there appears to be an absence of standardised musculoskeletal screening tools to identify existing or potential risk of musculo-skeletal injury in fitness settings.
Methods: A systematic review of the peer-reviewed literature was conducted using PubMed (1948–), SPORTDiscus (1975–), CINAHL (1981–), Health Source: Nursing /Academic Edition (1980–), Medline (1948–), AMED (1985–), and EMBASE (1980–) databases up to March 2012. Studies were included if they examined the use or efficacy of a pre-exercise physical screening examination to identify adults at risk of musculoskeletal injury when undertaking an exercise program.
Results: Five studies examining the use and efficacy of musculoskeletal pre-exercise screening tools were identified. The identified tools were designed for use with athletes in sporting settings, with most tools scoring measures such as strength, power, endurance and range of motion rather than the quality of the movements performed. No articles were identified that specifically examined the use of musculoskeletal pre-exercise screening tools for exercise beginners, particularly in fitness settings.
Conclusions: The implications of this lack of evidence and use of musculoskeletal screening in Australian fitness settings are discussed in light of issues such as the influence of injury, and fear of injury on participation and dropout rates. A clear need exists for the development and validation

of a standardised musculoskeletal screening tool for this setting. This review forms the basis for a larger study aimed at developing and validating a standardised musculoskeletal pre-exercise screening tool for the Fitness Industry, which will complement existing screening tools that typically focus on other health-related risks.

264 | Emergency preparedness in the health and fitness facilities in Queensland

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Introduction: The Australian health/fitness industry is an important contributor to the national preventative public health strategy against obesity and associated health risk factors such as coronary heart disease, diabetes, various forms of cancer, osteoporosis and mental health problems (Commonwealth of Australia, 2010; Mathers et al. 2000). Although regular physical activity can significantly reduce obesity and associated health risk factors, epidemiological studies show that vigorous exercise can trigger cardiac events, especially in habitually sedentary people with known or unknown coronary artery disease (Corrado et al. 2006b). In this regard, the aim of this study was to investigate if the health and fitness facilities in Queensland comply with risk management practices related to emergency plans such as cardiovascular screening, emergency procedures and the use of automated external defibrillators (AEDs) as described in published international standards.

Methodology: The data was gathered from the managers of all health/fitness facilities in Queensland (n=262) using the self-developed Health and Fitness Industry Risk Management Questionnaire (HFRMQ) (α=.877). Overall, 52 health/fitness facility managers participated in the study yielding a %20 return rate. Descriptive statistics and Spearman`s correlation were conducted for the data analysis using PASW Statistics 18.

Results: The results of the study showed that the health and fitness facilities in Queensland show low compliance with emergency related risks management practices (mean=3.5±.616). Even though, the majority of the health/fitness facilities (78.8%) have a written emergency plan in place (mean=4.04±.989), neither these facilities revise their emergency plans (mean=2.54±.999), nor physically rehearse their emergency response systems at regular intervals (mean=2.63±1.205). Besides, only 19% of the health/fitness facilities have at least one AED installed (mean=2.35±1.282) while only 15.4% of their staff recruited to use the AED in case of emergency hold current AED training and certificate (mean=3.61±.916).

Discussion and Conclusions: The results of this study highlight the need for proper adaptation and implementation of risk management practices related to emergency plans in the health and fitness facilities in Queensland. In this regard, a policy development and regulation of the health/fitness industry to implement proper risk management programs including but not limited to emergency procedures, processes and use of AEDs so as to promote physical activity in reasonably safe facilities is suggested.

265 | How does public law manage the risk of adverse health outcomes and injury in the fitness industry?

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The purpose of this paper is to identify the regulation that governs risk management in the fitness industry and consider how far and to what extent it prevents the risk of adverse health outcomes and injury and the public law liabilities associated with those risks. The focus of the paper is on public law rather than the private law of contracts and duty of care. Accordingly the paper will traverse statutory occupational health and safety provisions, anti-discrimination legislation, human rights charters and the like.

Data will be drawn from a comprehensive review of primary materials, including legislation, regulations, industry codes and judicial decisions.

This data will be analysed having regard to the key literature on methods to reduce the risk of adverse health and injury outcomes.

The paper will provide the foundation for:

1. the development, in consultation with our industry partners and key stakeholders, of new best practice benchmarks to improve safety in the fitness industry and reduction of the risk of adverse health and injury outcomes;
2. the design of regulation and safety practices to advance the achievement of those benchmarks; and
3. the development of training materials for industry use related to those benchmarks, with the objective of increasing safety, reducing the risk of adverse health outcomes and injury, and decreasing the prospect of adverse legal liability outcomes.

266 | Physical activity, physical fitness, computer games and BMI of 6–7 year old children from Poland

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Introduction: Decreasing level of physical fitness among children and youth in the past decade has been attributed largely to behavioral and environmental factors. The proper proportions between eating, physical activity habits and computer games have been established at preschool age. It should be also noted the development of physical fitness. At that stage of development immediately preceding the upswing the Body Mass Index known as adiposity rebound and the level of physical fitness. The main purpose of the study was to assess the effect of physical activity, the time spent on computer games, BMI on physical fitness of children at 6–7years old.

Method: The cross-sectional study was carried out in Poland representative sample of 45731 children at 6–7years old. Anthropometric and physical fitness values (including body height, body mass, BMI, sense of balance, strength, flexibility and velocity) was measured in children. The parents were asked to provide information regarding spontaneous physical activity throughout the day, time spent on computer games during a day. Descriptive statistic were calculated in all variables. The data were normalized and combined in one group. Stepwise multiple regression was used to determine the best predictor of the physical fitness. SPSS package software was used for the statistical analysis. The significance level was set at p≤0,05.

Results: About 44,82% of children were active all the time during a day and 37% spend active only 1–2 hours a day in parents opinion. It was noticed that high percentage of children play computer games 1–2 hours a day (49%). Only 14% parents declared that their children did not use a computer. The fraction of obese children was varied from 5,02% to 5,88%. The percentage of children with underweight according to sex were also differed (11,72% – boys, 12,47% – girls). Multiple regression analysis revealed that all predictors: BMI, the level of physical activity and time spent on computer games had a significant effect on the most aspects of physical fitness. The effect of the time spent on computer games was not significant for strength of arms and speed of arm movements (plate tapping). It was noticed the negative Beta value for BMI in the most traits of physical fitness.

Discussion: The results suggest, probably the right proportion between active time and time spent on computer games and also low value of BMI conductive of development of physical fitness at preschool age.

267   Multidimensional correlates of preschool children's physical activity*

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Introduction: Physical activity is important for young children's health yet compliance with recommendations is low. Identifying factors associated with young children's physical activity is necessary to inform development of future interventions and public health programs. This study sought to identify multidimensional correlates of preschool children's physical activity.

Methods: The social ecological model (SEM) was used to identify constructs potentially associated with preschool children's physical activity across each of the three domains–individual, social, physical environment. Cross-sectional data were collected from 1004 preschool children, aged between three and five years, and their parents in 2008–2009. Physical activity was measured over eight days using ActiGraph accelerometers. Parents completed a comprehensive survey. Generalized linear modeling was used to assess bivariable and multivariable associations between potential correlates and percent of time in each of three physical activity outcome variables (weekly [which included both week and weekend days], week day, weekend day) for boys and girls separately.

Results: Correlates of physical activity were found across all the domains of the SEM and varied between boys and girls and between week and weekend days for each of the sexes. Age was the only consistent correlate, with children spending approximately 10% less time in physical activity for each advancing year of age. Some modifiable correlates which were related to more than one physical activity outcome were rules restricting rough games inside and usual daily sleep time for boys (both inversely associated). Spending time outside on weekends and visiting active play spaces supported boys to be more active. For girls, a preference to play inside/draw/do craft rather than be active and child constraints such as lack of time or someone to play with were inversely associated with more than one of the physical activity outcomes. Paternal provision of logistic support was associated with girls spending a greater percent of their time being active on weekends.

Discussion: As correlates of preschool children's physical activity are multidimensional, future interventions and programs should ensure they address factors across all levels of the SEM. Potential strategies for promoting preschool children's physical activity should seek to influence identified correlates. Programs may need to consider whether they address week or weekend day physical activity as different correlates would need to be targeted. Sex-specific strategies may also be warranted.

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268   Predictors of preschool age children's physical activity at long day care

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Introduction: Understanding predictors of physical activity in centre based care is important for developing interventions to help ensure young children achieve recommended levels of physical activity and minimise their risk of overweight and obesity. The aim of this study was to describe children's levels of physical activity and modifiable centre-based associated with physical activity in long day care.

Methods: Pedometers were used to assess physical activity levels of 328 children aged between 3–5 years in 20 randomly selected long day care services in the Hunter Region of New South Wales, Australia. Staff questionnaires and observational audits were used to assess staff and centre-based characteristics including: staff qualification level, staff training in physical activity; staff participating with children in free active play or prompting children to increase physical activity, time spent playing computer/video games, time spent in seated activity, time spent in outdoor play, staff led physical activity , outdoor play area, portable and fixed playground equipment to encourage physical activity, and opportunities for children to learn and practice fundamental movement skills.

Results: Over the 6-hour observation period of 0900–1500, the average step count was 5,466 ($\pm$2,383) or 15.8 ($\pm$6.8) steps/minute. Step counts were significantly higher in centres that had a written physical activity policy (+3.8 steps/minute, p=0.03), included staff led structured physical activity (+3.7 steps/minute, p<0.001) and staff participation in active play (+2.9 steps/minute, p=0.057).

Discussion: It is recommended that Australian preschool children obtain 3-hours a day of active play. For children spending a large part of the day in care, much of this activity will need to be obtained during this time. Interventions to increase children's physical activity while in care should support long day care centres to develop and implement physical activity policies and build the capacity of staff to encourage physical activity through delivery of structured activities and participation in physically active play.

269   Familial determinants of sedentary behaviour in children 5 to 18 years from Colombia*

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Introduction: Excessive time spent in sedentary behaviors, such as television (TV) viewing, is associated with obesity, as well as other short and long term negative health outcomes, particularly in children. In developed countries, family socioeconomic status (SES), measured as income or head-of-household schooling, is usually inversely correlated with time children spend watching TV. However, the specific contribution of these family level factors is not clear in lower-income countries. Hence, the objective of this study was to assess familial determinants of TV viewing in children 5 to 18 years in Colombia using two national nutrition surveys (ENSIN) from 2005 and 2010.

Methods: The samples for this analysis included 2,403 children 5 to 11 years from ENSIN 2005 and 28,616 children 5 to 18 years from ENSIN 2010. We analyzed these data using binary two-level hierarchical linear models, with the child as the level-1 unit and the family as level-2 unit, and watching TV two or more hours a day (TV >2 hrs) as the outcome.

Results: The proportion of children who watched at least two hours of TV per day in these samples was 56% in 2005 and 58% in 2010. The family level accounted for 24% of the variability of TV >2 hrs in 2005 and 19% in 2010. Increased wealth and caregiver's years of schooling were consistently associated with increased odds of TV >2 hrs in both 2005 and 2010. For each quintile increase in wealth there was a 20% increase in the odds of TV >2 hrs in 2005, and a 19% increase in 2010 (p<0.001). Similarly, for every year increase in caregiver's schooling, the odds increased by 4% in 2005 and by 3% in 2010 (p<0.01). Caregiver's BMI and family size were not significant predictors of TV > 2hrs. At the individual level, age was positively associated with TV >2 hrs in both samples (9% increase in the odds per year), but TV viewing did not differ by sex.

Discussion: The positive relationship between SES and TV >2hrs in Colombian children is in the opposite direction of the relationship commonly observed in developed country settings. This difference should be considered when designing interventions to prevent sedentarism in Colombia and other Latin American settings.

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270 Association between maternal education and objectively assessed physical activity and sedentary time in youth: A cross country comparison

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Introduction: The association between maternal education and objectively assessed moderate-to-vigorous physical activity (MVPA) and sedentary time across countries is not established. This information is important for the development and targeting of physical activity interventions. The aim of the present study was to examine the independent associations between maternal education and objectively assessed physical activity and time spent sedentary in youth from Australia, United States, Europe and Brazil.

Methods: Pooled data were from 11 studies conducted between 1998 and 2009, comprising 16,354 children (10–18 years, 32.4% male) from the International Children's Accelerometry Database (ICAD). Time spent in MVPA (>2000 counts/min) and sedentary time (<100 counts/min) were computed after re-processing raw data from all studies. Self-reported maternal and maternal education was categorised as: 1) no-high school (HS) 2) college/vocational training (COL) 3) University/Graduate School (UNI). The association between MVPA and sedentary time (mutually adjusted) with socio-economic position (SEP) was examined using robust multivariable regression. Models were adjusted for a priori confounders (i.e. weight status, wear time, age and gender) and regression coefficients combined across studies using random effects meta-analysis. The I^2 statistic was used to compare the heterogeneity between studies.

Results: Girls accumulated significantly less MVPA (62.9 min/d [SD=32.5] vs 103.8 min/d [SD=45.8], P<0.001) and significantly greater sedentary time (513.7 min/d [SD=105.2] vs 464.4 min/d [SD=103.4], P<0.001) than boys. Meta analysis of the independent multiple regression estimates show that children of COL educated mothers did not have significantly different MVPA (-0.48 min, 95% CI, -2.12; 1.15) or sedentary time (1.67 min, 95% CI, -2.53; 5.86) when compared with those of HS educated mothers. However, children of UNI educated mothers had greater MVPA (2.18 min, 95% CI, 1.37; 2.99) and sedentary time (9.92 min, 95% CI, 5.58; 14.26) compared to children of HS educated mothers.

Discussion: Greater maternal education appears to be associated with greater MVPA and increased time spent sedentary in youth, although the strength of the association differed between countries and the magnitude of differences between groups was small. Future research is required to understand the specific socio-environmental determinants of physical activity in young people across countries.

271 Dog ownership, dog walking and children's independent mobility

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Introduction: Dog ownership is a catalyst for physical activity in adults. Given 60–80% of Australian and US households with children have a dog, dog-facilitated physical activity may be an effective way to increase children's physical activity. Few studies have examined the relationship between dog ownership and children's physical activity. Importantly, the relationship between dog walking and children's independent mobility has not been investigated. This study aimed to: 1) examine the association between dog walking, physical activity and walking in children and 2) examine if children who report walking their dog are more independently mobile than those who do not walk their dog.

Methods: Cross-sectional data from the Western Australian Travel, Environment, and Kids project (TREK) were analyzed for 729 children aged 10–12 years who had a family dog. Socio-demographic information, walking, walking with a dog and physical activity outside of school was collected from child and parent questionnaires. Weekly pedometer steps were also measured. Children reported their independent mobility to 15 neighbourhood destinations. Socio-demographic factors were adjusted for in models.

Results: Approximately 60% of children had a family dog. Of the children who owned a dog 55% reported walking their dog in the last week and 45% of these did so without an adult. Children who walked their dog were more independently mobile than those who did not walk their dog (all children, boys & girls p<0.01). Boys who walked their dog without an adult had greater independent mobility than boys who walked their dog with an adult (p<0.05). Dog walkers who were independently mobile did more walking/week (184mins) than those dog walkers who were not independently mobile (128mins; all children p<0.01). For boys, dog walkers who were independently mobile were also more likely to be sufficiently active (72% vs 59%; p<0.01). Dog walking and independent mobility was not associated with pedometer steps.

Discussion: Children who walk their dog are more independently mobile than children who own a dog but do not walk it. Dog walking and independent mobility are associated with children's walking and, for boys, are associated with achieving the recommended level of physical activity. These results highlight that dog walking provides opportunities for children to be independently mobile. Strategies aimed at encouraging older children to walk their dog may assist in increasing children's physical activity. Future research should examine if the promotion of dog walking in families is a viable intervention strategy for increasing children's physical activity.

272 Social influences of physical activity among Mexican-origin children in Texas border Colonias: Understanding the role of parents

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Introduction: The Mexican-origin population is the fastest growing racial/ethnic subpopulation in the U.S. This population growth has been occurring in burgeoning colonias along the U.S. border with Mexico, especially in Texas and in new-destination immigrant communities throughout the U.S. New-destination communities are characterized by a high concentration of Mexican-origin families and rapid growth in locations previously unsettled by Mexican immigrants. As an archetype for new destination communities, colonias are smaller, more dispersed communities comprised of disproportionately poor families of Mexican-origin with limited access to resources. This subpopulation is medically underserved with disproportionately high rates of diabetes and other obesity-related diseases across the lifespan, including children. Although physical activity plays a consistent role in preventing such diseases, a majority of this population fails to meet recommended physical activity guidelines. Given consistent support of theory to understand and/or increase physical activity participation, this study examined familial social support and social norms associated with physical activity engagement among *colonias* children using a *Promotora* model.

Methods: This study included 99 Mexican-origin family dyads made up of a mother and one child aged 6–11 residing in colonias in south Texas. Promotora researchers, indigenous community health workers trained in research methods, conducted surveys to gather demographic information as well as perceptions of familial social support and social norms relating to physical activity. One-on-one surveys were conducted with each mother and child separately in spring and summer of 2011.

Results: Of the 99 children in this study, 49 were overweight or obese. Mean parental social support for physical activity received by children was 6.77 (SD=5.76, range: 0–21), and girls reported receiving less (μ=6.0, SD=5.5) total parental social support than boys (μ=7.8, SD=6.0). Thirty-nine percent of mothers also reported exercising with their children (22% of girls and 16% of boys), and 33% provided transportation to their children for physical activity.

Discussion: The high level of overweight and obesity and low levels of social support, especially for females, indicate a need for improved social support to increase physical activity levels and combat obesity among colonias children. The observed social support discrepancies between males and females may be a reflection of social norms that need to be addressed in a culturally sensitive manner. Future research is needed to further examine gender differences and the role of differing perceptions of support by mothers and children.

273 Predictors of perceived competence in physical activities (PCPA) among Swedish adolescents, a longitudinal study

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Introduction: An individual's perceived competence in physical activities (PCPA) has been proven a powerful predictor for future physical activity. However, the perception of one´s competence may differ over time, especially during childhood and adolescence but also between types of physical activities or tasks. Further, the predictors for PCPA are largely unknown, but overweight status and gross motor skills have been proposed as candidates. We sought to identify predictors for general PCPA in Swedish adolescents, and PCPA in three highly prevalent forms of physical activities in Swedish physical education (PE), namely swimming, aerobics and soccer.

Methods: Body mass index-based overweight status (normal weight vs overweight/obese, according to Cole et al.) and gross motor skills (based on the Tidén-Nyberg test) were measured in 352 Swedish children (160 girls and 192 boys) at baseline (age 10). Immigration status (self-report) and average community household income level (quartiles, register obtained) at 10 yrs were used as possible socio-cultural confounders. Data on educational status of the PE teacher responsible for education at age 10 yrs was obtained by self-report from the teachers. Self reported data on general PCPA and PCPA in soccer, swimming and aerobics at 16 yrs was obtained at follow-up and predictors for PCPA was identified using logistic regression.

Results: Being overweight or obese (OR: 2.27, 95% CI: 1.18–4.38) and attending PE classes with unqualified teachers (OR: 2.41, 95% CI: 1.36–4.27) at age 10 yrs were both risk factors for low general PCPA a age 16 yrs. Concerning the selected activities, being overweight or obese at age 10 yrs predicted low PCPA in swimming (OR: 2.67, 95% CI:1.31–5.46) but not in the other activities at age 16 yrs. Poor gross motor skills at age 10 yrs predicted low PCPA at 16 yrs only in soccer (OR:1.48, 95% CI: 1.02–2.13). Female gender (OR: 0.21, 95% CI: 0.13–0.38), and higher socioeconomic status (OR: 0.71 per quartile, 95% CI: 0.55–0.92)at age 10 yrs were both found to be associated to lower risk for low PCPA in aerobics.

Discussion: Overweight status and educational status of the PE teacher both affect the risk of having low general PCPA. The effect of gender, overweight status, gross motor skill and socio-economy seem to differ between specific activities, indicating that PCPA may be task specific in adolescents. These results may serve as background when planning physical activity interventions. Further, they stress the need for professional PE teachers to teach in younger classes.

274 Increasing specificity to correlate research: Can we improve the prediction of children's context-specific physical activity?

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Introduction: Lunchtime and after-school are two important periods of the day where children have an opportunity to engage in physical activity (PA). However, evidence shows that children are not engaging in adequate levels of PA during these periods. It has been proposed that increasing the specificity of correlate research might improve prediction and our understanding of PA occurring in specific contexts. The purpose of this study was to identify the predictors of lunchtime and after-school PA and compare the effectiveness of a context-specific versus a generic questionnaire in predicting children's lunchtime and after-school PA.

Methods: Cross-sectional data was collected from 423 South Australian children aged 10–13.9 years (200 boys; 223 girls). PA was measured using accelerometers. Context-specific correlates were assessed using a purposively developed Youth Physical Activity Survey for Specific Settings (Y-PASS) and the LEAP II questionnaire was used as the generic correlate measure. Multivariate analysis using Correlated Component Regression for linear regression models was conducted to derive predictors of context-specific PA and to determine the percentage of variance explained by the prediction equation. R^2 scores for the Y-PASS and LEAP II models were statistically compared using tolerance intervals.

Results: In general, the context-specific questionnaire outperformed the generic questionnaire in explaining the variance in PA for boys at lunch time (25% variance explained vs 8%), for girls at lunch time (17% vs 6%), for boys after school (20% vs 11%), but not for girls after school (7% vs 23%). Common predictors identified across both the Y-PASS and LEAP II questionnaires included younger age (boys) and PE enjoyment (girls) for lunchtime PA and perceived behavioural control (boys and girls) for after-school PA. Examples of significant context-specific predictors included "I like to walk around at lunchtime" (β=-0.32, boys; β=-0.11, girls), "Our school play area has painted lines on the ground to help me be active" (β=-0.23, boys), "I can still be active at lunchtime even if I am wearing my school uniform" (β=0.07, girls), behavioural attitudes and beliefs about after-school organised sports and non-organised activities (β=0.06, boys), and "I have enough time to do an organised sport or activity after-school" (β=0.04, boys).

Discussion: The prediction of context-specific lunchtime and after-school PA was better using a context-specific correlate questionnaire rather than a generic questionnaire, except for girls' after-school PA. Such evidence will assist in developing future initiatives targeting the promotion of PA in the lunchtime and after-school specific contexts.

275 | Action Schools! BC: A whole-school physical activity model to increase children's physical activity

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Introduction: The importance of physical activity (PA) for health is widely known; however, the prevalence of PA is low in children, both in Canada and worldwide. Schools may be effective intervention sites given their potential to impact a large number of children from a range of ethnic and socioeconomic backgrounds. We developed a school-based PA model (Action Schools! BC) that was evaluated in a cluster randomized controlled trial (for efficacy) in 2003–2004. Based on positive results, the model was rolled out across the province of British Columbia, Canada. Thus, we had the unique opportunity to evaluate its effectiveness following its provincial dissemination.

Purpose: To evaluate the effectiveness of Action Schools! BC at increasing PA during provincial dissemination.

Methods: Action Schools! BC is a flexible, whole school PA model delivered by generalist teachers. Thirty schools (n=1529 children, aged 8–11 years) were randomly assigned to intervention or control group and assessed across two school years. We measured PA via accelerometry in a subgroup of children (n=629) at baseline (Fall 2005) and at the end of each school year (Spring 2006 & 2007). We used age–specific cutpoints to classify activity as moderate-to-vigorous (MVPA), light, or sedentary. We also categorized MVPA according to bout length (0–5, 5–10, 10–20, and ≥20 min).

Results: At baseline, girls were less active (MVPA: -18.4 min/day (95% CI -25.7, -11.1)) and more sedentary (+17.5 min/day (95% CI 7.5, 27.6)) than boys. Light activity was similar between girls and boys at baseline. At the end of the first school year, girls attending intervention schools accrued more MVPA than girls attending control schools (+13.5 min/day; 95% CI 2.9, 24.1). However, this difference did not persist across year two. There was no between-group difference in boy's MVPA at the end of the first or second school year. There was no effect of the intervention on sedentary time or light activity in either girls or boys.

Discussion: School-based implementation trials speak to real world challenges confronting the school community, especially teachers. We view our results from year one as promising, given the higher volume of MVPA accrued by girls at intervention vs control schools. However, year two results suggest that a closer look at teacher and school compliance to sustained delivery of the intervention is warranted. The lack of effect on boy's MVPA may be due to generally higher levels of PA in boys compared with girls.

276 | Strategies to promote children's school based physical activity: Transform-Us! Mid-intervention findings

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Many children engage in suboptimal levels of PA despite the associated health risks. Schools (n=20) in the Transform-Us! program were randomized to one of four intervention arms that target increases in children's PA (PA), reductions in sedentary behavior (SB), both behaviors (SB+PA) or control current practice (C). This examination focuses on the PA promotion strategies employed in the PA and SB+PA arms compared with the C arm. To promote children's PA each PA and SB+PA class was provided with sporting and circus equipment; asphalt line markings were installed at the school; and teachers were asked to encourage PA. Grade 3 children at participating schools were invited to take part in evaluation assessments including the completion of a self-report survey. Findings from the PA promotion strategy questions at baseline (Feb–June 2010), and T2 (Nov/Dec) are reported here. Children (n=425, 55% female) were asked to respond (yes/no) to five items asking about social support for PA from their class teacher, which were then summed to create a 'teacher social support' scale. Children were also asked to indicate if 'there are markings on the walls or on the school playground to help us play games' (perceived availability of line markings); if they are 'allowed to use school sports equipment during recess and lunch breaks' (perceived accessibility of sports equipment); and how much they like 'the areas to play in at school' using a 5-point Likert scale (perceived school environment). Between baseline and T2, teacher social support increased in both PA (1.7[1.4] vs 2.1[1.4]) and SB arms (1.9[1.4] vs 2.4[1.4] but declined in C (2.0[1.4] vs 1.7[1.5]). For all three arms, increases were seen in perceived availability of line markings (PA: 53.2% vs 69.4%; SB+PA: 59.3% vs 71.4%; C: 60.0% vs 69.8%); perceived accessibility of sport equipment (PA: 87.7% vs 97.2%: SB+PA: 80.7 vs 94%; C: 85.4% vs 97.6%); and perceived school environment (PA: 1.44[0.9] vs 1.42[0.8]; SB+PA: 1.5[0.8] vs 1.6[0.7]; C: 1.4[0.9] vs 1.5[0.7]) between baseline and T2. All findings were significant at a 1% probability level. At the mid-intervention time point, findings suggest that PA strategies have increased perceived availability of line markings, accessibility of sport equipment, and perceived school environment in children allocated to the PA and SB+PA arms. However, there were also unexpected increases in the C arm for three out of four items. Post-intervention findings will add to these preliminary findings.

277   Improving health-related fitness in children: The Fit-4-Fun randomized controlled trial

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Introduction: *Physical* fitness is a strong predictor of health status in youth. However, a large proportion of children do not participate in sufficient physical activity of moderate-to-vigorous intensity to achieve the associated health benefits. The aim of this study was to evaluate the impact of a multi-component school-based physical fitness education intervention (Fit-4-Fun) on the physical fitness and activity levels of primary school children. Methods: The study involved a group randomized controlled trial with a wait-list control group. Four primary schools in the Hunter Region, NSW, Australia, were randomised by school into the Fit-4-Fun intervention or the control conditions. The study sample included 226 primary school children aged 10–13 years (mean age 10.72 years±0.6, 47.8% male). Fit-4-Fun was a multi-component school-based physical fitness education intervention delivered as part of the Health and Physical Education (HPE) curriculum and targeted fitness improvements. The program utilised a range of evidence-based behavior change strategies to promote and support physical activity of adequate intensity, duration and type, needed to improve health-related fitness. The 8-week program includes three specific components based on the Health Promoting School Framework, a HPE curriculum program (1x60min/week), a daily break-time activity program (recess/lunch) and a home fitness program (3x20min/week). The control group participated in their usual weekly 60min HPE lessons. Cardio-respiratory fitness (CRF) was the primary outcome and secondary outcomes included body composition, muscular fitness, flexibility and physical activity. Assessments were taken at baseline, 3- and 6-month follow-up, to determine changes in health-related fitness and physical activity levels.
Results: After 6-months, significant intervention effects were evident in cardio-respiratory fitness (beep test adjusted mean difference [95% CI]=1.14 levels [0.74, 1.55]), body composition (BMI adjusted mean difference [95% CI]=-0.96 kg/m^2 [-1.42, -0.5] and BMI z-score adjusted mean difference [95% CI]=-0.47 z-scores [-0.70, -0.25]), flexibility (sit & reach adjusted mean difference [95% CI]=1.52cm [-0.65, 3.68]), muscular fitness (sit ups mean difference [95% CI]=0.62 stages [-0.97, -0.26]) and physical activity (steps adjusted mean difference [95% CI]=3253 steps/day [1776, 4730]). There were no group by time effects for three measures of muscular fitness (basketball throw, push-ups and standing jump).
Discussion: The Fit-4-Fun program was successful in improving several measures of fitness in primary school-aged children. These findings suggest that well designed HPE programs that promote vigorous activity within and beyond the school day have the potential to improve health-related fitness in children.

278   Applicability of a pedometer based physical activity program in the primary school environment

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Introduction: Approximately 68% of Australian children do not engage in sufficient levels of physical activity. Considering the health benefits of regular physical activity, there is a need to implement interventions specific to this population. The primary school environment provides an ideal setting to promote physical activity to children. 10,000 Steps is an established physical activity health promotion project which aims to raise awareness and increase participation in physical activity. It is being increasingly used in primary schools to promote physical activity despite being originally designed for adults. Therefore, the purpose of this research was to determine the applicability of a pedometer based physical activity program (10,000 Steps) within the primary school environment.
Method: Three primary schools were invited to implement a 10,000 Steps program as a pilot study. At the conclusion of the program semi-structured interviews were conducted with teachers (N=10) and focus groups were conducted with students at each primary school (N=18). Participants were asked to discuss topics relating to the appropriateness and sustainability of the 10,000 Steps program and to provide recommendations for further use in this population. Each interview and focus group was audio-taped and the audio was transcribed and thematically analysed.
Results: Four major themes were identified regarding the implementation of 10,000 Steps in a school setting: 'pedometers', 'curriculum inclusion', '10,000 Steps challenge and resources', and 'motivation and enthusiasm'. Pedometers were reported to be a great motivator for children to participate in physical activity; however issues with falsely accumulating steps and tracking pedometers were raised. The teachers strongly highlighted the benefits of integrating the physical activity program into the school curriculum and that specific resources should be made for primary schools.
Conclusion: The outcomes from this study indicate that a pedometer based physical activity program such as 10,000 Steps program is applicable for the primary school environment. However, the program needs to be adapted to the primary school environment to make it more relevant and sustainable in this population. Required adaptations will be discussed including the revision of the step based targets for physical activity.

279   The GLAMA (Girls! Lead! Achieve! Mentor! Activate!) and BLAST (Boys! Lead! Activate! Succeed Together!) peer leadership and physical activity program: A stealth intervention

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Introduction: Within school settings, the effectiveness of stealth interventions that promote one outcome whilst designed to illicit additional outcomes warrants further investigation. Disguising the primary aim of promoting physical activity may be a successful avenue for sustainable school-based interventions. This study aimed to evaluate the efficacy of the GLAMA (Girls! Lead! Achieve! Mentor! Activate!) and BLAST (Boys! Lead! Activate! Succeed Together!) peer leadership and physical activity program: a primary to secondary school transition program aimed to increase leadership opportunities and physical activity.
Methods: Forty three Year 10 (Y10) peer leaders and 160 Year 7 (Y7) students from two state secondary schools (control and intervention) in Victoria, Australia participated. The primary outcomes were change in Y10 leadership self-efficacy and Y7 school connectedness. The group-by-time interactions of the primary and secondary outcomes were investigated with repeated measures analysis. In addition, regression analyses were performed to assess the relationships between Y7 school connectedness and social self-efficacy, social connectedness, physical activity self-efficacy (PASE) and bullying. The relationship between general self-efficacy, PASE, physical and psychosocial health to leadership self-efficacy in Y10 students were also measured.

Results: There were significant decreases in Y7 school connectedness for both the intervention (p=0.002) and control (p=0.015) schools, but were not significant between schools (p=0.735). Change (post-pre) in social self-efficacy, social connectedness, PASE and bullying experiences (r=0.551, p<0.001) contributed 29.2% to the variance in Y7 change in school connectedness. In the intervention school, 43.2% of variance in change in school connectedness was attributable to change in social self-efficacy, social connectedness, PASE and bullying (r=0.670, p<0.001). Additionally, Y7 PASE increased significantly in the intervention school (p=0.027), but not the control school (p=0.110); or between schools (p=0.335) following the GLAMA and BLAST program. Leadership self-efficacy in Y10 leaders did not significantly change following the intervention, however, there were significant group-by-time interactions (p=0.016) for PASE. Baseline general self-efficacy (r=0.221, p=0.025) and change in general self-efficacy (r=0.361, p=0.001) were the only predictors of change in Y10 leadership self-efficacy.

Discussion: The GLAMA and BLAST program provides an insight into school connectedness and leadership self-efficacy during school transition. Interestingly, PASE significantly improved in the Y10 leaders compared with the control school, thus demonstrating that although leadership opportunities were promoted the desired secondary outcome of improving PASE was achieved. School connectedness decreased in both schools suggesting this is still something that schools need to address during this challenging transition period.

280 Review of recess-based interventions on physical activity levels of school aged children and adolescents

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Introduction: The benefits of physical activity to maintain optimal health and wellbeing in children and adolescents are undisputed. The school environment offers opportunities for children to be physically active. The aim of this review was to systematically examine the effects of recess-based interventions on the physical activity levels of school-aged children and adolescents.

Methods: Two authors independently searched the literature using the same search strategies to identify papers reporting interventions which promote playground physical activity during school recess and lunchtime periods. Methodological quality was assessed using an adapted eight item assessment scale. The effects of the interventions were assessed with a rating system used in a recent review of interventions in youth.

Results: The search originally retrieved 2265 articles. Nine published peer reviewed journal articles met the inclusion criteria for this review. Eight studies used randomised controlled trials and one was a controlled trial, though none of the studies adequately described the randomisation process. Three studies demonstrated high methodological quality (33%). None of the studies adequately reported the randomisation procedure or used power calculations. Few studies reported potential confounders and three studies had less than a six week follow-up. Seven studies demonstrated a positive intervention effect on children's physical activity levels, with three reporting statistical significant increases and two significant decreases in recess physical activity. The summary of the levels of evidence for intervention effects found inconclusive results for all intervention types, though promising strategies that require further investigation were identified.

Discussion: A strength of all of the studies was the use of objective measures to assess physical activity outcomes, though several criteria were consistently absent from the studies. The summary of the levels of evidence for intervention effects found inconclusive results for all intervention types. This could be largely due to the small number of large high quality studies. The use of methodological checklists as a guide when designing intervention research could assist to improve intervention methodological quality in school recess physical activity research. There is an urgent need for higher quality intervention research to strengthen published findings to inform recess physical activity playground interventions. Intervention research is needed in adolescents due to the absence of school recess intervention research in this population.

281 Physically active at school – It's child's play. The Sydney Playground Project

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Introduction: This research was part of a larger study known as the Sydney Playground Project (SPP), which aims to increase physical activity and social skills in primary school children by means of a low-cost innovative playground intervention. For many children pure sports interventions are not the answer, hence this study engaged children's playful nature to promote physical activity and social interactions through play. The purpose of this part of the study was to study the effect of the intervention on physical activity.

Methods: 214 (115 boys, 99 girls) 5–7 year old (mean: 6.0 years at baseline) children from 12 Sydney primary schools participated in this CRCT. Baseline data were collected prior to a 14-week playground intervention or recess as normal, followed by post-testing during the last week of intervention. The playground intervention: unstructured items, consisting of or made from recycled material (tyres, balance beams, crash mats) introduced to the school playgrounds for the children to play with freely. Physical activity was measured by accelerometers during school days (0900–1500 for 5 consecutive days at baseline and post-test. Height, weight and BMI were measured. Mixed-effect ML regression (STATA/IC 12), taking clustering and repeated measures into account were used to examine net change from baseline values between groups.

Results: Over time, MVPA increased (1.82 min, p=0.006), and sedentary time decreased (-2.13 min, p=0.01) significantly during recess in the intervention group, however effect sizes were small. Activity increased independent of BMI. Anecdotally, schools and children were enthusiastic about the playground intervention, quoting less playground demeanour and more fun.

Discussion: This play intervention has the potential to be a cost-effective way to engage children in increased physical activity and social interactions and can potentially be implemented in a large range of settings.

282   Uptake and effects of a new sport program at a school in a disadvantaged locality

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Introduction: On any day, ~55 % of 11–13-year-olds play some kind of sport. However, recent research has shown that there are demographic effects on the activity patterns of children, with youth from lower socio-economic and single-parent family structures less likely to participate. This study investigated the uptake by 11–12 year olds in a disadvantaged locality of a new sport involving a modified, low-risk form of boxing (Box'Tag), and assessed the outcomes of their involvement.

Methods: All grade 7 students (N=146) from an urban Queensland primary school were invited to participate in an 8-week, lunchtime sport program consisting of 3 sessions per week. Prior to commencement of the study, senior teaching staff dichotomized all children as either "at risk" or "not at risk" of social disengagement based on each child's observed behaviour. In July 2011, 35% of children (51/146) volunteered to participate. A total of 47 of the 51 volunteers (92%) completed the program and on average attended 70% of the sessions. No injuries resulting from participation occurred. The Brunel Mood Scale (BRUMS) and the Strengths and Difficulties Questionnaire (SDQ) were administered at baseline (T1), 4 weeks (T2), 8 weeks (T3) and 12 weeks (T4). Participants completed a shuttle run test at T1 and T3.

Results: In contrast to previous research in which participation in voluntary sport programs was typically higher among boys, the proportion of males and females nominating for this study was not significantly different to that of the entire grade ($\chi2$=0.75, p=.39). Whereas 27% (40/146) of grade 7 children were identified as "at risk" of social disengagement, 43% of the volunteers for the program (22/51) were in this category, which was significantly more than expected ($\chi2$=68.0, p<.001). The Box'Tag group showed greater improvement in shuttle run performance than controls (F=4.64, p=.038, d=.69). No significant differences were found for BRUMS or SDQ scores, although the Box'Tag group reported more positive trends than controls for total mood disturbance from T1 to T2. Subjective reports from teachers indicated that several students showed substantial improvements in general behaviour.

Discussion: The findings suggest that this new sport program appeals to school age children of both sexes, specifically engages children at risk of social disengagement, may have positive effects on aerobic fitness and mood, and for some students may yield overall behavioural benefits.

283   After school physical activity intervention: Changes and challenges over a three-year-period

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Background: Researchers report declining trends in PA among adolescents. Those living in low SES environments are also hampered by additional constraints to be active. This study aimed to determine the PA levels and patterns of adolescents after participating in an after school physical activity (PA) intervention study over a 3-yr period.

Methods: 309 black adolescents (158 boys, 211 girls) from a disadvantaged environment in South Africa, (M=14.9±1.4 years boys; 14.3±1.4 years girls) participated in the study. An intervention group participated in an after school health related PA intervention (N=282) for two years, without any PA intervention in the 3rd year of the study, and was then compared to a control group (N=87) who received no PA intervention. Final measurements were taken at the end of the 3rd year of the study when no PA intervention took place. Multi-level modelling (repeated measures analysis of co-variance (ANCOVA) and repeated measures analysis of variance (ANOVA) over time, with a Bonferroni post hoc test were used to analyse the data. Week and weekend PA levels and patterns were analysed separately.

Results: The results showed similar mean PA levels among the two groups of boys (p>0.05) during baseline, with a significantly higher mean level of PA after 3 years in the intervention group (p<0.05). Baseline measurements for girls indicated statistically significant mean differences during the week and the weekend, although these differences were not significant during the final measurements three years later. Boys and girls (excluding the intervention group of boys), showed a tendency of declining mean PA over the 3 year period. The PA intervention showed a stabilising effect on the mean PA levels and contributed to more active choices among the intervention group of boys, especially over weekends.

Conclusions: Participation in similar PA interventions is recommended for adolescent boys, with adaptations to the content of such PA programs for girls. Such interventions should however be part of the school day, because adolescents living in disadvantaged environments have among other various barriers after school to overcome to be active, which should be addressed by health practitioners to improve the health benefits of such programs.

284   Can physical education improve insulin resistance in healthy boys and girls? The LOOK study

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Introduction: With low physical activity (PA) and cardiorespiratory fitness (CRF) in childhood being risk factors for insulin resistance (IR) and type 2 diabetes in adulthood, physical education (PE) in schools provides an ideal opportunity to introduce an early preventative strategy. However there is no evidence to date that primary (elementary) school-based PE can improve IR.

Methods: Participants in this 4-year cluster-randomized intervention study were 229 boys and 239 girls in grade 2, initially 8.1 (SD 0.31) years, from 29 primary schools. The curriculum prescribed 150 min/week PE from general classroom teachers, but in 13 schools 100 min/week was replaced with two classes of an intervention program conducted by specialist PE teachers from the not for profit Bluearth Foundation. The remaining schools formed the control. The System of Fitness Instruction Time (SOFIT) was used to compare class activities. Measurements in grades 2, 4 and 6 included fasting blood glucose and insulin for calculation of the homeostatic model of insulin resistance (HOMA-IR), percent body fat (%BF, DXA), PA (7 day pedometers and accelerometers), CRF (multistage run) and pubertal development (Tanner stage self-assessment) and socioeconomic status.

Results: With no group differences at baseline, by grade 6 the intervention had lowered IR by 14% (95% CI 1–31) in the boys and 9% (5–26) in the girls. Also by grade 6, the percentage of children with IR greater than 3, a published cut-off point for paediatric metabolic risk, was lower in the intervention (boys 12%, girls 32% combined 22%) than in the control group (boys 21%, girls 40%, combined 31%), with p=0.03 for the combined data. Intervention teachers included more specific fitness work than control classes, mainly in the form of muscular strength and endurance (7 min v 1 min, p<0.001) associated with dynamic and static postural challenges. Intervention classes also involved more moderate and vigorous physical activity (17min v 10 min, p<0.001), but there was no evidence of any four-year intervention effect on daily steps, CRF or %BF.

Discussion: By the age of 12, IR had increased to levels of concern in more than a quarter of these apparently healthy children, but well-designed PE attenuated the increase. Given that attention to risk factors during childhood and adolescence is likely to reduce the risk of chronic disease in adults, our data show that primary school PE can play an important role in early preventative medicine.

285 **Short-interval intracortical inhibition is not affected by varying the complexity of an isometric task in biceps brachii muscle**

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Introduction: There is considerable evidence that the excitability of neural networks involved in motor control is modulated in a task-dependant manner. At the level of the primary motor cortex (M1), corticomotoneurons have been shown to be more active during complex tasks. These changes in neural excitability are an adaptive response to the requirements of the motor task. However, the effect of varying the difficulty or complexity of the same task on the excitability of neural circuits is less understood, despite the importance of task-complexity in the rehabilitation of fine motor skill. The purpose of this study was to determine whether task-dependant differences in motor cortical network excitability occur when varying the complexity, via visuomotor feedback of an elbow flexion task.

Methods: Focal transcranial magnetic stimulation (TMS) was used to measure corticospinal excitability and short-interval-intracortical inhibition (SICI) of the contralateral biceps brachii (BB) in 10 healthy subjects, performing two isometric tasks of differing visuomotor demand at 5, 20 & 40% of maximum voluntary contraction force (MVC). To produce two tasks with differing visuomotor demand, the scaling of the on-line torque trace was modified.

Results: Corticospinal excitability did not differ between tasks (p >0.05), did differ between torque levels (p<0.05) and there was no task x torque level interaction effect (p >0.05). SICI did not differ between tasks (p >0.05), did between torque levels (p<0.05) and there was no task x torque level interaction (p >0.05).

Discussion: This study shows that the excitability of intracortical neural networks namely, intracortical inhibition; is reduced during increasing levels of torque production. The present findings demonstrate the influence of target torque levels on disinhibition of corticospinal neurons (i.e. increase M1 excitability), modulated by neurons responsible for SICI.

Conclusion: This study has demonstrated that intracortical inhibition is reduced during graded voluntary muscle action, which suggests that force production is modulated by neurons confined to the M1. Interestingly, the level of inhibition is not altered when varying the difficulty of the same task. This finding, which is in contrast to findings on lower arm musculature, suggests that SICI is more markedly modulated by force gradation than by task visuomotor demands at least in the BB muscle. These findings have important clinical implications in patient populations who have increased levels of intracortical inhibition.

286 **Brain activation declined during finger tapping in the later period of Ramadan fasting**

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Introduction: The effect of fasting on physical work capacity and sports related performances has been extensively investigated (Kirkendall, et al. 2008; Zerguini, et al. 2008). While various peripheral underlying mechanisms has been proposed to limit physical work capacity during Ramadan fasting, little is known if central factors such as brain activation would present similar detrimental effects. This study was designed to examine the effect of Ramadan fasting on brain activation during finger tapping task via the functional magnetic resonance imaging (fMRI) technique.

Method: Nine healthy right-handed participants volunteered for this study. All subjects provided consent to undergo fMRI testing during the early (EF: day 8–12) and later (LF: day 22–25) period of Ramadan fasting. Each subject were instructed to tap the index finger at a steady pace within 10 blocks of "tapping-rest" paradigm as previously described (Bell et al. 2006). Subjects were randomly assigned to morning (between 0800 to 1000) and afternoon (between 1500–1700) testing sessions within each EF and LF period. Brain activation, reported as percent signal change, was analyzed using statistical parametric mapping (SPM). Prior to the fMRI test, each subject's body weight and blood glucose level were recorded.

Result: The main finding of this study was brain activation declined during cognitive task in the later period of Ramadan fasting. During the afternoon testing session, the percent signal change in the left pre central gyrus (PCG) region was significantly lower in LF as compared with the EF period (0.232±0.117 vs 0.340±0.095; p=0.014, respectively). Similarly, a lower percent signal change was recorded in the right region of the PCG during the LF as compared with the EF period in both morning (0.336±0.184 vs 0.550±0.173; p=0.021, respectively) and afternoon (0.256±0.102 vs 0.460±0.110; p=0.001, respectively) testing sessions.

Discussion and conclusion: This study highlighted the detrimental effect of fasting on cognitive task as fasting progresses into the later period of Ramadan. The current finding led us to proposed that reduced physical work capacity experienced during the later period of Ramadan fasting is associated with central factor. Thus, leading us to believe that physical activity or competitive sporting events organised in the later part of Ramadan may restrict participation from fasting individuals. Future studies is needed to formulate strategies to improve tolerance to physical ability during the later part of Ramadan fasting.

287 Time-course changes in motor cortical excitability following low level constant transcranial direct current stimulation

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Introduction: Transcranial direct current stimulation (tDCS) is a non-invasive technique that has been found to modulate the *excitability of* neurons within the brain. The polarity of the current applied to the scalp determines the effect of tDCS on the underlying neural tissue. Anodal-tDCS increases excitability, whereas cathodal-tDCS decreases it. However, it remains unclear as to what amplitude of direct current results in the greatest increases in human primary motor cortex (M1) excitability. Therefore the aim of the present study was to establish the time-course effects of different amplitudes of anodal-tDCS on M1 excitability and inhibition.

Methods: In a cross-over design, with a one-week wash-out period, 8 participants (4 male & 4 female, age range 21–36 years) were exposed to 10 minutes of anodal-tDCS at 0.8, 1.0 and 1.2 mA. The applied current was induced by a saline-soaked pair of surface sponge electrodes (25cm^2) delivered by a NeuroConn DC stimulator. Focal transcranial magnetic stimulation (TMS) was used to measure M1 excitability and short-interval-intracortical inhibition (SICI) of the contralateral extensor carpi radialis brevis muscle (ECR) at baseline, immediately post anodal-tDCS and every 5 minutes up to 30 minutes following the removal of tDCS.

Results: M1 excitability was elevated in all conditions following tDCS with greatest increases at 15–25 minutes. Of the three conditions, 0.8 mA demonstrated significant increase in M1 excitability with peak increases of 81%, 85%, 89% at 15, 20 and 25 minutes respectively ($P<0.05$). SICI was observed in both 0.8 mA and 1 mA conditions with similar time-course patterns. Significantly reduced inhibition between 28–37% ($P<0.05$) was found at all time points immediately following tDCS until 30 mins.

Discussion: Two of the three tDCS conditions (0.8 and 1.0 mA) significantly enhanced M1 excitability and reduced SICI. Further, low-level anodal-tDCS (0.8 mA) provided the greatest effect on enhancing M1 excitability and reducing SICI. The effects of anodal-tDCS were probably induced by modifications in synaptic plasticity between neurons, demonstrating short-term potentiation. This data demonstrates that transcranial electrical stimulation using weak currents may be a viable clinical tool to modulate cerebral excitability in a non-invasive, painless and focal way in the rehabilitation following brain injury.

288 A novel approach to enhancing muscular strength and function: A pilot study using transcranial direct current stimulation

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Introduction: Transcranial direct current stimulation (tDCS) is a neuromodulation technique that provides benefits for motor function. When low level electrical current is applied to the scalp, the resting membrane potential of the underlying cortical neurons is altered, influencing depolarisation and synaptic efficacy. Acute application of tDCS can produce immediate increases in skill performance, muscular strength, and endurance. While some studies have noted a cumulative effect following acute session delivered across several days, the application of tDCS during strength training programs has not been investigated. Therefore, the aim of this study was to assess changes in muscular strength and neurological function following three weeks of training the wrist extensors with simultaneous application of tDCS.

Methods: 12 volunteers were randomly allocated to a control group (CONT), a sham tDCS training group (SHAM) or a tDCS training group (tDCS). Outcome measures included dynamic strength (1RM wrist extension), muscle thickness (measured with ultrasound), corticospinal excitability and cortical inhibition (measured with transcranial magnetic stimulation). The SHAM and tDCS groups underwent training of the wrist extensors (4 sets of 6–8 repetitions 3 x per week) at 80% 1RM intensity for 3 weeks. The CONT group did not train. Anodal tDCS (2mA) was applied to the motor cortex for 20 minutes (tDCS group only).

Results: Dynamic strength increased significantly ($p<0.05$) for both the tDCS (18.2%) and SHAM (10.4%) groups following the intervention, but not the CONT group. The amplitude of motor evoked potentials (MEPs) obtained at motor threshold increased for the tDCS group (30.8%) but not the SHAM (-15.2%) or CONT (0.2%) group. Maximal MEP amplitude increased for the tDCS (14.0%) and SHAM (3.4%) groups but not the CONT (-2.1%) group. These findings did not produce statistical significance, but the tDCS group displayed effect sizes of 0.74 and 0.45 respectively. No significant changes in muscle thickness were detected.

Discussion: Results from this pilot data suggest a potential for utilizing tDCS with training programs to further enhance strength gains and neurological adaptation. Testing continues and power analyses have indicated that significant findings will emerge with increased sample size. This indicates that the use of tDCS in conjunction with training sessions may be of benefit to athletes, during rehabilitation or in any situation where maximal strength and performance gains are desired. Future research must assess the performance benefits of tDCS when utilized in trained athletes, among different muscle groups, and when delivered during rehabilitation programs.

289 Effect of transcranial magnetic stimulation protocol on recruitment curve parameters

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Introduction: The construction of transcranial magnetic stimulation (TMS) recruitment curves (RCs) involves stimulation over the target muscle representation in the primary motor cortex, with stimulus intensities beginning below an individual's active motor threshold (AMT), and increasing in even increments until a plateau is observed in the amplitude of the motor evoked potential [MEP]. A sigmoidal equation is then fitted to the data, which provides four key parameters including minimum, slope, stimulus intensity at which MEP amplitude is 50% of maximum (V50), and plateau value (maximum). However, there are variations in protocols used to collect data for RCs within existing literature, thus the purpose of this study was to compare two of these common protocols.

Methods: Nine participants were involved in a cross over study with two conditions one week apart. RCs were constructed for the extensor carpi radialis muscle of the right forearm using two different protocols. Protocol 1 involved increasing the stimulus intensity in intervals of 5% of the maximum stimulator output (MSO) from a level of 10% of MSO below AMT until there was no further increase in MEP amplitude (plateau). Protocol 2 involved increasing the stimulus intensity from a level of 90% of AMT in increments of 5% of the individuals' AMT until responses plateaued. Five stimuli were delivered at all intensities in each protocol.

Results: This study demonstrated a significant difference between testing protocols for slope ($p=0.002$; ES=1.877) and V50 ($p<0.001$; ES=8.490). However, there were no differences in the maximum ($p=0.251$; ES=0.11) or minimum value ($p=0.071$; ES=0.72) of the curves between the two protocols.

Discussion: These findings show that variations in testing protocols result in different values for slope and V50 of the RC. Specifically, protocol 2 appears to be more sensitive in detecting slope and V50. Slope provides a measure of the neurophysiological strength of intracortical and corticospinal connections, and the V50 is an indication of threshold characteristics of corticospinal cells and spinal alpha motor-neurons. Therefore, protocol 2 offers more meaningful results, which may be an important consideration in studies with multiple conditions, groups or time-points. This protocol also negates issues arising from variations in AMT between participants within a group or condition since stimulus intensities are determined relative to each individual's AMT, thus results are more comparable and RCs can be constructed to represent group data.

290 Relationship between fatigue and EMG activity in triceps surae during isometric plantar flexion

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Introduction: Many studies have focused on mechanisms of fatigue and motor unit recruitment patterns of muscles of the triceps surae, however, few studies have investigated the relationship between these two factors during isometric plantar flexion. Therefore, the purpose of this study was to investigate the relationship between central and peripheral fatigue during sustained maximal voluntary contraction (MVC) and the EMG activity of muscles of the triceps surae during ramp contraction to MVC.

Methods: The present data consist of 10 male subjects (average age 35 years) who performed two protocols randomly on different days. Protocol 1 comprised a 60 sec maximal voluntary isometric plantar flexion of the triceps surae while Protocol 2 consisted of a 15 sec ramp contraction to MVC. Both protocols were performed with the knee and ankle joints fixed at 90 and 0 degrees flexion, respectively. Surface electromyographic (EMG) activity was recorded from the soleus (Sol) and medial and lateral gastrocnemius muscles (MG and LG) using miniature (5mm diameter pair, interelectrode distance 10mm) electrodes and 10mm diameter disk electrodes placed 30 to 40 mm apart on the bellies of the respective muscles. In analysis, root-mean-square (rmsEMG) break points (BP), defined as the point of change in the force slope versus rmsEMG, of the three muscles during ramp contraction were determined for each subject. The relationship between ramp BP and the average rate of force decline from the fatiguing contraction was investigated.

Results: A correlation between the average rate of force decline during sustained MVC and the BP of the MG during ramp *contraction* was found (P<0.05). No relationship was *found* between Sol and LG ramp BP and sustained MVC average rate of force decline.

Discussion: BPs appear to reflect a change in motor unit recruitment and/or rate coding. These results suggest that the fatiguability of the triceps surae, during sustained maximal isometric contraction, and the recruitment pattern of the MG, during isometric ramp plantar flexion to MVC, are interdependent. They also highlight the importance of the MG in plantar flexion and point toward the need for specialised training programs for the triceps surae, especially the MG muscle.

291 Neuromuscular changes of abdominal and lumbar muscles following exercise for chronic non-specific low back pain

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Low back pain (LBP) is a prevalent physical, social and economic problem in developed countries. Past research has shown exercise to be a favourable treatment, but the most successful mode of exercise for LBP is unknown. This study compared 8 weeks of specific and general forms of exercise in chronic non-specific low back pain (CNSLBP) individuals. Surface electromyography (sEMG) was used to measure the abdominal and lumbar muscle onset times of the central nervous system (CNS) in a rapid unilateral arm movement. Self-reported disability and pain were also measured. It was hypothesised that there would be a decrease in muscle onsets following specific exercise and no change in onsets following general exercise. Neither hypothesis was supported, as neuromuscular changes were observed following both general and specific exercise with no between-group differences identified. Muscle onsets were found to change in the direction of the prime mover. This change was proposed to be an adaptation of the CNS to produce more coordinated neuromuscular responses following each intervention. Contrary to past research, no delays in muscle onsets in LBP were identified. Side-specific changes were also found in muscle onsets, with the contralateral side activating prior to the ipsilateral side. Disability was reduced after specific exercise only, but pain was reduced following both interventions. A possible rationale for the lack of treatment effects observed in this study includes common adaptations of the CNS underpinning the success of any form of appropriately prescribed exercise. Moreover, muscle onsets may be a neuromuscular marker of this adaptation. Future studies are required to replicate these findings and further investigate the relationship between pain and neuromuscular responses of the CNS.

292 | A hitchhiker's guide to assessing sedentary behavior among young people: Deciding what method to use

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Introduction: Sedentary behavior is a relatively new area in health behavior research and there is a need to expand the evidence-base among children and adolescents to better understand the epidemiology and health consequences, and identify effective intervention strategies. However, this evidence must come from accurate measurement using protocols and instruments that are also feasible. There are currently a wide variety of approaches being utilized to measure sedentary behavior in young people, and there is no guide detailing the characteristics and discussing the suitability of common measures to assist researchers and practitioners interested in measuring this behavior. Our objective was to provide a 'user's guide' for selecting an appropriate method to assess sedentary behaviors among children and adolescents.

Methods: Expert consensus among members of the Australasian Child and Adolescent Obesity Research Network's (ACAORN) Physical Activity and Sedentary Behavior Special Interest Group (www.acaorn.org.au). We developed decision flow charts to assist researchers and practitioners to select an appropriate sedentary behavior measure, identified attributes of each method and described five real-life scenarios to illustrate considerations associated with the selection of each method of measurement. The scenarios included a screen time intervention among preschoolers, a school-based intervention to reduce sitting during class-time among children, a treatment program for overweight/obese school children focused on reducing sedentary time, the primary prevention of adolescent screen time in a clinical setting, and an observational study to estimate the population prevalence of screen time among adolescents.

Results: The guide offers information about key attributes and considerations for objective (accelerometry; inclinometers; direct observation; screen monitoring devices) and subjective (self-report; parent report; and time use diaries/logs) approaches to assessing sedentary behavior. Attributes of instruments and other factors to be considered in the selection of assessment instruments include: population (age); sample size; respondent burden; method/delivery mode; assessment time frame; physical activity information required (data output); data management; measurement error; cost (instrument and administration) and other limitations.

Discussion: It is important that researchers, practitioners and policy makers understand the strengths and limitations of different methods of assessing sedentary behavior among young people, and have easy access to information about the most appropriate instrument/s to suit their needs.

293 | Validation of a novel, objective measure of occupational sitting

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Introduction: Few devices objectively measure sitting time. The aims of this study were to test the validity of a sitting pad (SP) to measure desk based sitting time and '*transitions*' to and from sitting, against camera derived direct observation; and to compare the data with those from two commonly used devices with inclinometers, the activPAL3™ (AP) and ActiGraph GT3X+ (AG).

Methods: Personal office chairs of employees (9 women, 4 men, mean age 30±6.5 years) were fitted with a SP and each participant wore an AG and AP. A camera was positioned to record chair based transitions during a prescribed sitting/standing and a free living protocol. Camera and device data were binary coded and mapped against the camera derived timeline (sitting=0; standing/moving=1). Mean sitting time and transitions were calculated for each device and intra-class correlations (ICCs) and mean differences between a) the SP and the camera and b) the AP, AG and camera, were compared.

Results: During the prescribed protocol, the smallest mean differences compared with the camera were for the SP (sitting time 0.30±0.21 minutes; transitions -0.46±0.78). For free living, both the SP and AP showed excellent levels of agreement with the camera for sitting time (0.999 and 0.990 respectively), while agreement between the camera and the AG was poor (0.257). For number of transitions, there was excellent agreement between the SP, AP and the camera (0.997 and 0.928 respectively), but the agreement between the AG and the camera was poor (0.033).

Discussion: The findings indicated that the SP and AP provided highly accurate measures of desk based sitting time and transitions in both the prescribed and free living protocols. In contrast, the AG inclinometer was unable to accurately measure sitting time or transitions in either protocol. The SP offers novel measurement opportunities to assess links between occupational sitting and health outcomes, and future potential as an intervention tool to reduce and break prolonged sitting at desks.

294 | Integrating self-report and device-based measures to measure workplace sitting time and sitting patterns

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Background: Recent reviews have noted the importance of collecting sitting time data from both device-based measures (to assess total sitting time and patterns of accumulation), and self-report measures (to capture important domain and behaviour-specific information). However, the practicalities of achieving this are unclear. We describe a method that we developed to combine self-report (diary) information with device-based (activPAL3™) data to assess bouts of sitting that occur at the workplace (a key setting for prolonged sitting) and outside the workplace, as part of a pilot study targeting workplace sitting reductions. We evaluate this method and compare it to the usual approach (i.e. without self-report data and assuming time at the workplace is 0800 or 0900–1700 Monday to Friday).

Methods: Using SAS 9.3, we combined the activPal™ events (bouts) files (which contain more information regarding pattern than epoch summaries) with diary-recorded work, sleep, and removal times. Due to *imprecision*, self-reported events (e.g. starting work) often occur during a monitored activity bout, so we classified bouts that occurred >=50% during the relevant self-reported period as being at the workplace (/not), sleep (/wake) and removed (/worn). We used Bland-Altman analysis to evaluate whether the derived monitor-corrected start and finish times adequately reflect participants' self-report times, and whether our process differs from using monitor data alone with assumed work times.

Results: In total, the study monitored 165 days of activity at the workplace from 41 full-time office workers from one organisation. Median (min, max) time of first starting, and last finishing work were 8:32 (06:49, 13:59) and 17:00 (12:00, 21:31). Excluding instances when the monitor was not worn, the monitor-corrected start and finish times agreed with self-report, with mean differences being small (0.0 and 1.3 minutes, respectively) and 95% Limits of Agreement (LoA) excluding meaningful differences (-4.1 to 4.2 and -5.1 to 7.8 minutes, respectively). Monitor-corrected start and finish times showed limited agreement with assumed times (mean difference [95% LoA]: 3.4 (-110.7, 117.5) for 08:30, -26.6 [-140.7, 87.5] for 09:00 and 2.0 [-139.6, 143.6] for 17:00).

Conclusions: Self-reported information can be easily integrated with device-based measures to assess workplace sitting and sitting patterns, with only negligible corrections required to match activPaL™ events files with self-report. Findings also suggested that even in an office-based setting, assumed work periods may inadequately separate workplace from non-workplace activity, and unintentionally attribute non-workplace behaviours, such as active transport, to the workplace.

295   Adult perception of sedentary behavior self-report assessment: Cognitive interviewing the SIT-Q

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Introduction: Currently, there are no rigorously tested, comprehensive questionnaires that assess adult sedentary behaviour across multiple domains. The SIT-Q was developed to address this need: it assesses sedentary behaviour across occupation, transportation, household and leisure-time domains.

Methods: Cognitive interviewing is an important, but often overlooked, step in questionnaire development. Qualitative attributes can substantially affect questionnaire validity and reliability. Cognitive interviewing can identify misunderstandings of text that could lead to response error and can provide insight into ways in which respondents comprehend, retrieve and formulate their answer. Three rounds of cognitive interviews were conducted with a convenience sample of 11 Canadian adults.

Results: Key themes identified by the cognitive interviewing process included: i) confusion about the use of the word "activity" to describe time spent sitting or lying down; ii) uncertainty about the concept of "double counting" time in different, but simultaneous activities; iii) difficulty separating out different workplace sitting tasks, as multitasking is common; iv) difficulty comprehending the concept of "usual" time when child custody is shared and weekends vary accordingly; and, v) seasonal variation introduced difficulty in estimating sedentary time within the leisure-time domain.

Discussion: Findings from these cognitive interviews provide some of the first insights into adult conceptualisation and comprehension of sedentary behaviour. The outcomes of these interviews led to significant restructuring of questions and changes in wording, as participants' perception of the meaning of questions was sometimes quite different to what had been intended. The cognitive interviewing process has helped to minimise future participant reporting errors by ensuring that items and instructions are worded in a manner appropriate for the target population.

296   Reliability and validity of adults' recall of past-day sitting time

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Introduction: Prolonged sitting is highly prevalent in the adult population and has detrimental associations with cardio-metabolic risk biomarkers and health outcomes. Time spent in sedentary behaviour has primarily been measured by questionnaires requiring participants to recall behaviour (sitting time) over the past-week (or longer), or as usual behaviour. These measures often have modest validity correlations. Past-day recall, as opposed to recall of past week or typical behavior, may improve the validity of self-report sitting time measures. This study examines the test-retest reliability and criterion validity of the seven-item, Past-day Adults' Sitting Time (PAST) questionnaire.

Methods: Participants (n=90, breast cancer survivors, age 33–74 years, BMI 25–40kg/m^2) completed the interviewer-administered PAST instrument, which asks about time spent sitting on the previous day (a weekday) for: work, transport, television viewing, non-work computer use, reading, hobbies, and other purposes (times summed for composite measure of sitting time). The instrument was administered twice, seven days apart, to examine test-retest reliability (n=85). Device-assessed sit/lie time (activPAL™ inclinometer, worn for seven days during waking hours) on the day of recall and as average sit/lie time per monitored day were used as the validity criteria (n=63, loss due to monitor not worn during recall period). Analyses included Intraclass Correlation Coefficients (ICC), Pearson's correlations (r) and Bland-Altman analyses.

Results: The composite measure of sitting time had fair to good test-retest reliability (ICC: 0.54; 95% CI: 0.37, 0.67). Correlation between the PAST and activPAL™-assessed sit/lie time on the day of recall was r=0.62 (95% CI: 0.44, 0.75) and for average sit/lie time per monitored day was r=0.41 (95% CI: 0.18, 0.59). The mean difference between PAST composite sitting time and: a) retest was -20 minutes (95% Limits of Agreement (LoA): -5.6, 4.9hours); b) activPAL™ sit/lie time on day of recall was -56 minutes (95% LoA: -5.5, 3.6 hours); and, c) activPAL™ sit/lie time per monitored day was -41 minutes (95% LoA: -4.1, 4.5 hours).

Discussion: The PAST questionnaire provided a reliable and valid measure of sitting time in this sample. However, further examination of its reliability and validity in populations other than female breast cancer survivors is needed. These findings indicate that past-day recall of sitting time shows promise for use in future health-behaviour, epidemiological and population-surveillance studies.

297 Energy expenditure in children: Applicability of simultaneous methods

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Introduction: The measurement of energy expenditure in children is a challenge for all professionals interested in paediatric health and from a broader perspective, the public health fraternity charged with considering longer term health consequences of physical inactivity. The primary objective of this study was to identify a suitable indirect and objective measurement technique for the assessment of energy expenditure in children. The ideal characteristics of such a technique are that it should be reproducible and have been validated against a criterion reference method.

Methods: Experiments were carried out on 19 children aged 8–12 (mean age=10.3±1.0 yr). To indirectly predict energy expenditure 12 different procedures were used. Only one procedure, combining activity and heart rate (AHbranched), was based on a group equation, the others were based on individualised regression.

Results: Three of the individually-based techniques were able to accurately predict energy expenditure in free-living conditions. These tecniques were HRPAnetRMR using HRnet [HR exercise minus sleep HR (SHR)] against PAnet (measured PA exercise minus measured RMR) and upper and lower body equations corrected by RMR; HRPAnet4act using the same procedure but corrected by the mean resting VO_2 for 4 resting activities [(4act) = supine watching TV, sitting watching TV, sitting playing computer games and standing], and HRPALBnet4act using only lower body activities and corrected by 4act. Bland and Altman analyses showed good agreement between AHbranched predicted and measured TEE using the DLW technique. A SEE of 79 kcal.d[-1] and a mean difference of 72 kcal.d[-1], with a 95% CI ranging from -238 to 93.9 kcal.d[-1] were found. In addition, predicted HRPAnetRMR and measured TEE using DLW, showed an SEE of 99 kcal.d[-1] and a mean difference of -67 kcal.d[-1], and a 95% CI ranging from -276.6 to 141.9 kcal.d[-1].

Discussion: HRPAnetRMR was only slightly more accurate than HRPAnet4act and HRPALBnet4act, but this technique is only adjusted by RMR whereas the other two are heavily dependent on more complex laboratory calibration. AHbranched and HRPAnetRMR were both valid and similarly suitable for the prediction of energy expenditure in children under free-living conditions.

298 Assessment bias: Physical activity questionnaire assessment inadvertently influences patients' desire to be 'more physically active'

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Introduction: Evaluating physical activity is important for public health population research and evaluating lifestyle interventions among targeted groups. Self-reported questionnaires are frequently used to evaluate physical activity in a variety of contexts where resource or pragmatic limitations prohibit the use of more sophisticated approaches. However, prior research in the use of other patient reported outcomes in healthcare settings has highlighted that simply completing a questionnaire may change a patients' behaviour or responses to subsequent questions. This methodology study aimed to examine whether completing a standard physical activity questionnaire altered patients responses to two related questions a) whether they are 'sufficiently physically active' and b) whether they desire 'to be more physically active.'

Methods: A convenience sample of patients (n=224) attending a hospital outpatient clinic for musculoskeletal conditions completed a customized survey at a single assessment point. Participants were asked whether they consider themselves to be a) sufficiently physically active (yes/no), and b) whether they would like to be more physically active (yes/no). Patients then completed the Active Australia Survey (AAS) before repeating questions a) and b). The number (percentage) of respondents who changed their response was calculated. McNemar's (Chi2) tests were used to examine whether differences between questions a) pre and post AAS completion and b) pre and post AAS completion were due to chance alone.

Results: All participants had complete data and were included in analysis. Before completing the AAS, 114 (50.9%) participants considered themselves to be sufficiently active, of these participants 43 (37.7%) changed their response to indicate they did not consider themselves to be sufficiently physically active after completing the AAS (McNemar's-Chi2 p<0.001). Similarly 33 (14.7%) did not desire to be more physically active before completing the AAS, of these participants 16 (48.5%) changed their response to indicate they desired to be more physically active after completing the AAS (McNemar's-Chi2 p<0.001).

Discussion: The act of completing a physical activity questionnaire altered patients' responses to a) whether they consider themselves to be physically active, and b) whether they desired to be more physically active. These findings are consistent with methodology research in other fields of healthcare and highlight that a simple self-reported physical activity assessment may lead to a chain of cognitive events influencing responses to subsequent questions, or possibly future physical activity behaviours. This unintended source of influence has potential to invalidate population based questionnaire research or randomized trials dependent on self-reported outcome measures. Mitigating potential bias from physical activity assessments must be considered when planning physical activity research.

299   Concurrent validity evidence of physical activity measures for Korean adults: A preliminary study

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Introduction: Due to the lack of validated physical activity measures for Korean, it has been limited to determine the impact of daily physical activity on health accurately. The purpose of this study was to validate frequently employed physical activity measures and to investigate the validity evidence of the measures for Korean adults.

Methods: A total of 42 adults (23 males: 23.26±2.72yrs & BMI 23.30±3.23 vs 19 females: 20.74±2.10yrs & BMI 19.88±1.96) were participated in study. As a criterion measure, indirect calorimetry (K4b2, Italy) was employed to measure VO_2 ml/kg, heart rate (HR), MET value, and energy expenditure (Kcal). Also, the hand-tally counts of walking steps was employed as the criterion measure of step counts. Accuracy of the various field measures was determined to measure physical activity levels, which were including an accelerometer (Actigraph GT3X, USA), a pedometer (Omron Pedometer HJ-720ITC, Japan), and OMNI-Walk/Run Scale of Perceived Exertion (Utter et al. 2004). The selected physical activities of the validation protocol based on the scientific evidences were including sitting, standing, walking (slow, natural, & fast), running (slow & fast), moving objects, and stair up and down. To determine the concurrent validity of the physical activity field measures, descriptive analysis was applied, and the coefficients of Pearson product moment correlation (r) and the percent of the error (%error) were calculated, respectively, using SPSS 19.0 (α=.05).

Results: The calculated MET value from the criterion measure showed moderately correlated with HR (r=.696), Actigraph (r=.788), and OMNI scale (r=.589), respectively. The walking steps measured by the pedometer showed high correlations with the steps measured by hand-tally counts (left r=.977 & right r=.985). The total %error of walking steps between tally counts and pedometers was -1.62(±4.35)%, which is relatively low.

Discussion: Accuracy of the physical activity field measures such as an accelerometer, perceived scale, HR, and pedometer was acceptable to estimate the physical activity levels (METs and steps taken) for Korean adults in the laboratory settings. The validity evidence of the field measures to estimate physical activity levels in free-living should be examined with a larger sample size. This work was supported by the National Research Foundation of Korea[NRF] grant funded by the Korea government [MEST] [No. NRF-2011-0013871].

300   SIT: Sedentary behaviour International Taxonomy. Expert concensus project and folksonomy

S. Chastin[1]* ▪ D. Skelto[1] ▪ [1]Glasgow Caledonian University

Introduction: Evidence, from both cross sectional and longitudinal studies, has shown that sedentary behaviour is associated with poor health and wellbeing outcomes. This has led to several countries including Canada, UK, Ireland, New Zealand, France, Denmark, Finland and USA to issue national recommendations to limit sedentary time at all ages. The next phase of research is to refine these guidelines, but currently sedentary behaviour is an umbrella term that describes a cluster of behaviours where sitting or lying is the dominant mode of posture and energy expenditure is low. This covers a very broad range of behaviours which might have different impacts on health and might be more or less difficult to modify. Some might be harmful and others necessary, for example to rest. Therefore, to advance sedentary behaviour research, a standardised system of labelling and classifying sedentary behaviours is required.

Methods: SIT uses a 3 phase Delphi process to gather expert consensus. In the first phase, a draft taxonomy, a set of criteria and definitions were presented to researchers, who have published articles on sedentary behaviour, for comments. These were analysed, summarised and debated at a workshop during the 8th World Congress on Active Ageing. A new taxonomy was developed from this phase and presented to the experts for approval and testing. This expert consensus runs concurrently with the second phase, the establishment of a folksonomy (lay man classification) of sedentary behaviour. Using web-based applications and social media the public was asked to tag and classify a range of sedentary behaviour scenes. In the final phase of the Delphi protocol, experts will be asked to use the taxonomy to classify the same scenes. This will allow the translation of the expert classification into universally understandable layman terms.

Discussion: The Delphi consensus will finish in August 2012, and we will present the results of both the taxonomy and folksonomy. We will present the final version of the agreed classification system and present the online resources developed during the project and available online.

301   Global action on physical inactivity: Progress and prospects from GAPA, the advocacy council of ISPAH

SYMPOSIUM

F. Bull[1]* ▪ T. Shilton[2]* ▪ A. Bauman[3]* ▪ [1]The University of Western Australia ▪ [2]Heart Foundation ▪ [3]School of Public Health, Sydney University

Physical activity has been identified as the 4th leading risk factor of premature death from non-communicable diseases (NCDs). Most recently, in a special issue of The Lancet, inactivity has been estimated to account for over 5 million deaths annually and to pose a similar threat to population health as that attributed to tobacco smoking (Lee et al. 2012). It is evident that there is sufficient evidence to warrant clear and substantive Government action. Despite some progress, the response at a national level has generally been limited. In many high income countries there is a need to scale up and coordinate actions already underway but in most middle and low income counties there is a need to initiate the development of a coherent population based response to inactivity. GAPA, the Advocacy Council of the International Society of Physical Activity and Health (ISPAH) has a program of work aimed at raising the priority of physical inactivity and securing greater investment and national action. This symposium will comprise three presentations addressing recent events and developments on physical inactivity within global agenda of NCD prevention.

Professor Fiona Bull will present on the achievement of a global target and indicator on physical inactivity that, against much resistance, is included in the World Health Organisation's proposed Framework for NCD Prevention in 2012. This accomplishment required considerable global and regional advocacy actions which will be outlined along with key lessons learned. Adjunct Associate Professor Trevor Shilton will present on the development of advocacy training courses on physical activity and NCD prevention and their implementation in Columbia and Thailand. Professor Adrian Bauman will present the third paper on the development and use of key advocacy tools on effective interventions such as the GAPA document "7 Investments that Work" and the new information sharing global initiative GlobalPANet. The session will provide an opportunity for wide discussion about progress and needs at the country, regional and global levels to advance action to address physical inactivity.

R. Macniven[1]* ▪ T. Shilton[2] ▪ B. Walker[2] ▪ A. Bauman[1] ▪ [1]University of Sydney ▪ [2]Heart Foundation

Introduction: In 2006, the Australian Physical Activity Network was launched and has progressively grown to almost 4,000 members from a range of professional sectors involved in physical activity promotion and is recognized as the largest national physical activity network worldwide. It is an initiative of the Heart Foundation and the University of Sydney, funded by state and territory governments. AusPAnet provides members with regular professional electronic updates on the latest physical activity research, policy and practice. Success of the initiative prompted plans to develop a global version of the service, GlobalPAnet to build knowledge and capacity in the international physical activity workforce.

Methods: Discussions between the AusPAnet Management Team and international Government departments and Non-Government Organizations identified potential funders for the global service. Physical activity professionals based in each world region were recruited to join the Global Editorial Board and A comprehensive, dedicated website to house a searchable Knowledge Base of physical activity resources and through which to communicate electronically with members was developed in collaboration with relevant stakeholders. Expert commentaries and other physical activity resources featured in AusPAnet during 2006–2012 were individually categorized by variables such as document type, target group, setting, sector, geographical location, behavior, disease, environment, population prior to inclusion in the Knowledge Base.

Results: Funding for GlobalPAnet was received from five organizations worldwide; three health promotion foundations in Thailand (1) and Australia (2) and two international NGOs. Launched in 2012 and under ownership of the International Society of Physical Activity and Health (ISPAH), GlobalPAnet aims to attract and retain 5,000 members by 2014 and produce regular e-News communication containing the latest international physical activity research and information. Progress towards these goals will be tracked through monitoring e-News and website usage by members through the Content Management System (CMS) and Google analytics. The Knowledge Base will be incrementally developed to contain over 12,000 expert commentaries and other physical activity resources, individually tagged by relevant categories and searchable by GlobalPAnet members.

Discussion: GlobalPAnet provides an upscaled version of the established Australian Physical Activity Network and builds capacity in the international physical activity workforce to progress research, policy and practice. As physical activity as a discipline continues to grow, professional development and information dissemination are important, particularly in countries undergoing rapid development. Ongoing monitoring of member details and e-News usage as well as period member evaluation surveys will determine the impact and future development of the initiative.

Thursday 1 November

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SPORTS MEDICINE AUSTRALIA

THURSDAY 1 NOVEMBER POSTERS AT A GLANCE

Please note: The scientific poster session 1 will be held from 1705 – 1830 in the Bayside Gallery

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303 | Athlete's Health Index (AHI) – An injury's impact indicator

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Health indicators represent summary measures that capture relevant information on different health attributes and dimensions, and the performance of the health system. These measures attempt to reflect and monitor the health status of a population. The aim of this study was construct an athlete's health indicator. The challenge was to create an index which measures injuries and absence of training, for the health state's surveillance of 1116 athletes in a Brazilian private sports club with different sports (volleyball, judo, swimming, tennis, gymnastics, indoor soccer, basketball). The elements used to construct the health index were: the total number of athletes, the number of injured athletes, the number of injuries per athlete, the number of training days and the number of days off. The AHI was the ratio of product (days X athletes) between the injured and healthy athletes. The numerator was described by the sum of the product of the number of injuries in the month and days out of training. The denominator is the total number of athletes and the total number of training days during the month. There are three situations that impact in the index differently: athletes who had one injury per month, more than one injury per month or who are out of training because an injury that happens a month before. In this model, it's possible to show this difference, so injuries with long period for recovery will impact the absence, but its report just once. So, just injuries with absence are reported; those athletes who are not totally out of training are described as healthy athletes due to the difficult to measure the partial participation in the training. The size of team impact in the index either, small teams have lower values than bigger ones. The index is a number between 0–100, the higher index show less impact in health. All injures and days off were reported by team's physical therapist. Two indexes were calculated for each sport: for professional and for young athletes. A plan filled monthly is used to compare the results of professional and young athletes in the 8 different sports. The index is an important tool for the athlete's health surveillance, showing the impact of injuries in training. With this index, it's possible to monitor the injury's frequency and severity and analyzing contextually the practice background support the health and training load interventions and indirectly could measure the impact of them.

304 | Difference in injury profile in Trampoline and Artistic Gymnastics

C. Bolling[1]* ▪ M. Leite[1] ▪ [1]Minas Tênis Clube

The trampolines and artistic gymnastics have a high incidence and severity of injuries, with many differences in the elements, movements and demands. The purpose of this study was to compare Trampoline and Artistic Gymnastics' injury profile. The sample was 33 athletes, 80% female and 20% male, 14 artistic and 19 trampolines gymnasts. The mean age was 11 years for artistic and 17,2 years for trampoline gymnasts. The survey was done by analyzing records of competitive level gymnasts, seen in the Physical Therapy Department of a Brazilian private sports club, in 2010. Athletes who suffered no injury, or not sought medical care in physical therapy were not included in the study. The incidence was 84 injuries in gymnastics sports, 27 in artistic and 57 in trampoline, the mean was 1,9 injury per athlete for artistic and 3,0 for trampoline. According the kind, 52% was acute injuries and 48% was chronic, in both modalities; 36% happen in right side, 34% in left side, 5% in both sides and 25% in no specific side. The most common trampoline injury was low back dysfunction (26,3%), and in artistic gymnastic ankle sprains (25,9%). The upper limbs injuries happen often in the artistic gymnasts, especially in the wrist and shoulder (22,2%). Leg injuries, mainly periosthitis, occurred only in trampoline. The most injuries were ligament and tendon in artistic and muscle damage in trampoline. The stress fractures occurred in both types of gymnastics. According to the injury mechanisms, the majority in trampoline was skeletal muscle spasms and in the artistic was nonspecific pain, related to overuse, like tendinitis and joint dysfunctions. The difference between the trampoline and artistic could be seen in the different profile injuries. The upper extremities are used as weight bearing limbs in artistic gymnastics, so high impact loads affect directly wrist and shoulders with specific injuries that occurred only in modality. The low back overload in trampoline is clear with high number of injuries which appear to result from repeated microtrauma caused by repeated jumps. The high incidence in lower limbs is always reported in literature and is supported in this study. Some points are similar, like the proportion between chronic and acute injuries and laterality. The risk of gymnastic injuries seems to be proportional to the level of the athletes, this was is possible to confirm in this study, in trampoline with higher mean age the injuries frequency was bigger than artistic.

305 Association of musculoskeletal injuries between, prior and during the training camp of Thailand rowing athletes

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Introduction: Suranaree University of Technology (SUT) and the Rowing-Canoeing Association of Thailand (RCAT) had established a collaborative training camp with applying Sport Science during the training in which hope to improve the performance of the athletes for the 26th SEA games 2011 in Indonesia. Integrated care was applied to all athletes of 109, with the emphasis on injuries, which is one of the most serious obstacles for good performance during practices or competitions. This study showed that the relationship between areas of injuries prior and during the training can be used to establish a management plan to prevent further injuries at specific group of musculoskeletal.

Methods: Observational study via the questionnaires was used to screen musculoskeletal injuries. Prevalence, Chi-square, and Odds ratio for the relationship of the anatomical sites of injuries were used to analyze the data.

Results: The ratio of the samples in this study were 60.55% males to 39.45% females, with the age ranges of 19–23 (21.42±5.54). The period of practice prior camping was within 4 months. We found the prevalence of musculoskeletal injuries were 40.36% prior to camping, 54.12% during camping and 62.38% prior and during camping, respectively. We also found 33.03% of these injuries disturbed practicing with area of injuries 27.16% at shoulder, 19.75% at back and 29.03% of these athletes were rehabilitated by stretching average 15–18 minutes. The correlation of injuries between "prior" and "during" camping was significant ($p<0.01$) i.e. overall chance of injuries increased 6.64 times (OR=6.64, 95% CI=2.73–16.1).

When focusing on specific anatomical sites of injuries, chance for repeating back injuries increased by 63 times (OR=.63, 95%= CI=5.75–690.37) and repeating shoulder injuries increased by 34 times (OR=34, 95%= CI=4.91–235.61). Other anatomical sites of injuries, i.e. wrist, arm and knee has no significant differences.

Discussion: Anatomical sites of injuries depend on the action of musculoskeletal movement during practice according to boat types. We would suggest an effective management plan to prevent further musculoskeletal injuries by increasing the strength and stretching time. Establishment of an integrated care program in sports medicine team is recommended, including health promotion, prevention, treatment, and rehabilitation. RCAT can use these results in recruiting Thai Rowing athletes. However, a specific and deeper issue in musculoskeletal injuries of the Thai Rowing athletes should be further investigated in the future.

306 Sport injuries in volleyball as found in PlusLiga volleyball players in Poland

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Introduction: Although physical activity brings a range of lifelong health benefits, it may also lead to injuries that pose a significant threat to health. It is particularly noticeable in people involved in professional sports where sport-related injuries commonly occur and are associated with intense exercise to improve physical fitness. The purpose of the research was to determine incidence of sport injuries reported by PlusLiga (the Polish Volleyball League) volleyball players, as well as to identify the types and risk factors which contributed to sport injuries.

Material: The research project involved 90 Plus Liga volleyball players aged 18–37 with the average age of 25.11 (s_d±5,378). More than 54% of sportsmen reported over 10-year period of training. A method of diagnostic survey was applied to collect empirical data by means of anonymous questionnaire developed by the authors (researchers). The questionnaire comprised 7 open and 22 closed questions. The results were statistically analysed and verified with a chi-squared test at the significance level (or critical p-value) of $p≤0.05$.

Results: The average body height and weight for volleyball players were 195.82 cm (sd±7.99) and 89.36 kg (sd±8.78). More than 84% volleyball players mentioned 15-hour training per week. Over half of the respondents reported over 10-year period of sports training. Eighty-seven per cent of players suffered from at least one sport-related injury. In total, 362 injuries occurred (4.02 injury/a volleyball player) the most common of which involved the ankle, or talocrural joint (n=46 injuries), knee and lower leg muscles (n=30), interphalangeal articulations of fingers (n=30), as well as shoulder joint. More than half of the injuries (57%) occurred twice or three times. Volleyball players were more frequently injured in training than during matches. The most common causes for injuries were exhaustion, lack of rest and undertreated injuries. The research proved correlation between the age of a volleyball player and the number of sports injuries ($p≤0.05$). The number of training hours also appeared to be significant ($p≤0.05$). The more they trained, the more injuries they received. Most injuries were revealed by players with over 15-hour training per week.

Discussion: Even though the number of publications on mechanisms of injuries and risk factors is still increasing, deficiency in studies concerning prevention strategies in volleyball might be noticed. Therefore, more attention should be focused on analysis of prevention effects on single and constant injuries since sport injuries diminish the intensity and joy of participation in professional sports.

307 Rowing, Soccer and Swimming: Injury differences (location, type, consequence) in preparation for the World Masters Games

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Introduction: It has been proposed that Masters athletes are more likely to experience injury however; to date, there is a lack of empirical evidence to support this notion. The World Masters Games (WMG) is recognized by the IOC as the largest international sporting competition in participant numbers. This cohort of mature-aged athletes remains proportionately under investigated, particularly with regard to injury. This study aimed to compare injury incidence, location and consequences in Australian WMG athletes who competed in rowing, soccer or swimming over the four year period in preparation for the WMG.

Methods: A cross-sectional, observational study utilizing an online questionnaire (LimeSurvey) was used. The survey consisted of four basic demographics, medical history, injury history (location, type and consequence) and physiologic measures. A total of 8,070 responses were obtained from all WMG participants of which 6,652 were excluded from analysis as they were from other sports or not from Australia.

Results: 1,418 Australian WMG athletes (25–91yrs, mean=51.9, +SD=10.2, 52.0% male) who participated in either rowing (n=585, 41.2%), soccer (n=410, 28.9%) or swimming (n=423, 29.8%) participated in this study. Statistical analysis (via Pearson's Chi-square) found non-significant differences in types of injuries sustained between sports or between genders. With regard to location of injury there were numerous significant (p<0.05) differences between sports (ankle, arms, foot/feet, hands, knees, legs, neck, shoulder, spine/back). Furthermore, there were significant differences in the consequences of the injuries (loss of training days) whilst in preparation for the WMG with 173 athletes reporting losing day(s) of training due to injuries sustained (number/mean days/range of days lost); rowers (n=72/21.2/0–240), soccer (n=55/23.3/0–180) and swimmers (n=46/36.5/0–200). Additionally, 36 injured athletes reported losing days of work due to injuries incurred; rowers (n=15/2.2/0–40), soccer (n=9/2.3/0–56) and swimmers (n=12/1.1/0–14). Athletes were more likely to lose days of training as opposed to days of work (X^2=108.5, p<0.001), with males losing more days of training (58%) and work (59%) from injuries incurred.

Discussion: Despite the proposed higher risk of injury at older ages, the incidence of injury was not sufficient to warrant a general suggestion against participation due to increased risk of injury at older ages. Given the evidence of the benefits of exercise at older ages, this is a welcome finding.

308   Sport injuries in grappling and striking combat sports practitioners

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Introduction: Combat sports show different motor patterns and a variety of physiological demands, according to striking (S) or grappling (G) principles.

Objectives: To quantify sport injuries (SI) of combat sports athletes, considering sport specificity (S or G), injury type and body site.

Material and methods: From transversal analytical study, 116 combat sport athletes (30.4±9.5 yo, 174±6 cm and 80±11 kg) from different modalities were involved. They filled a Referred Morbidity Inquiry with their combat sport, SI type, occurrence moment, anatomical site and recovery time. The data were registered in electronic sheets and analyzed with descriptive and inferential statistics.

Results: More than half of combat sports athletes showed, at least, one important SI in the previous year (58.3% to S and 51.6% to G). The more common occurrence moment is attacking in a fight moment (S=29.8%; G=25%), followed by training tactical/technical alone in standing position in S (14,9%) and groundwork tactical/technical training in G (18.8% in attack situations and 18.8% in defensive situations). Considering body regions, foot, posterior thigh and knee (respectively 17%, 10.6% and 10.6%) are the most frequent places in S. To G knee (25%) and shoulder (18.8%) were the main sites of injury. There was significant differences (χ^2=37.54, p=0.001) among SI mechanisms. In S, punches were those which generated most SI, followed by stretching practices (17%). However, in G, stand blocks (25%), attacking or defending throws (25%), and guard passing in the ground (12.5%) were the main mechanisms observed. In respect to SI type, S and G showed significant differences (χ^2=17.97; p=0.03): contusions and strain were more common in the first one (23.4% and 19.1%), G presented more sprains and tendon injuries (31.2% and 25%).

About the recovery time, 31% of combat sports practitioners from S returned to the practice in until 7 days and 27.7% needed more than 2 months. In G, 25% recovered in one week and 37.4% needed more than 2 months.

Discussion: Trainers and coaches can use this information in SI prevention, because S and G had distinct injury mechanisms, with punches predominating in S and blocks in G. It was observed differences in SI type, with more muscular injuries in S and joint injuries in G.

309   Sports trainers' attitudes towards injury surveillance in community Australian Football

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Introduction: Setting up uniform injury surveillance systems in community sport is challenging because there is little infrastructure and few personnel with the time and expertise to carry out data collection. To address these challenges, Sports Medicine Australia (SMA) has developed Sports Injury Tracker, an online tool specifically for use in this context. To ensure that a new injury surveillance system can be successfully implemented and maintained, it is imperative to first understand the perspectives of the people who will use it. In community Australian football, these end-users are likely to be the clubs' on-site sports trainers. The aims of this research are to: i) evaluate current injury recording practices of sports trainers in community Australian football; ii) determine the objectives of injury surveillance from the perspective of sports trainers; iii) obtain feedback on what data should be collected as part of an injury surveillance system; and iv) obtain feedback on likely barriers and facilitators of using Sports Injury Tracker.

Methods: Sports trainers from four Australian football leagues across Victoria were invited to participate in the study via an email containing a link to an online survey. The survey instrument was developed after a review of the literature on sports injury surveillance instruments and structured around the aims of the study. The survey was created using the SurveyMonkey® online survey tool and then pilot tested on a sample (n=8) of test participants. Questions were included about the participant's level of sports trainer training and experience, injury recording practices, reasons for recording injuries and opinions on Sports Injury Tracker.

Results: The online survey was emailed to 74 participants and remained open for six months. Once the survey is complete, responses will be collated and analysed using descriptive statistics and presented as frequencies and percentages. Demographic information, such as age-group and league will be used to subgroup responses.

Discussion: Survey results will be used to: i) determine the feasibility of ongoing injury surveillance in community Australian football; ii) develop appropriate injury surveillance guidelines; and iii) guide development of future implementation support strategies, such as promotion of Sports Injury Tracker.

By consulting with end-users from the outset, injury surveillance guidelines are more likely to be contextually relevant, thus increasing the likelihood that they will be accepted and adopted by clubs.

310 Perceptions and practices of Australian golf coaches towards physical fitness for golf

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Introduction: It is frequently recommended that golfers undertake exercise programs to prevent injury and improve performance. While golf coaches are uniquely positioned to implement injury prevention programs, little is known about golf coaches' perceptions and attitudes towards physical fitness for golf. Method: Working with Golf Australia and the Australian Professional Golfers Association (PGA), we developed a survey about perceptions and practices related to physical fitness for golf which was sent to all 1650 PGA members. The survey comprised 45 questions that collected demographic data, measured coaches' perceptions using 5-point Likert scales ranging from 'Strongly Disagree' to 'Strongly Agree' or from 'Never to Always', and also asked about education and training that respondents had attended in the previous 12 months. After performing initial descriptive analysis, respondents were divided into two groups – those who agreed with the item, "I consider it very important for all of my clients to be physically fit for golf" (n=136) and those who disagreed or were undecided (n=115). Means and standard deviations were calculated and t tests were conducted to explore differences between the groups.
Results: 251 surveys were returned (response rate=15.2%). Overall, 53% of respondents considered it very important for all of their clients to be physically fit for golf but 35% disagreed with this statement. 83% considered it more important for elite golfers to be fit for golf. While 75% of respondents reported that they asked their clients about pain and injury, only 35% reported that they referred those clients to a health professional. However, 84% reported they would like to know more about physical fitness. Coaches who did not think physical fitness was important for all of their clients had coached for more years (p=0.01), were more likely to work with beginners (p=0.01), believed that physical fitness was more important for elite/professional golfers (p=0.02), tried to correct swing mechanics before referring clients with pain and injury to a health professional (p=0.01), and were more confident in coaching golfers with disabilities (p=0.05).
Discussion: Nearly half of the Australian golf coaches who participated in this study did not agree that physical fitness is important for all of their clients. With the increasing evidence of the efficacy of exercise programs for golfers, providing specific and targeted education for golf coaches could help improve uptake of, and adherence to, effective programs.

311 Epidemiological indoor soccer's team injuries profile in 2010 National League

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The indoor soccer has high physical demands of strength and power, therefore the incidence of injuries increases. The literature shows age, position, features of training and competition's level as risk factors. The aim of this study was to understand the profile of indoor soccer players injuries from a team during the 2010 indoor soccer league, the major national league in Brazil. The team with 17 professional athletes, with a mean age of 23.24 years, who participated in the first and second phases of the championship, totaling 30 games from April to September 2010 were included in this study. During the performance of this championship, concomitantly, more 15 games were played for regional championships. All injuries were registered by the team's physiotherapist and were also described: the position of the athletes, if the injuries were in a situation of non-contact or contact, and if they occurred during training sessions, games or other time off. A descriptive analysis were realized. The total of 30 injuries led to the physical therapy treatment. The mean number of lesions treated per athlete was 2.7. The average of absence in training sessions and games was 7 days. The muscular strains (36.7%) were more prevalent then sprains (16.7%) and muscle spasms (16.7%). Regarding of the type of injury, muscle damage (53.3%) occurred in greater numbers, followed by ligament injuries (23.3%). Most injuries happened in non-contact situations and during games (66.7%). The Side Midfielder players, especially on the right side, had the largest number of non-contact injuries. The injury profile is very similar with other studies with soccer players, more muscle and ligament injuries, during games. Despite the popularity of indoor soccer, there are few scientific articles that describe the epidemiologyof this modality Like most of the injuries was non-contact (atraumatic) injuries as muscle damage, greater emphasis should be given to eccentric and plyometrics exercises, besides the importance of muscle recovery after training and after games. The athletes participated in other tournaments simultaneously, which according to the literature, may lead to the appearance of injuries. The injuries epidemiology profile of the team in 2010 Futsal League provides important data for injury prevention.

312 The effects of open vs closed kinetic chain exercises among injured adolescent cricket players in KZN, South Africa

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Introduction: There has been limited research showing the effects of kinetic chain exercises among injuries in athletes. The goal of this retrospective, epidemiological study was to determine the effects of open versus closed kinetic chain exercises among injured adolescent cricket players in KZN, South Africa.
Method: Participants were required to complete a self-report musculoskeletal questionnaire probing the prevalence of cricket-related musculoskeletal pain within the last 12 months and in addition, subjects' quadriceps angles were measured. The significance was set at p≤0.05.
Results: One hundred and eighty eight subjects (80.34%) experienced cricket-related musculoskeletal pain (p<0.0001). The prevalence of cricket-related musculoskeletal pain specific to the various anatomical sites were mostly knee (29.79%) and lower back (28.72%). The subjects who experienced knee pain had abnormal Q-angles (right knee – 12.71o; left knee – 11.19o) (p<0.0001) which further precipitated their risk of injury at the knee joint. The knee was the most common anatomical joint site of pain, and therefore kinetic chain exercises were used to interpret these findings among the injured adolescent cricket players.
Discussion: In open-kinetic-chain knee extension exercise, the flexion moment increases as the knee extends from 90o of flexion to full extension (mainly in wicket-keepers) which increases the tension in the quadriceps and patellar tendon. Therefore, the patellofemoral joint reaction forces are increased in batsmen when propelling forward with peak force occurring at 36o of joint flexion. Similarly, as the knee moves towards full extension when batsmen propel backwards and when bowlers land at the popping crease, the patellofemoral contact area decreases which causes increased contact stress per unit area. In closed-kinetic-chain exercise, the flexion moment also increases as the knee flexes which causes increased tension in the quadriceps and patellar tendon and therefore an increase in patellofemoral joint reaction forces.
Conclusion: Closed-kinetic-chain exercises might be better tolerated in cricketers because contact stress is minimized. Cricket players' mostly adopting closed-kinetic chain exercises have a reduced chance of sustaining any pain or injuries.

313   A 5-year study into hamstring strain injuries at the Penn Relay Carnivala

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Introduction: Hamstring strain injuries (HSI) are the primary injury sustained in running based sports. Much of this data is derived from Australian and American football, rugby union and soccer, however there are fewer studies examining HSI rates in track and field athletes. Of the limited evidence available in track and field, HSI accounts for between 14–26% of all injuries. The aim of this study was to examine the rates of acute HSI over a 5-year period in track and field athletes at the Penn Relay Carnival.

Methods: A 5-year injury surveillance study was conducted from 2002 to 2006 at the Penn Relay Carnival – the world's single largest annual track meet held at the University of Pennsylvania. During the study period the Penn Relays were open to junior high school, high school, college, Olympic development, masters and special Olympic athletes. All athletes presenting with an injury/illness requiring treatment by the medical staff were included in this study. HSI rates were calculated as a percentage of total injuries and analyzed based on gender, competition level, and different events.

Results: Over the 5-year study period more than 60,000 athletes competed and 802 injuries/illnesses were reported. 217 athletes reported a HSI, accounting for 27.1% of all injuries/illnesses and 74.1% of all muscle strains reported. HSI accounted for 32.2% of all injuries in males and 21.4% in females. When looking across different competition levels, HSI accounted for 52.4% of all injuries in masters level, 35.0% in college, 28.6% in Olympic development and 24.4% in high school athletes respectively. The percentage of HSI injuries was highest in the 4 x 200m (62.1%) and 4 x 100m (41.0%) relay events.

Discussion: HSI is the most common acute muscle injury in track and field athletes, particularly in sprinters. Prevention and rehabilitation strategies to reduce the incidence of HSI in track and field athletes should be given more attention.

314   Injury surveillance in Rugby League junior development competitions

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Introduction: Currently in junior rugby league (RL), there is no standardised procedure to record or monitor injures sustained at training or in competition matches. The development of an operational sports injury surveillance paradigm in RL has lagged behind other contact sports such as rugby union, AFL, cricket and football (soccer). This study aims to develop a systematic reporting structure for rugby league injuries suffered during match play and training as well as for injury follow-up.

Method: The study is a prospective cohort experimental design. Players from the 2012 NSW Junior Representative RL Competitions will be recruited and monitored during the pre-season through to the competition grand final. Three standardised measurement instruments have been developed. The Players' Baseline Information Form included demographics (age, ethnicity, medical history) and player characteristics (position, play history, injury history). The Player injury Notification Form will be completed by the team medical trainer or other personnel to whom players report for injuries sustained at training and matches. It consists of: the nature, characteristics and mechanism of the injury, onset, environmental conditions, diagnosing/treating person, initial treatment and referral. The Injury Follow-up Form will be completed by the team doctor, physiotherapist or medical/rehabilitation trainer who determines the treatment of the injury and return to training and/or match play. This form includes: diagnosis of the injury, treating person, further referral for medical treatment and/or investigations, number of training sessions and/or matches missed or date for return to play. The players match and training exposure and compliance to completion of forms will also be recorded. Personnel completing the forms will be surveyed to determine the ease of completion, relevance to the team's requirements, preparedness to adopt, and reasons for not adopting the form.

Results: A total of 332 players from 22 teams (Under 16s and Under 18s) within13 clubs have been recruited.

Discussion: A standardised methodology for injury reporting and surveillance has been developed for the junior elite RL competition. The findings may enable the identification of risk factors for injuries as well as provide data for a larger study to explore the subsequent reduction in the likelihood of re-injury; the development of safe return to training and play guidelines, and recommendations for training volume and total game exposure to minimise injury from rugby league to achieve sustainable health in elite junior players for their long-term progression in rugby league.

315   Rowing biomechanics and injury prevention

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Rowing injuries have been occurring from poor technique. Most of the rowing related injuries can be attributed to cumulative stress placed on particular areas of the body by the improper performance of the competitive pattern of movement or training regime. The purpose of this study was to examine if there is a relationship between injury and rowing kinematics. Experiments were conducted in laboratory and on water using a case study design. Body movements were recorded in 6 Thai national rowers during ergometer rowing and on water rowing at 32 strokes/min. The movements of 4 body landmarks (right ankle, knee, hip, shoulder) were record by video camera. Using SIMI software, the angles of the knee and hip segments relative to the horizontal axis were computed. The angles among rowers with and without a history of knee injury were comparing. Significant differences were found between the rowers with and without a history of knee injuries. Statistical analysis indicated that the rowers at higher both hip and knee angles were significant (P=0.05) in knee injury compare with the rowers at lower hip and knee angles. No differences in the angles among the rowers without an injury history 6 months before the study. Differences in hip and knee angels appear to be related to rowing injury. Preventive knee injury rowing technique focused on proper angles may be trained for all rowers.

316   Physical activity-related injuries and associated factors in adults from southern Brazil: A population-based study

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Introduction: Although physical activity practice improves health, physically active individuals are also susceptible to a higher risk of injuries.
Objective: To describe the prevalence of physical activity-related injuries and the associated factors in a representative sample of adults in the city of Pelotas, southern Brazil.
Methods: Population-based cross-sectional study including 972 adults (aged 20 to 69 years), of both sexes, residents in the urban area was conducted. The questionnaire included socioeconomic, demographic and behavioral information. To characterize the outcome, after people enumerating all physical activities they practiced, the following question was asked: "Have you ever injured yourself doing one of these physical activities?". The association between the outcome and socioeconomic, demographic and behavioral variables was tested using the chi-square test for heterogeneity and linear trend and a multivariable analysis was performed through Poisson regression with robust variance.
Results: The percentage of injuries resulting from physical activity was 22.4%. Among respondents, 49.2% reported involvement in physical activity during leisure time. The most common physical activities were walking (42.6%), soccer playing (21.5%), cycling (18.6%), weight lifting (6.5%) and running (5.5%). Injury chance was associated with sex (men – 31.2%), 20 to 34 age group (27.8%), non-white skin color (39.2%) and being single (29.8%). Results show a downward trend in physical activity-related injury rates with increasing age.
Discussion: The prevalence of injury is high and its occurrence is associated with male gender, young people and non-white skin color. Although active people are at greater risk for the occurrence of lesions and the prevalence of injury is high, people should be encouraged to practice physical activity, because the benefits of an active lifestyle outweigh the risk of injuries occurrence.

317   Minimally invasive surgical technique In treating recurrent patellar dislocation

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Introduction: Recurrent patellar dislocation is one of the most common pathologies affecting the knee joint in young people. The underlying pathology is either soft tissue, bony or combination of both. The literature describes more than 100 different surgical approaches to address recurrent patellar dislocation. The medial patello-femoral ligament (MPFL) has been identified as the primary medial restraint to prevent lateral patellar displacement. The MPFL accounts for 80% of the medial restraining force on the patellar. We have developed a minimally invasive technique to reconstruct the torn MPFL, which commonly occurs with patellar dislocation.
Method: 21 consecutive patients, 9 males, 12 females were treated with MPFL reconstruction using our minimally invasive technique between 2009 and 2010 by a single surgeon. All patients had recurrent dislocation of the patellar. The age ranged between 14 and 55 years mean being 25 yrs. 12 left, 8 right, 1 bilateral. Pre and post op assessment included Tegner Lysholm Score and Kujala Knee score, MRI and radiological examination. Three different artificial materials as a ligament augment graft were used. The ligament was secured using a screw fixation on the femur and an endobutton on the patella. All underwent arthroscopic surgery at the time to address the intra-articular pathology. Post operatively patients were mobilized with physiotherapy, weight-bearing as tolerated and taken through a range of motion with no bracing.
Results: All patients had follow ups with a minimum of two years. Patients were reviewed clinically and radiologically with x-rays. Assessment included Tegner Lysholm Score Average of 93 and Kujala Knee score average of 90. High satisfaction was achieved with the majority of patients. All patients returned to pre-injury activities. All but one patient had sense of stability in their knees. Complications included one patellar re-dislocation 18 months following the surgery. One patient had a direct fall on the patellar, which resulted in osteochondral damage to the patellar without dislocation. One patient had a stiff knee that needed manipulation under anaesthetics 12 weeks post surgery with complete resolution.
Conclusion: It is well accepted that medial patellar femoral ligament is the main restraint against patellar dislocation. This ligament is injured in the majority of patellar dislocations, so by reconstructing this structure with minimally invasive techniques excellent results can be achieved. This avoids major reconstructive surgery and prolonged rehabilitation, which was the traditional method of management.

318   Characteristics, training loads, injury patterns and stretching habits of Australian Ironman Triathletes

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The Ironman triathlon is an individual sport consisting of three disciplines – swimming, cycling and running. This endurance sport has grown in popularity with over 22 races annually worldwide and 24,000 participants. Despite this participation there are insufficient data concerning injuries in the Ironman triathlon and regarding athletes' stretching and training habits, especially in Australia. The aim of this retrospective cross-sectional study was to investigate the incidence of overuse injuries in this sport according to anatomical site, and their relationships to gender, age, training hours, stretching habits and other factors. Questionnaires were provided in the race packs of 1250 participants of the Australian Ironman Triathlon in 2006. Two hundred and ninety-six questionnaires were returned giving a low response rate of 24% (74.3% male, 25.7% female). In this sample, 86.1% reported suffering an overuse injury related to competition or training in the last year. The most common site of injury was the knee (35.1% of respondents), followed by the lower back (34.1%) and the ankle/foot (30.7%). There was no statistical relationship between incidence of injury and training load, gender or age, however triathletes with a triathlon coach had a lower injury rate. Participants reported stretching less before training (41.2%) than after training (67.2%). Among those participants who stretched, the most commonly stretched muscle groups were the hamstrings (88.9%), calves (88.5%) and quadriceps (86.1%). The lower back (61.5%), upper back (31.8%) and shoulder (53.4%) muscles were not stretched by as many participants. Lower back injuries had a significant association with cycling (n=101, r=0.256, p=0.01). A strong positive trend was demonstrated between stretching after training and a reduction in total injuries (p=0.059).The health professional intervention most utilised by participants was physiotherapy. The overuse injuries in Ironman triathlons in other countries were reported to be most common in the knee, ankle/foot and lower back, which was confirmed in this study of Australian Ironman triathletes. These areas injury need further investigation, to develop interventions to prevent or minimise injuries in this population. There is a need to educate physiotherapists on the injury profile of these athletes, so they are better prepared to treat and design interventions to prevent these types of injuries.

319 The effectiveness and dose-response relationship of extracorporeal shock wave therapy in lower limb tendinopathy: A systematic review

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Introduction: There is accumulating evidence of the utility of Extracorporeal Shock Wave Therapy (ESWT) for treating greater trochanteric pain syndrome (GTPS), patellar tendinopathy (PT) and Achilles tendinopathy (AT). This systematic review evaluates i) the effectiveness of ESWT in these common conditions and ii) whether there is a relationship between the protocols (e.g. dosage) used and ESWT effectiveness.

Methods: PubMed, Embase, Web of Science, Cochrane and CINAHL databases were searched in January 2012 for primary research investigating the effectiveness of ESWT. Quality assessment was performed using the Downs and Black Criteria. Additionally, effect size calculations and data pooling were completed where possible.

Results: Nineteen studies of varying methodological quality were identified, of which 12 provided adequate data to complete effect size calculations. Most studies contained small numbers, and randomisation and blinding was often lacking. The number of impulses, number of sessions, interval between sessions and the use of local anaesthetic varied between studies. A wide range of outcome measures were used including the Visual Analogue Scale and the Victorian Institute of Sport Assessment Questionnaire were used most frequently. When treating GTPS, ESWT was more effective than a control intervention in the short (<12 months) and long term (>12 months), and more effective than home training at three months. Additionally, ESWT produced inferior outcomes to cortisone injection at one month, but superior outcomes at 12 months. When treating PT, ESWT appears to be more effective than a control, but shows no additional benefit in comparison to surgery in the short and long term. When treating AT, ESWT was found to be more effective than a control intervention in the short and long term. When comparing ESWT to an eccentric loading program in mid-portion AT, outcomes were similar. However, for insertional AT, ESWT produced superior outcomes in the short and long term compared to eccentric loading. Additionally, combining ESWT with eccentric loading when treating mid-portion AT, produced superior outcomes to eccentric loading alone in the short and long term.

Discussion: ESWT appears to be an effective intervention for GTPS, AT, and PT. However, current evidence is limited by low participant numbers, and methodological weaknesses such as inadequate randomisation and blinding. These issues need to be addressed in future research. Further research evaluating 1 most effective energy levels, number of sessions, number of impulses and the use of local anaesthetic is required to optimise treatment protocols for each condition.

320 World Masters Games North American Body Mass Index profile

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Introduction: The World Masters Games (WMG) represents the largest international sporting competition in participant numbers. These WMG athletes have either pursued a physically active lifestyle for an extended period of time or have initiated exercise/sport in later life. This unique cohort of middle- to older-aged adults remains relatively uninvestigated with regards to various indices of health. With a need for multifaceted solutions to the obesity epidemic, investigating special populations such as those competing in sport at older ages may further the understanding of the nexus between aging, physical activity and obesity. The purpose of this study was to investigate the body mass index (BMI) of North American WMG competitors with respect to national health guidelines and demographics.

Methods: A cross-sectional, observational study utilizing an online questionnaire (LimeSurvey) was used to collect demographic information from athletes competing at the Sydney WMG. BMI was derived using the participant's height and body mass.

Results: A total of 928 (46.7% male, 53.3% female) participants from Canada and the United States (age 52.6±9.8 yrs, range 27 to 87 yrs) completed the survey. The top 5 sports in which participants competed were football (25.6%), track/field (15.4%), swimming (8.4%), volleyball (8.2%), and softball (7.8%). Female and male BMI (kg/m^2) across all sports were: >30 (obese–13.9%), 25–29.9 (overweight–34.1%), 18.5–24.9 (normal–50.3%), and <18.5 (underweight–1.7%). Data indicated that BMI was a health risk factor for 13.9% of the participants and a developing risk factor for 34.1% of the participants. Analysis (via Pearson's Chi-square) demonstrated a significantly reduced (p<0.001) classification of obesity of the North American WMG competitors when compared to summary statistical values for the Canadian and United States national populations.

Discussion: It is believed that adherence to exercise improves indices of general health. This is supported by our findings, in that, a key index of health (obesity) was significantly lower in prevalence for North American WMG competitors when compared to the Canadian and US national populations. From the literature on high BMI in national populations, this would imply there would be a reduced burden on health from the deleterious influence of high BMI for North American masters athletes competing at the games. This would include reduced risk of conditions such as type 2 diabetes, cardiovascular disease, dyslipidemia, hypertension and some classifications of cancer in this population.

321 Reduced prevalence of smoking in masters football codes (rugby union, soccer and touch football)

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Introduction: Smoking is a prominent risk to health globally, as well as specifically within Australia, with tobacco use one of the biggest public health threats the world has ever faced. Most prominent of the negative effects of both smoking and passive smoking are associated cancer risks. Smoking is linked with social disadvantage, placing economic strain on health care systems. Within Australia the national economic cost of smoking, the most significant lifestyle behavior as a cause of preventable death, has been estimated to exceed A$31 annually. The addictive nature of nicotine causes smoking to become a long term habit that is difficult to discontinue. In addition to findings on current smokers, data from the Australian Bureau of Statistics (ABS) suggest an increased risk of adverse health conditions in ex-smokers. In the context of the popularity of various football codes in Australia, it was of interest to consider the smoking status of masters athletes competing in football codes (rugby union, soccer and touch football).
It was hypothesized that this cohort competing at middle to older ages, might demonstrate improved lifestyle behaviors over the national population. These behaviors might either be responsible for improved health, allowing competition at older ages or indicative of a dedication to health and wellbeing in competitive masters football players.
Methods: This study was conducted in accordance with the ethical standards of the Helsinki Declaration. An online survey was utilized to investigate participants' demographics and medical health histories. Electronic invitations were sent to World Masters Games competitors who provided a valid email address.
Results and discussion: A total of 931 masters football players participated (489 male, age range 29–72yrs, mean=47.6yrs, SD=7.1yrs), representing Australia (67.2%), Canada (20.1%), USA (6.6%), New Zealand (3.9%) and other countries (2.2%). Of the football players, 36 (3.9%) were current smokers (4.0% of males and 3.9% of females). Additionally 177 participants (19.4%) indicated that they were ex-smokers. Ex-smokers represented 22.1% of males and 16.4% of females. Considering current smoking habits, 878 were non-smokers (96.1% of participants, 52.5% of whom were male). Findings compared favorably with global (WHO) as well as Australian specific data (ABS) on smoking prevalence.
Conclusion: The reduced prevalence of smoking in masters football codes would be associated with increased probability of both improved health as well as economic status. Possibly either contributing to their ability to compete in masters sport or associated with healthier lifestyle behaviors in masters football culture.

322 The spatial-temporal gait characteristics of hip joint osteoarthritis: A systematic review and meta-analysis

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Introduction: Hip osteoarthritis (OA) is a progressive musculoskeletal condition which is prevalent in older adults. There is no cure for hip OA and current management focuses on addressing the presenting symptoms of pain, stiffness and functional limitations in activities such as walking. An understanding of gait dysfunction in people with hip OA is therefore required in order to effectively manage the disease. The purpose of this systematic review, critical evaluation of the literature and meta-analysis was to determine how the spatial-temporal gait characteristics of hip OA are altered.
Methods: Eleven electronic research databases were searched. Studies comparing spatial-temporal gait variables in hip OA with healthy controls or the affected and contra-lateral limbs in people with hip OA were included in the review. A methodological appraisal of 33 included studies was performed. A meta-analysis was undertaken with standardised effect sizes (Cohen's d) and corresponding 95% confidence intervals computed for spatial-temporal gait variables reported in these 33 articles. Data were grouped into 3 categories; gait speed, gait stability and gait symmetry related measures.
Results: *Gait speed measures:* Mean gait speed was reduced in hip OA relative to control groups and was explained by decreased stride length and step length in the hip OA population. There was inconsistent evidence of the effect of hip OA on cadence. *Gait stability related measures:* There was moderate evidence of the effect of hip OA on double support duration with an overall increase reported in hip OA participants. The evidence for stance and swing duration was inconclusive. There was some evidence for increased step width in the affected limb of hip OA participants. *Gait symmetry related measures:* Consistent evidence was found for limb asymmetry with reduced step length and increased swing duration in the OA hip compared to the contralateral limb.
Discussion: Spatial-temporal measures of walking are relatively simple to assess in a clinical setting and may be used to establish the extent of gait dysfunction and to monitor treatment progress in hip OA. This systematic review identified 33 articles that evaluated spatial-temporal characteristics of hip OA related to walking speed, gait stability and gait symmetry. Overall findings from the review confirmed the presence of gait adaption in hip OA, most notably in terms of reduced walking speed and gait symmetry. Both gait speed and limb symmetry may be useful measures for assessing gait dysfunction in hip OA patients and monitoring treatment progress in the clinical environment.

323 Non-union distal fibula avulsion fracture in a 16 year old male: A clinical case report

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Introduction: Distal fibula avulsion fractures are commonly associated with ankle sprains. Reasons for non-union of distal fibula fracture in a healthy young person may be a cause for concern. This report covers the case of a 16 year old male who presented with a non-union distal fibula avulsion fracture at 12 weeks post injury.
Presentation: A 16 year old male presented for physiotherapy with a 12 week ongoing ache over the right lateral malleolus on weight bearing and turning, fast walking and running. History revealed a distal fibula avulsion fracture and ankle sprain sustained during a football game 12 weeks previously and diagnosed on X-ray. After a 6 week cast immobilization, follow-up hospital X-rays at 3, 6 and 12 weeks post injury revealed no indication of fracture union or callous formation. Previous musculoskeletal conditions history included left ankle sprain, bilateral medial tibial stress syndrome and ongoing shoulder pain while exercising, all within the last 6–12 months. No other health issues were reported apart from an 18 month history

of scalp rash and adolescent acne for 3 years. A dermatologist 18 months previously had prescribed a daily oral isotretinoin agent (Oratane®) and advised against any contact sports or excessive sun exposure. Reasons for these precautions were not clearly provided, however contact sports were ceased for 8 months while on Oratane®. Oratane® was stopped for a 6 month period and the patient returned to contact sports. The scalp rash returned so Oratane® was recommenced but this time the patient also continued to participate in contact sports.

Management: Referral to a doctor for medication review was recommended. At follow-up the patient reported subsequent cessation of oral intake of Oratane® and within 4 weeks a callous formation was reported on X-ray with significant symptom reduction.

Discussion: Non-union distal fibula fractures in young adolescent otherwise healthy males are a cause of concern. Symptoms of on-going lateral malleolus pain and non-union fibula fracture after 12 weeks should alert the health practitioner to investigate other causes. Oratane® commonly prescribed for severe acne symptoms in adolescents has many side-effects including myalgia, arthralgia and possible osteopenia. The actions are not clearly understood and precautions in taking such medications should always be clearly explained to young people undertaking contact sports. This case raises the issue of risks involved in taking such medications with the need for increased awareness of the side effects.

324 Platelet Rich Plasma therapy – PRP

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Interest in PRP treatment for sports injuries and musculoskeletal healing has been building up for the better part of the last decade. Clinics in Spain, have been administering PRP treatments to injured soccer players since the early part of the decade. Reports of PRP in medical literature were first made back in 1970's concerning platelet interaction with tissues. Autologous PRP has since then been used extensively in the fields of Maxillofacial Surgery, Dentistry, Neurosurgery, ENT, Aesthetic Medicine, Wound Healing, Orthopaedics and Sports Medicine. Platelets have a vital role in the healing of injured tissues. PRP refers to a concentration of platelets in plasma that is higher than that of normal circulating platelets in the body. The alpha granules of platelets contain growth factors including PDGF (Platelet derived growth factor – aa, bb, ab) which effect; mitogens of mesenchymal stem cells and promote synthesis of extracellular matrix; TGF (Transforming Growth Factor-beta – a, b) which effects stimulation of DNA synthesis, proliferation of various cells and favours synthesis of collagen; IGF (Insulin-like growth factor) which stimulates proliferation and differentiation of osteoblasts and stimulates proliferation of fibroblasts; VEGF (Vascular Endothelial Growth Factor) which stimulates angiogens and EGF (Epidermal GF) which stimulates proliferation and differentiation of epidermal cells, co stimulating angiogenesis. The responsibilities of the various growth factors cumulatively accelerate tissue and wound healing.

The methods for harvesting autologous PRP vary from system to system however the basic procedure is performed within the clinic, blood is drawn from the patient through venipuncture using a vacutainer to fill the approved tubes with permitted anticoagulant and in some systems a separating gel. The tubes are spun within a centrifuge for several minutes in order to achieve a separation of cells and plasma. The PRP is then aspirated from the tube and then injected generally under ultrasound guidance for maximum accuracy.

There have been no reports of adverse effects and patients report a favourable outcome to the treatment. PRP provides a means of biological stimulation for tissue healing. PRP has the potential to be a powerful tool in the management of Sports injuries. Current clinical studies show beneficial results, particulary for soft tissue and Osteoarthritis reducing pain and increasing function.

325 The next step in osteoarthritis management – Photoactivated Platelet Rich Plasma injections: A case study

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Arthritis is a major cause of disability and chronic pain affecting at least 3.85million people within Australia at a cost of >$23.9 billion each year. The most prevalent form of this is osteoarthritis; a progressive and degenerative condition. Current medical treatment strategies aim at symptom control and unlike therapies for inflammatory arthropathies, do not offer benefits of disease modification. Recent research has identified the role of catabolic cytokines – primarily IL-1 – in the development of osteoarthritis and shown that exposure to UV light (photoactivation) reduces pro-inflammatory cytokine expression and increases IL-1 Receptor antagonist expression in peripheral blood. Additionally, research focussed on Platelet Rich Plasma (PRP) therapies has demonstrated improved cartilage matrix expression in animal and in-vitro studies, whilst a limited retrospective cohort study has indicated significant reductions in pain post intra-articular injection of PRP. Thus, photoactivated platelet rich plasma (PAPRP) may offer an injectable treatment for osteoarthritis wtih potential improvement in pain and function and theoretical modification of disease progression.

This case study focuses on a 50yr old female with severe tri-compartmental osteoarthritis with persistent pain and reduced function despite conservative treatment, who underwent a course of photoactivated platelet rich plasma.

Methods: Autologous blood was taken from the study participant and centrifuged using an accepted soft single spin method to create a PRP medium which then underwent photoactivation to improve the expression of IL-1RA. The PAPRP was injected intra-articularly on three separate occasions over 2 weeks. Outcome measures were recorded using a numerical pain rating scale (NPRS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC Index 3.0), and percentage perceived improvement.

Results: NPRS reduced from a baseline of 4 to 0 by Week 6 and remained between 0–1 until final data collection at Week 18. WOMAC score at baseline indicated significant pain with physical and functional impairment (Global WOMAC Score 59.38). At Week 6, the Global WOMAC Score had improved by 65% and remained improved up to final data collection in week 18. At week 18, a perceived improvement of 80% was reported.

Discussion: In a single case study, PAPRP has shown significant improvement in symptom control beyond recognised conservative treatment measures. These results not only highlight the need to further investigate the use of PAPRP in the treatment of osteoarthritis, but to skew the treatment paradigm from solely focusing on symptom control, to also including disease modification.

326   Effect of same sport environment on athletic identity and physical injury

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Introduction: Athletic identity is the way that athletes perceive and feel about their sporting role, which comprises their goals, values, thoughts, and sensations related to their sport. The purpose of this study was to investigate the effect of national camping on physical injury and athletic identity among teenager and adult elite athletes with different athletic identity.

Method: 132 women elite athletes (44 karate, 44 taekwondo, and 44 wosho) completed the athletic identity measurement scale (AIMS) (Brewer 1993) at the first and last day of national camping respectively (around 6 months). In every sport half of athletes were teenagers and half of them were adult. In order to analyze data Paired sample t-Test was used.

Results: Results indicate that although prior research and the pre test in the first day of national camping showed teenager athletes had significantly higher athletic identity than adult, teenagers showed the same athletic identity as adult in the last day of national camping. In other words, the athletic identity dramatically dwindled in teenagers athletes. On the other hand, by dropping athletic identity, teenagers showed more physical injury, compared to adults that their athletic identity remained steady.

Conclusion: The findings suggest that sport environment is so effective that can affect athletic identity. It seems that in conjunction with decreasing in athletic identity, the physical injury increase. So it had better in national camping, sport psychologist work on athletic identity to avoid from physical injury specifically in teenager hood that the body is more vulnerable than adult. Also, it is better, in national camping, teenager and adult athletes are taught in distinctive places and have the different dormitory for living during national camping.

327   The psychological response to physical activity related injury

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Public health policies have been developed to encourage a greater proportion of the population to meet recommended levels of physical activity (PA) to benefit health. However, with a sudden increase in the volume and/or intensity of activity undertaken comes greater exposure to risk of injury. Musculoskeletal injury is the most common adverse effect of PA and once injured many individuals do not seek treatment or perform rehabilitation exercises increasing their risk of re-injury. Injury is frequently reported as the reason for (temporarily or permanently) ceasing involvement in activity, not doing more activity and fear of injury acts a barrier to adopting PA. As more individuals seek to meet PA recommendations, injury prevalence will increase and one challenge will be to ensure individuals return to activity post-injury. Research in other contexts has shown that the psychological response to injury will influence whether or not behavior is resumed. Therefore, the aim of this research was to review the psychological responses to activity-related injury and subsequent effects on PA behavior. Initially, we performed database searches using keywords related to injury, PA and psychological outcomes to identify published research. This highlighted that little empirical research exists on the topic. Consequently, we drew from cognitive appraisal and stress process frameworks and research in sport and general injury contexts to provide indirect support for psychological responses that may occur. Results suggested that following an injury, individuals will experience distressing emotional states, e.g. frustration, anxiety, negative affect, sense of loss, and a decrease in self-esteem. These occur because individuals are blocked from achieving activity-related goals, participating in a valued activity or because their identity as someone who is active is threatened. Self-efficacy will decrease, particularly in relation to perceived ability to do certain activities and overcome new barriers to activity presented by the injury. Injuries are painful; negative appraisal of pain contributes to heightened pain intensity, fear of re-injury and avoidance of PA. The extent of these psychological responses and their effect on PA are dependent on personal (e.g. the length of time being regularly active, coping skills, injury severity) and situational factors (e.g. presence of social support, access to rehabilitation). In conclusion, as researchers have claimed, there appears to be a myriad of psychological outcomes that could result from an activity-related injury that would impact post-injury PA. However, there is only indirect support for these processes and they should be confirmed directly through empirical research.

328   The motivations of marathoners scales instrument for evaluating motivational factors in a variety of mainstream sports

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Background: The Motivations of Marathoners Scales (MOMS) may be used to gauge the importance of a range of psychological factors in determining sports participation. Previous research has supported the use of the MOMS for Marathon runners; however its use in other sports has not been investigated. The 2010 Pan Pacific Masters Games recorded over 10,700 athletes, representing 26 nations. The age ranges present in the research used to develop the MOMS survey instrument had significant overlap with age ranges in the 2010 Pan Pacific Masters Games and items identified in the MOMS have been identified by other researchers as important motivational constructs for masters athletes. This event thus presented an excellent opportunity to investigate the applicability of the MOMS to a variety of mainstream sports.

Aim: To assess the efficacy of the MOMS instrument in evaluating motivational factors in a variety of mainstream sports.

Methods: This study was conducted in accordance with the ethical standards of the Helsinki Declaration. A total of 1590 athletes (739 male, 851 female) aged 25 to 83 (mean=49.1years, SD±9.0) competing at the 2010 Pan Pacific Masters Games completed the MOMS questionnaire online. The MOMS questionnaire assesses the salience of a broad range of psychological factors as related to sports participation. This data then underwent factor analysis and Cronbach Tests in order to assess the applicability of the MOMS for this population.

Results and discussion: The results of the Cronbach Tests showed psychological coping, self-esteem, life meaning, general health, weight concern, affiliation, recognition and personal goal achievement to have α values greater than 0.8 while competition had an α value greater than 0.7.

Confirmatory factor analysis using maximum likelihood extraction and a series of rotations revealed that the MOMS factor structure was partially supported for this diverse population of masters athletes of both genders. There were however some discrepancies in terms of factor complexity on ten items and some reverse factor loadings for the constructs of psychological coping, self esteem and life meaning. This may be explained on the basis that a second order factor defined as psychological motives was structurally linked to these three factors.

Conclusion: Based on the confirmatory factor analysis there was significant relevance of the MOMS instrument to masters athletes. Based on factor complexity discrepancies and reverse factor loadings there was however evidence for further refinement, reflecting the differing constructs for sports participation/motivation with masters athletes.

329 Physical impairments are greater following hip arthroscopy in people with chondropathy compared to people without chondropathy or controls

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Introduction: Hip arthroscopy is increasingly being used to diagnose and treat intra-articular hip joint pathology. While post-operative rehabilitation aims to reduce symptoms and enhance physical function, there is minimal knowledge of physical impairments following hip arthroscopy. People with chondropathy may represent a population with early onset hip osteoarthritis; knowledge of specific impairments in this subgroup may assist in the implementation of targeted interventions post operatively. The aim of this study was to compare the physical impairments between people post hip arthroscopy with and without chondropathy and age matched healthy controls.

Methods: 70 patients (35 female; age=35±10yr; height=1.75±0.10m; weight=79±12kg) were recruited 12–24 months post hip arthroscopy; and 60 healthy controls (41 female; age=36±9.6yr; height=1.71±0.94m; weight=68±12kg) were recruited. Participants were tested for hip range of motion (ROM), normalised hip joint peak torque and functional performance (hop for distance). The intra-rater reliability of physical tests was established (ICC and SEM). Hip arthroscopy patients were grouped with chondropathy (CHA) and without (0HA). Between-group differences of physical impairments were tested using Univariate Analysis of Co-Variance (ANCOVA) tests. Post hoc analysis was performed on impairments where a significant between group difference was observed (p<0.01).

Results: All tests demonstrate good reliability (ICC>0.80). ANCOVA tests revealed differences for hip internal rotation (IR) ROM at both 0° hip flexion (p=0.039) and 90° hip flexion (p=0.001), hop for distance (p<0.001); and for all strength measures (abduction(AB) p<0.001 adduction(AD) p<0.001; extension(EX) p<0.001; flexion(FL) p<0.001; external rotation(ER) p=0.001; IR p=0.003). Post hoc analysis revealed no difference between controls and 0HA for the hip IR ROM measures. However, CHA had lower range of hip IR at 90° hip FL compared to controls and 0HA (p=0.001). Hip muscle strength was reduced in all measures between the controls and CHA (FL p<0.001; EX p<0.001; AB p<0.001; AD p<0.001; ER p<0.001; IR p=0.001). Furthermore, 0HA also exhibited lower AB (p=0.006) and AD (p=0.004) strength, compared with controls. A difference in functional tests was only seen between CHA and controls (p<0.001).

Discussion: Physical impairments exist in people who are 12–24 months post hip arthroscopy compared to controls. People with chondropathy at the time of hip arthroscopy have greater impairments in hip IR ROM, all hip muscle strength and functional performance compared to both those without chondropathy, and healthy age-matched controls. This study is important as it is the first to describe physical impairments in this patient population. It may enable therapists to provide targeted rehabilitation programs.

330 Biomechanical comparison of two arthroscopic rotator cuff repair techniques using synthetic scaffolds as a bridging device in an ovine model

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Introduction: Massive irreparable rotator cuff tears are difficult to manage. Synthetic materials have been proposed as one solution to bridge tendon defects in these tears. Recent investigations in our institution suggest that synthetic patch repairs may offer a promising long (9.7 years) term outcome for otherwise irreparable tears. To date, no investigation has been made into how these repairs respond biomechanically, and how they respond to different footprint repair techniques.

Aim: This study aimed to determine the footprint contact pressure and pull-out strength of a synthetic patch repair using a simple-suture technique and a tension-band technique.

Methods: Rotator cuff tears were created ex vivo in 12 ovine shoulders divided into two groups: simple-suture repair and tension-band repair. A pressure probe was passed through a hole created in the centre of the humeral footprint to measure footprint pressure. The infraspinatus tendon was detached from its humeral insertion to represent a full thickness tear. The distal end of the tendon was secured to a synthetic patch via simple-sutures using No. 2 polyester sutures (Ethicon, Somerville, New Jersey). The distal end of the patch was repaired to the humerus using either double-loaded simple-suture anchors (Parafix; Arthrocare, Austin, TX), or knotless anchors (Opus Magnum; ArthroCare, Austin, TX). Contact pressure was measured at variable tensions (10-N to 30-N) and degrees of abduction (100 to +100). Repair strength was determined by a pull-to-failure test using an Instron 8874 (Instron, Norwood, MA) machine.

Results: Tension-band repairs provided higher footprint contact pressure than simple-suture repairs in all cases. This was significant in seven out of nine tension/abduction combinations (P<0.05). Footprint contact pressure was maximised with increasing tension and decreasing abduction angle. Tension-band repairs (188 N±10N) had higher pull-out strength than simple-suture repairs (220 N±7N) (P<0.03).

Discussion: The tension-band technique delivers higher footprint contact pressure and pull-out strength than a simple-suture repair technique when repairing a synthetic patch to bone with suture anchors. It was interesting to note in this model that a synthetic patch-to-bone repair was stronger than similar tendon-to-bone repairs performed previously in our institution. We hypothesise that the elastic deformation of the synthetic patch may contribute to higher failure load properties of interpositional patch repair as compared to native tendon-to-bone repairs.

331 The effectiveness of ultrasound in diagnosis of adhesive capsulitis: A pilot study

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Introduction: Shoulders with adhesive capsulitis have been found, on MRI, to have thickened joint capsule and coracohumeral ligament. This study aimed to determine if thickening and increased vascularity of the shoulder capsule and coracohumeral ligament would be reliably detected by ultrasound. Methods: 6 weeks following arthroscopic rotator cuff repair, thickness and vascularity of the posterior capsule, the capsule at the rotator interval and the coracohumeral ligament at a medial and a lateral point were sonographically assessed. Vascularity was also measured at the supraspinatus repair site. Results: Twenty three subjects were recruited in the study and clinical examination of range of external rotation found 5 subjects had severe restriction, 17 had mild restriction and 1 was unrestricted. A positive control cohort of 4 primary frozen shoulders was included. The unrestricted cohort could not be statistically analysed, so the severely and mildly restricted cohorts were compared. Thickness and vascularity showed no significant difference (p>0.05) at the capsule or coracohumeral ligament. Vascularity was significantly increased at the supraspinatus repair site of severely restricted shoulders (p=0.03). A trend, although not significant, was observed of decreasing restriction with decreasing capsule and ligament thickness. Discussion: Vascularity at the tendon repair site increased with shoulder restriction, but no other difference was found between severely and mildly restricted shoulders. More work needs to be done before ultrasound can reliably diagnose adhesive capsulitis of the shoulder.

332 Demineralized bone matrix augmented tendon-bone healing in transosseous-equivalent sheep rotator cuff model

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Introduction: Rotator cuff repair is one of the most common shoulder surgeries. Yet despite its prevalence, it is associated with high failure rates due to tendon detachment at the tendon-bone interface. Biological strategies to augment tendon-bone healing in the shoulder represent a new area of focus to improve patient outcomes. Demineralized bone matrix (DBM) is known for its osteoinductive and osteoconductive properties. This study tested the hypothesis that DBM administered to the bone bed prior to the reattachment of the tendon, will result in enhanced tissue morphology that more closely resembles that of a normal enthesis using an ovine rotator cuff model.
Methods: Following ethics approval, 10 adult wethers (18 months) were randomly allocated to control, n=4 (without DBM) or DBM, n=6 (DBM administered to bone bed) groups. The infraspinatus tendon was detached from its insertion and repaired in a transosseous equivalent fashion using PEEK suture anchors in an established model. Ovine DBM that was prepared using a modified Urist protocol was injected into the bony tendon footprint.
Animals were culled at 4 weeks following surgery and processed for tissue histology and micro-computed tomography (μCT) endpoints.
Results: No infection or tendon detachment following repair was noted in either group. 3D reconstructed images of μCT scans verified correct DBM and suture anchor placement. Histological images demonstrated distinct differences in tissue morphology between the two groups; however there was no evidence of the four-zoned structure characteristic of a healthy tendon-bone insertion, in any specimens. In the control group specimens, the tendon midsubstance was highly disorganized with randomly arranged collagen fibres. Diminutive areas of fibrocartilage were noted. In the treatment group, large regions between tendon and bone were occupied by fibrocartilage. Fibrocartilage was organized and chondrocytes were orientated in the direction of the insertional collagen fibres. Organized collagen fibre orientation within the tendon midsubstance was observed, though this was not consistent throughout all the specimens. DBM particles were resorbed and trabecular bone occupied the DBM holes. The PEEK anchors were all well integrated and fixed.
Discussion: This study showed that DBM augmented tendon to bone repair leads to increased amounts of fibrocartilage between the repaired tendon and underlying bone. This results in improved organization which more closely resembles the morphology of the normal enthesis. Introduction of osteoinductive DBM at the tendon-bone interface during surgery may reduce failure rates associated with rotator cuff repair and improve clinical outcomes.

333 Shoulder injury in professional surfers

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Introduction: Shoulder pain and injury is a common problem in both recreation and competitive surfing. A survey of 451 surfers conducted by Nathanson et al. found that musculoskeletal strains were the most common chronic surfing injury accounting for 59% of all cases.
Among musculoskeletal strains, the shoulder (27%) was the most common joint affected. This study aimed to examine the incidence of shoulder injury in a group of professional surfers that qualified for the World Championship Tour.
Methods: Fifteen athletes were examined over the first two days of competition of a world tour event. Athletes were asked whether they had a past history of shoulder injury or pain. Both the left and right shoulders were assessed on all athletes for range of motion, strength, scapula winging, shoulder impingement and instability.
Results: Six out of thirty athletes reported a past history of shoulder injury on a total of eight shoulders. There was one case of anterior shoulder dislocation, four cases of shoulder tendonitis and three cases of impingement. The average range of shoulder internal rotation was 48.83 degrees, external rotation was 90.16 degrees. All shoulders had full range of motion of abduction in the scapula plane and no surfers reported a painful arc through range. Eight of the thirty shoulders examined had winging of the scapula during shoulder abduction. Two patients had active signs of external impingement as evident by a positive Hawkins Kennedy Test and Neer's test. Three of the thirty shoulders had grade one anterior instability on clinical examination.
Discussion: This was a small cross sectional study which demonstrated the incidence of shoulder injury in a group of professional surfers. The overall incidence of injury was 28%. Further studies performed on a larger population of surfers are required to further clarify the incidence of injury and identify risk factors for injury in this population.

334   Recommendations for a golf conditioning program based on examination and golf swing analysis – A case series

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Introduction: Given the popularity of golf in the senior age groups (over 50 years as determined by golfing associations) and the complex movement patterns required for the golf swing, tailored exercise and treatment programs for individuals based on their physical capabilities are required for both injury prevention and performance enhancement.

Methods: A history and orthopaedic physical examination is performed on the golfer, a 9 point physical swing assessment highlighting areas of concern, and a tailored physical fitness program is developed for improved results. At each point the physical positioning of each part of the body is assessed, with comments made on areas of concern. These recommendations are designed to help the golfer reduce the risk of developing a golf injury. This assessment is designed to highlight the stresses and strains being placed on the body and make suggestions to prevent these, and Identify inefficiencies in the use of the body that might be impacting the effectiveness of the swing.

Results: Five golfers, all male and aged between 35 and 70 years were assessed by a golf injury specialist (Doctorate on golf injuries) and recommendations were made based on the findings of golf swing video analysis and physical examination. Recommendations included treatment to improve joint function, and muscular hypertonicity (soft tissue therapy, stretches, mobilisations/manipulations) as well as specific conditioning exercises designed to strengthen tissue under increased stress during the golf swing. Specifically, one golfer was devised a treatment program aimed at improving function/range in restricted motions. Specifically neck and shoulder motion dysfunction and Improving lower limb soft tissue tightness through deep soft tissue massage therapy. Exercises specific for his golf swing included Wall squats to Strengthen quadriceps muscles and quadraped exercises to strengthen gluteal muscles.

Conclusions: Whilst a general golf conditioning program can aid some golfers, a program matched to the individual requirements of a golfer in terms of their physical limitations/capabilities and their individual golf swing will provide optimal benefit. Not only can such a program improve compliance as the individual knows that the program is structured with them in mind, it can reduce the risk of injury as it takes into account what the golfer can and cannot physically perform. A structured treatment program to improve any motion dysfunction will also reduce injury risks further and may result in an associated performance improvement.

335   A pilot study on the effect of a weight-and-age classification on injury incidence in junior rugby league competitions

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Introduction: In Australia most junior sports, including junior rugby league, organise playing divisions by arbitrary age cut-offs. As children of the same age can vary greatly in height, weight and maturity, it is currently a contentious issue that children of variable sizes are competing against each other in a contact sport. The aim of this study was to identify normative values for weight and height in junior rugby league players and identify any difference in injury incidence in a weight-and-age competition as compared to a standard age group competition.

Methods: Anthropometric data (weight and height) was collected from participants competing in Under 12 to Under 14 junior rugby league open-weight based competitions. Weight and height was then collected from participants of a junior rugby league gala day where 27 teams participated across two age divisions (Under 12 and 14) each divided into an open-weight age based competition or a weight-and-age based competition. Four gala day competitions comprising six Under 12 weight-and-age (under 55kg) teams, seven Under 12 open-weight teams, six Under 14 weight-and-age (under 65kg) teams and six Under 14 open-weight teams were conducted with injury incidence and type recorded on standardised forms by trained first aiders.

Results: Data was recorded for 398 junior rugby league players. Mean height and weight and SD for each group were as follows: Under 12 weight-and-age: weight=43.6kg (7.08) and height=150.3cm (7.35), Under 12 open-weight: weight=54.6kg (15.6), height=154.4cm (9.02), The Under 12 control group: weight=51.1 (12.2), height=156.5 (8.4). The Under 14 weight-and-age: weight=53.6 (7.7), height=161.2 (7.7). The Under 14 open-weight: weight=65kg (15.5), height=168.1cm (7.7). Each group was significantly different with respect to height, weight and BMI. In the four competitions, a total of 28 injuries were recorded with injuries distributed evenly across the four groups.

Discussion: The fact that these gala day groups were significantly different in size indicates that having a larger weight-and-age based competition may place more like-sized players against each other and remove the large differences that currently exist within age groups. The control data indicates that the cut-off weights for the weight and age groups should also be changed from that used in this study as the mean weight was less than the cut off chosen. Larger studies are needed to compare differences in injury incidence in open weight competition and weight-and-age based competitions in junior rugby league.

336 Neuromodulation for chronic pain conditions

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Background: Treatment of chronic neuropathic pain presents a challenge for pain specialists. Neuromodulation offers a novel alternative to conventional interventional therapies. Neuromodulation involves the selective stimulation of afferent nerve fibres with a programmable pulse waveform to relieve pain. This treatment is most indicated in cases of severe localised pain, intractable to analgesics and other conventional therapies. In Peripheral Nerve Field Stimulation (PNFS), leads are subcutaneously placed to stimulate the region of affected nerves, cutaneous afferents, or the dermatomal distribution of the nerves, which converge back to the spinal cord. PNFS has the advantage of being able to provide paresthesia to regions not previously reachable with spinal cord stimulation.

Methods and materials: We prospectively assessed 174 successful PNFS trial patients who were subsequently implanted with octrode percutaneous leads within the major area of pain in their craniofacial, thoracic, lumbar/sacral or abdominal/pelvic areas. Outcome measures assessed via surveys and patient histories were; pain, analgesic use, employment status, disability (Oswestry disability index (ODI) and Neck Disability Index (NDI)), and depression (Zung depression index). A follow up rate of 100% was achieved with an average follow up ranging from 4–23 months. Ethical approval was obtained. Statistical analysis was performed, a p value of <0.05 considered statistically significant.

Results: An average statically significant pain reduction of 4.3 ± 2.5 pain scale points, on an 11-point scale was reported ($p\leq0.00$). In particular, 73% of patients reported good ($>50\%$) to excellent ($>75\%$) pain relief. Pain relief achieved shortly after implantation was sustained for greater than 12 months. Overall 74% of patients reduced their analgesic use following PNFS, with reduced analgesic use correlating with improved pain relief $r=0.704$ ($p=0.00$). Disability (ODI and NDI) was significantly reduced following PNFS. Where applicable, 48% of patients below the age of 60 years increased their capacity for paid employment. Of the 174 cases, 24 patients reported complications ranging from hardware erosion and migration to infections and implant rejections. Only 6 patients had their complication rectified by a system explant, the remaining 18 patients underwent replacements, repositions and/or re-implants with positive outcomes. No long-term complications were reported. Overall, 85% of patients were satisfied with their outcome.

Discussion: This prospective 174 consecutive PNFS patient outcome study demonstrates that PNFS can be a safe and effective treatment option for, otherwise, intractable chronic pain conditions. PNFS has the potential to fundamentally change the way we think about pain management.

337 How does foot plant strategy affect cutting technique in male and female Touch Football players: Implications for ACL injury risk?

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Introduction: Past research has claimed that male and female athletes display biomechanical differences when performing cutting manoeuvres. However, when male and female Touch football players were matched for age, skill level and anthropometry, many of the gender differences in cutting technique were no longer evident. Instead, players tended to display one of two distinct foot plant strategies when cutting, either a lateral (foot away from the midline of the body) or a central (foot towards the midline of the body) foot plant. This study aimed to determine whether the biomechanical variables that characterise cutting differed with respect to the foot plant strategy used by male and female Touch football players.

Methods: Based on a two-dimensional qualitative analysis (25 Hz, JVC camcorders) of the foot plant strategy used during unanticipated cutting, 14 male (20.8 ± 1.5 yr) and 14 female (19.8 ± 1.0 yr) representative Touch football, matched for age, skill level and lower limb anthropometry, were divided into three groups: male lateral foot plant (MLP; n=14), female lateral foot plant (FLP; n=7) and female central foot plant (FCP; n=7). Three-dimensional kinematic (200 Hz; OPTOTRAK 3020 motion analysis system) and kinetic (1000 Hz; Kistler force platform) data were collected to derive lower limb joint angles, moments and muscle activation patterns (Noraxon Telemyo system) at initial contact (IC) and at peak resultant ground reaction force (F_R).

Results and discussion: One-way ANOVA revealed there were no between-group differences in the peak knee moments or muscle synchrony patterns. However, FLP participants recorded significantly greater ankle inversion at IC ($p=0.018$); greater ankle internal rotation ($p=0.015$) and knee adduction ($p=0.036$) at F_R; and greater peak vastus lateralis activity ($p=0.001$) compared to MLP participants. Conclusion: Although the small sample size may have precluded more significant between-group differences, these findings suggest that female Touch football players who adopt a lateral foot plant strategy may be at greater risk of ACL injury than males who perform a similar technique and females who adopt the central foot plant strategy. Further research is required to determine the functional relevance of the non-significant differences between females performing different foot plant strategies, as well as to identify males who perform the central plant strategy for comparison so that the effects of gender and foot plant strategy on ACL injury risk can be further understood.

338 Risk factors in the development of exercise related groin pain: A systematic review

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Introduction: Groin pain is a commonly diagnosed injury in a number of sports and often progresses into a chronic condition that has traditionally been difficult to manage and rehabilitate. Managing athletes and preventing initial injury is an important measure to limit the impact of any injury. In an attempt to identify those more susceptible to groin pain a number of studies have investigated the risk factors related to the development of groin pain. A number of systematic reviews have been conducted in this area, however some methodological issues and the period of time since the last review warranted an updated systematic review into the risk factors relating to the development of groin pain.

Methods: A systematic search strategy was entered into MEDLINE, CINAHL, AMED, AUSPORT Medical, Embase, SportDiscus, PEDro and the Cochrane Library. This search yielded 1,893 studies that were reduced to 15 following application of inclusion and exclusion criteria. Data was extracted and synthesised quantitatively, via meta analysis, where applicable and qualitatively in other cases.

Results: Meta analysis identified previous history of groin injury (OR 1.64, 95% CI 1.13–2.39, p=0.01, I^2<0.001) and increasing age (OR 2.27, 95% CI 1.53–3.37, p<0.001, I^2<0.001) as increasing the risk of groin injury. Height (p=0.14) and weight (p=0.17) were not significant risks based on meta analysis. Other factors were not included in meta analysis as they were only identified in individual studies or statistical data was not provided to allow meta analysis.

Discussion: This review highlights the risk factors identified in prospective cohort studies and non-modifiable factors in retrospective studies. Several potentially important risk factors may not have been adequately investigated due to design issues in previous studies. Considering some of the proposed pathologies in the region, assessing risk factors identified in other regions associated with bone stress injury, tendinopathy and joint degeneration may reveal novel factors that are yet to be identified. Future research should aim to clearly diagnose the source of groin pain to overcome differences in nomenclature and generic hip and groin diagnoses.

339 Diagnosing exercise related pubic pain: Findings from exploratory focus groups involving clinical experts

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Introduction: The diagnosis of pain originating from the hip and groin, especially from the pubic bone and its soft tissue attachments continues to be a challenge in sports medicine. Despite the publication of previous clinical models, calls for the development of standardised diagnostic criteria continue. A clinical model, based around a synthesis of previous literature has been proposed to assist in the diagnosis of exercise related pubic pain (ERPP). The eight sub-groups in this proposed clinical model are abdominal enthesopathy, abdominal tendinopathy, adductor enthesopathy, adductor tendinopathy, pre-pubic complex tears, pubic bone marrow oedema, pubic symphysis irritation and pubic instability, however validation of the clinical model is required. The lack of a gold standard in this region makes validating these clinical sub-groups a challenging process. The aim of this study was to explore, via focus groups, current opinions on the presentation of ERPP. A particular focus was to explore opinion on the existence of these proposed sub-groups.

Method: Using the pre-developed clinical model as a foundation, exploratory focus groups that included sports physicians, orthopaedic surgeons, radiologists, physiotherapists and anatomists recognised as experts in hip and groin pain were conducted. The four focus groups included between 4 to 8 participants who were asked to comment on the following questions:

- What pathologies exist that have the potential to present as ERPP around the pubic symphysis?
- What is a clear, recognisable description of each pathology or sub-group?
- What do you consider as the onset of ERPP?
- What do you consider as signs of full resolution of symptoms?
- What other structures and pathologies may present as exercise related groin pain?

Following completion of focus groups audio recordings were transcribed and thematic analysis completed.

Results: Focus groups demonstrated varied support for the existence of the proposed sub-groups. Several other structures were identified as potential sources of groin pain.

Discussion: These results may provide an insight into the feasibility of the proposed sub-groups of ERPP and other diagnostic considerations. For sub-groups recognised as feasible during these focus groups further research is required to identify the clinical and radiological features of these groups. Methodology that attempts to reach consensus between multiple clinicians will increase confidence in the existence of these sub-groups and provide preliminary validation of this clinical model.

340 Revision ACL reconstruction after use of the LARS ligament: A case series

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Introduction: The Ligament Augmentation Reconstruction System (LARS. Surgical Implants and Devices, Arc-sur-Tille, France) is a synthetic non-absorbable augmentation device made of polyethelyne terephtalate (PET). It has rapidly gained popularity in Australia with 982 used in 2009 and 1050 in 8 months in 2010 according to the manufacturers website. Whilst autograft use in Anterior cruciate ligament (ACL) reconstruction has demonstrated excellent clinical results, little has been published to support the use of artificial ligaments. Poor patient outcomes associated with graft failure, tunnel osteolysis, foreign body synovitis and premature arthritis are among the reasons that artificial ligaments were abandoned over two decades ago.

Method and results: We report a case series of 7 patients who attended to our clinic for revision of failed LARS ACL reconstruction. In 5 patients single stage revision was possible but in 2 patients a 2 staged procedure was required. There were 4 males and 3 females, mean age 27 years (range 20–37). One 33 year old male (case number 2) demonstrated significant synovitis necessitating a complete synovectomy. Histopathological analysis revealed findings that were consistent with a haemosiderotic synovitis in a setting of chronic tissue reaction to foreign material (LARS ligament).

Conclusion: Given the demonstrated foreign body synovitic reaction to the LARS ligament and initiation of an iatrogenic degenerative process, we assert the LARS device, like its artificial graft predecessors, should be used with great caution, if at all, for treatment of ruptures of the ACL, particularly in young healthy patients.

341   Investigating cortical changes associated with patellar tendinopathy

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Introduction: Tendinopathy, the clinical syndrome of pain and dysfunction in a tendon is debilitating, recalcitrant to treatment and therefore often termed a chronic condition. Importantly, it is not known how the central nervous system modulates or interprets tendon pain and whether it is similar to other chronic pain conditions. This study aims to investigate whether there are cortical excitability differences between people with and without patellar tendinopathy. Cortical excitability and inhibition are important determinants for muscle function and, as such, any differences between healthy and tendinopathic participants may provide data for the altered muscle function associated with tendinopathy and improve future rehabilitation directions. Cortical differences in other chronic musculoskeletal pain conditions have provided clinically useful direction of treatment.

Methods: Male and female volleyball players aged over 18 years with and without patellar tendinopathy, matched for age, gender and activity level will be invited to participate in the study. Objective measures of single leg decline squat pain, tendon ultrasound and maximal voluntary leg extension torque will be recorded. Single and paired pulse transcranial magnetic stimulation (TMS) will be applied over the motor area projecting to the quadriceps muscle group to obtain measures of corticospinal excitability and intracortical inhibition. Stimulus-response curves will be obtained and the slope and peak values will be used to establish the strength of projection. Results of tendinopathic and healthy individuals will be compared. Pain severity and length of time of symptoms will be correlated with TMS measures to identify whether a relationship exists.

Hypothesised Results: It is hypothesised that individuals with patellar tendinopathy will show differences compared with normals of reduced cortical excitability and that changes will be more pronounced with increasing chronicity of symptoms.

Discussion: The incidence of tendinopathy is increased with aging and activity and may cause a person to become sedentary due to load related pain. Improving our understanding of this condition is vital. This will be the first study to examine the cortical changes in people with tendon pain. Differences identified will be correlated to clinically useful measures of severity of pain and length of time of symptoms to determine the effect of chronicity. This information may assist clinicians with early prognostic indicators for people presenting with patellar tendinopathy and help guide the use of interventions which target pain or muscle function.

342   Reasons for sport participation and dropout among Australian junior cricketers and netballers

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Introduction: Participation in sport makes an important contribution to children's overall health and well-being through a range of well-documented physical and psychosocial health benefits. It provides an opportunity for children to increase their energy expenditure, enhancing a child's likelihood of attaining sufficient levels of physical activity for good health, while reducing the risk of conditions such as childhood overweight and obesity. Despite some recent Australian data suggesting that many children are active in sport, evidence of 'regular' child sport participation in Australia has shown a decline over the past two decades.

Methods: This research aimed to investigate the self-reported reasons why children chose to participate or dropout of organised sport among a sample of junior cricketers and netballers aged 9–17 years. A total of 284 cricketers (predominantly male) and 279 netballers (predominantly female) completed a validated survey instrument during a scheduled training session to collect information about their cricket/netball participation, reasons for continued sport involvement, injury history and reasons for sport dropout.

Results: Enjoyment was the most frequently reported reason (over 90% of respondents) for ongoing sport participation among both samples. Cricketers (54%), more frequently than netballers (34%, p=0.002), reported improving skill/ability or competition for continued sport involvement, while netballers (67%) reported peer influence as sport motivators more frequently than cricketers (49%, p<0.001). Few children in the sample reported planned sport dropout (4% of cricketers and 16% of netballers). Of these children from both samples, the most frequently reported reason for dropout was a lack of enjoyment (64% cricketers, 85% netballers), followed by having other things to do (approximately 37%), and sport injury (approximately 20%).

Discussion: Although not investigated in the study, it may be likely that factors, such as injury occurrence, indirectly contribute to a reduction in enjoyment, hence the reported frequency of this factor in children's planned sport dropout. This area warrants further research. This study demonstrates a range of factors contributing to sport uptake and dropout that are consistent with other research. However, it has raised awareness of potential factors impacting children's sport participation that have, until now, been relatively overlooked in the literature. The findings and recommendations from this study can inform sporting bodies of how to promote sport participation among Australian children, and identify areas for future research, particularly in the realm of injury prevention.

343   The who, where and how... Understanding hamstring injuries in the AFL

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Introduction: Hamstring muscle strain injury is the most common injury and cause of missed games in the Australian Football League (AFL). Over the last 20 years, the average number of new hamstring injuries has remained high at 5.9 and 6.2 per club for 10 and 20 years respectively. A substantial amount of research has been conducted into factors associated with such injury, however little consensus exists and many potential risk factors have not been examined. The purpose of this exploratory study was to gain a more in-depth understanding of hamstring injuries in the AFL.

Method: For every hamstring muscle strain injury that was reported in the 2011 AFL season, data was collected on player factors, injury details, extrinsic factors, past history and recovery information associated with injured player and the injury.

Results: All AFL clubs participated in the study and 91 hamstring injuries were reported. Backline players were most commonly injured (36%) and the majority of injured players had a past history of a hamstring strain (57%). More than half of the injured players reported hamstring or lower back symptoms just prior to the injury and 27% had a previous history of groin pain. The biceps femoris muscle was injured in 83% of cases. Of the 62 injuries that occurred during a game, the majority occurred in the third quarter (32%) and 16% of injuries occurred on the MCG. Interestingly, 23% of injured players had played on Etihad stadium in the round prior to sustaining the injury. On average training loads measured in both RPE x time and percentages increased incrementally in the three weeks prior to the injury. Information on game hardness data, ground conditions, and mechanism of injury will be presented.

Discussion: The results of this study highlight some potential risk factors that have not been studied extensively in past research. Hamstring and lower back symptoms prior to the injury and the ground conditions and training loads in the lead up to the injury may warrant further investigation. Further analysis of the data might provide more direction for future research and assist in the identification of at risk players.

344 Age based differences in factors motivating masters athletes

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Background: Previous research has identified psychological factors considered by masters athletes to be significant in motivating their sport participation. This population does, however represent a range of age groups. Identifying any differences existing between age groups might assist in directing strategies for increasing sports participation.

Aim: To identify age group differences in the factors motivating masters athletes to participate in sport.

Methods: This study was conducted in accordance with the ethical standards of the Helsinki Declaration. An online survey was used in order to investigate athletes competing at the 2010 Pan Pacific Masters Games. In total 1547 masters athletes (age 30–69, mean=48.7, SD±8.2) completed the Motivations of Marathoners Scales (MOMS). The MOMS questionnaire assessed the salience of the following psychological factors: general health orientation, weight concern, personal goal achievement, competition, recognition, affiliation, psychological coping, life meaning and self esteem, as related to sport participation. Prior to data analysis, participants were split into 4 age groups which ranged from 30–39 to 60–69. An ANOVA and subsequent post-hoc tests (Tukey's test) were conducted in order to assess any differences in the importance given to psychological factors present in the MOMS.

Results: ANOVA indicated differences (p<0.05) under the factors of psychological coping, general health orientation and competition. Post-hoc testing found no differences under the factor of competition, but differences between the 30–39 and the 50–59 age groups under psychological coping. Likewise, the Tukey's test identified differences between the 40–49 and both the 50–59 and 60–69 age groups under general health orientation.

Discussion: Despite differences in the importance placed on the factor psychological coping, it was apparent that greater consideration of this was not warranted as it is considered unimportant by all age groups. Older masters athletes tended to place greater importance on the general health aspect of sport, though this was still considered as important by all age groups.

Conclusion: Of the nine factors analysed, two demonstrated differences between age groups. One of these two factors "psychological coping" was considered unimportant by all groups. The other factor, the general health aspect of sport was considered important by all groups, however athletes 50 and older placed a greater emphasis on this factor. Based on these findings, that are specific to the factors assessed by MOMS, strategies aimed at increasing sports participation and adherence in individuals aged between 30 and 69, do not necessarily need to be tailored to more specific age groups.

345 Anterior cruciate ligament reconstruction: Incidence and risk factors for graft failure and contralateral rupture

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Background: Graft rupture or injury to the anterior cruciate ligament (ACL) in the contralateral knee is a devastating outcome following ACL reconstruction surgery. The aim of this study was to determine the rates of graft rupture and contralateral ACL injury and investigate patient characteristics that may be associated with these.

Methods: A consecutive cohort of 750 patients who had undergone primary ACL reconstruction surgery with a minimum 3 year follow-up was identified. All were sent an on-line questionnaire with telephone follow-up regarding the incidence of ACL graft rupture, contralateral ACL rupture, family history of ACL injury and current activity level. Further information obtained from patient databases included demographic information (age, gender), original injury mechanism and meniscus or articular surface injury. Multivariate binary logistic regression was used to assess the association between the measured variables and the risk of ACL graft rupture and contralateral ACL injury.

Results: Responses were received from 558 patients (74%) at a mean follow up time of 4.8 (1.1) years. ACL graft ruptures occurred in 25 patients (4.5%) and contralateral ACL injuries occurred in 41 patients (8%), noting that 44 patients with prior contralateral ACL injury were excluded from this analysis. The odds for sustaining an ACL graft rupture increased five-fold for patients that were under 20 year of age. A contact mechanism of initial injury increased the risk of graft rupture by a factor of three. A return to cutting and pivoting sports also led to a three-fold increase in contralateral ACL injury. Patients who were under 20 years of age had double the risk of sustaining contralateral ACL injury.

Conclusion: Patients that have ACL reconstruction who are under 20 year of age are at significantly increased risk for both graft rupture and contralateral ACL injury. This has implications for the preoperative advice that is given to these younger patients and may also influence the timing of their return to sport.

346   Propensity for emotion rehearsal, body image estimation and metabolic health in Chinese children

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Introduction: Body size misperception are shown to be linked to psychopathology and related weight control behaviours in adolescents, with growing evidence that body dissatisfaction can emerge as early as childhood. However, little is known about children's body size perception and the possible psychological self-regulatory mechanisms behind the prolongation of the misperception into adolescence. With emotional dysregulation found to be related to body image dissatisfaction and disordered eating behaviours in adolescence, the current study aims to investigate if body size estimation is linked to rehearsal (the propensity to rehearse over adverse experiences over the past, present and future) and cardiovascular (CV) risk status in Hong Kong Chinese children.

Methods: Children, aged 8–12 years, were recruited from a local government-aided primary school in Hong Kong (n=370; mean age=10.31yr±1.11; 48.2% boys). Height and weight were recorded followed by the completion of the Children's Body Image Scale (CBIS) and the Rehearsal Scale for Children – Chinese (RSC-C). Participants were categorized into 'at risk' or 'not at risk' of three or more CV diseases based on age- and gender-specific BMI cut-offs for Hong Kong Chinese children.

Results: Propensity for rehearsal is significantly related to boys' body size estimation but not girls, with the greatest rehearsal tendencies in the overestimators, followed by the accurate estimators and then the underestimators. Chi-square analysis shows a notable link between body size estimation and CV risks, with fewer overestimators (7.0%) and accurate estimators (19.6%) in the 'at risk' group and an equally high percentage of at-risk (31.1%) and not-at-risk (29.7%) children underestimating their body size.

Discussion: Inaccurate body size estimation can pose considerable risks on the development of inappropriate weight control behaviours. While overestimation may prompt a normal-weight child to lose weight, an overweight/obese underestimator may not regard weight management as necessary. Our results show that boys with higher propensity to rehearse tend to overestimate their body size, of particular importance here is the possibility that their rehearsal tendencies might fuel the continuation of their overestimation into adolescence, contributing to possible disordered eating behaviours as documented in the literature. Astonishingly, about a third of children who underestimated their body are of CV risk concern. This finding is crucial for consideration in the design of intervention strategies to curb obesity in Chinese children. Future longitudinal research is certainly called for to establish the relationship between propensity for rehearsal, body image estimation/satisfaction and health behaviours across childhood and adolescence.

347   Patellofemoral osteoarthritis is associated with smaller hip muscle volumes than healthy controls

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Introduction: The patellofemoral joint osteoarthritis (PFJOA) is common and associated with knee pain and reduced physical function. However, currently there is limited knowledge of the modifiable impairments associated with PFJOA, which could be targeted in rehabilitation programs. Hip muscle dysfunction may influence PFJ stress and hence, be important in PFJOA. Therefore, the aim of this study was to compare the volumes of the primary hip-abductors (gluteus medius, gluteus minimus and tensor fasciae latae) of individuals with PFJOA, with those of healthy controls.

Methods: 50 individuals with radiographic and symptomatic PFJOA, aged >40 years and 13 healthy people aged >40 were recruited. The cross-sectional area of hip-abductor muscles were manually segmented from each magnetic resonance (MR) axial slice, and used to calculate volume (ICC 0.997). Muscle volumes were normalised to body weight and analyses were performed with and without gender as a co-variate.

Results: There were no differences in characteristics between the PFJOA group (female 40 (63%); age 55±10 yrs; height 1.69±0.09m; weight 76±13 kg) and control group (female 10 (62%); age 52±6yrs; height 1.68±0.10; weight 71±13kg Comparisons of mean normalised muscle volumes revealed significant between-group differences for gluteus medius (mean difference: 95% confidence interval 0.47: 0.08 to 0.86 cm3.kg-1; p=0.02), gluteus minimus (0.21; 0.09 to 0.33 cm3.kg-1; p=0.001) and tensor fasciae latae (0.23; 0.03 to 0.42 cm3.kg-1; 0.024). Inclusion of gender as a covariate did not change the significant findings.

Conclusion: Individuals with PFJOA had significantly smaller gluteus medius, gluteus minimus and tensor fasciae latae muscles when compared with healthy control individuals. As muscle volume is directly related to peak isometric force output, smaller muscles will tend to be weaker. It is unclear whether hip-abductor weakness is a cause or an effect of PFJOA. Regardless, the present study provides several directions for future research on this relationship.

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348   An association between exercise item and cardiac biomarkers in the endurance athletes

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Introduction: In late years, a clinical utility of various kinds of cardiovascular disease-related biomarker attracts attention. Exercise training represents a successful and powerful strategy to prevent future cardiovascular disease. However, there are extremely few reports that examined an association between exercise item and various cardiac biomarkers of the endurance athlete.

Methods: 27 healthy male student athletes (age: 18–22 years, height: 171±6 cm, weight: 60±6 kg) were participated in this study. We measured various kinds of cardiac biomarkers for student athletes and examined association with the exercise item specificity. Student athletes were 15 long-distance runners and 12 road cyclists. We performed fasting drawing blood, urine sampling, a resting electrocardiogram and the cardiac ultrasonography.

Results: Body weight were significantly higher in the cyclists than in the runners (p<0.01). By a resting electrocardiogram and the cardiac ultrasonography, the obvious abnormal findings were absent. MDA-LDL (malonyldialdehyde low density lipoprotein) level was more significantly higher than a reference value in the whole athlete. No significant differences in NT-proBNP (N-terminal pro-B-type natriuretic peptide), hs-CRP (high-sensitivity C-reactive protein), and cardiac troponin T were observed among the runners and cyclists. The levels of adiponectin, HDL-C (high density lipoprotein cholesterol), and HPC (Hematopoietic progenitor cell) were significantly higher in the runners than in the cyclists (p<0.05). The level of glucose and insulin were significantly lower in the runners than in the cyclists (p<0.05).

Discussion: In the present study, as a marker of myocardial wall stress, the described similarity of NT-pro BNP values between male endurance athletes with athlete's heart and healthy untrained control subjects with hearts of normal size supports the hypothesis that repeated bouts of endurance exercise do not chronically alter myocardial wall stress is not elevated in endurance athletes with athlete's heart. In classification of sports, running (long distance) is distinct from cycling. Running (long distance) can be classified as Ic (low static, high dynamic), but cycling can be classified as IIIc (high static, high dynamic). Therefore, the levels of adiponectin, HDL-C, HPC may be influenced.

Conclusion: Exercise item may be associated with cardiac biomarkers by a training method, a muscle composition and various kinds of metabolism system.

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349 Acute effects of whole-body vibration on testosterone responses in the athlete and non athlete

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Introduction: Recently, sport immunology has been noticed by many researchers of sport science, physiology, immunology and behavior sciences. It has been found that there is significant relationship between neuro-hormonal and immune systems. Sport effectively alters hormone level and neural system functions. Findings indicated increase of testosterone and growth hormones level.

Methodology: Since control of all effective factors on variables of the research was not possible, hence it was done in a semi experimental method. Athlete group were with mean age of 23.4±1.4 years, height 166±4.43 cm and weight 61±3.2 kg and non athlete group with age of 22±2.3 years, height 168±4.15 cm and weight of 63±3.26 kg were selected. Blood samples were collected from the left hand brachial vein before, immediately after, and 2 h after vibration For data analysis, the inferential statistic methods such as variance of analysis (ANOVA) with repeated measurements and following test of LSD were used.

Results: One session vibration training has significant effect on the serum testosterone concentration in the athletes and non-athletes girls (P≤0.05). Serum testosterone concentration in the athlete girls immediately after training and after training showed significant difference compared to the before training, but insignificant 2 h after training compared to immediately after training Also serum testosterone concentration in the non athlete girls immediately after training showed significant decline compared to the before training, and had significant difference 2 h after training compared to immediately after training. Insignificant difference was noticed between before training and 2 h after training .

Conclusion and Discussion: We found increase of testosterone. One of them is increase of hormone secretion though stimulation of hypothalamus and hypophysis – adrenal. Testosterone – cortisol ratio is an anabolic to catabolic index. Findings of the present study indicated that one session vibration training at 40 Hz frequency causes decrease of testosterone significantly .The reason could be attributed to the nature of vibration, intensity, time or amptitude of vibration performance ,further relevant studies are suggested.

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350 Effects of active-video playing games on salivary α-amylase activity

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Introduction: Active-video playing games such as Nitendo Wii Sports® have the potential to improve daily physical activity levels for someone who tends to be sedentary. Salivary α-amylase activity activated by sympathetic-adrenomedullary system and hypothalamic-pituitary-adrenal axis has been suggested as a biomarker to determine physical activity levels. The purpose of this study was to investigate the effects of active-video playing games on salivary α-amylase activity in recreationally active men.

Methods: Ten recreationally active men served as the subjects [age: 21 year, height: 172.0±4.9 cm, body weight: 70.8±7.6 kg, BMI: 23.9±2.9 kg/m², Body fat: 20.8±5.3 % (mean±SD)]. All subjects performed active-video playing games, Wii Sports® baseball™, tennis™ and boxing™, in random order for 20 minutes each, with a 30-minute break between games. During each game, heart rate (HR) was measured using a Polar® heart monitor. Immediately before and after each game, salivary α-amylase activity was determined with a biosensor qualified by Yamaguchi et al. (J Int Med Res, 34: 152–159, 2006). At the same time, ratings of perceived exertion (RPE) were also determined.

Results: Two-way (time x type) analysis of variances (ANOVA) revealed significant main effects for time (Pre: 57.9±30.3, Post: 56.4±24.9 for Wii Sports® Baseball™; Pre: 39.3±15.9, Post: 47.1±20.6 for Wii Sports® Tennis™; Pre: 45.9±23.9, Post: 53.7±21.6 kIU/L for Wii Sports® Boxing™, p<0.05), but no different across type with regard to the salivary α-amylase activity. The hierarchy of the percent increase of the salivary α-amylase activity from the smallest to largest was Wii Sports® Baseball™>Wii Sports® Boxing™>Wii Sports® Tennis™. Pearson's product-moment correlation demonstrated a moderate relationship between salivary α-amylase activity, HR and RPE.

Discussion and Conclusions: Previous studies have shown physical activity levels of active-video playing games at the basis of energy expenditure. These findings of the present study suggest that physical activity levels based on salivary α-amylase secretion may rely on each type of the games. When active-video playing games are utilized to prevent metabolic syndrome and maintain physical fitness, intensity, frequency and duration should be considered.

351   The development of the Basketball Exercise Simulation Test

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Introduction: An increasing number of exercise protocols replicating the specific match activity requirements of various team sports have been developed recently. To date, no such protocols have been developed specific to the demands of basketball competition. Therefore, the aim of this study was to develop a reliable and valid field test that replicates the match-specific activity demands of elite male basketball competition.
Methods: Fourteen male basketball players (mean±SEM, age: 24.9±2.3 yr; stature: 187.8±2.8 cm; body mass: 88.8±3.2 kg; body fat: 18.1±2.2%) from state- (n=6) and regional-level (n=8) Australian competitions volunteered to participate. The Basketball Exercise Simulation Test (BEST) was developed from match activity data recorded for elite adult male basketball players using time-motion analysis techniques. The BEST was constructed following a circuit-based design contained within one-half of a standard basketball court. All participants completed a repeat-sprint protocol, Yo-Yo Intermittent Recovery Test (Yo-Yo IRT) and 12-min BEST trial. Nine participants completed a further BEST trial at least 7 days later. Measures taken across the BEST included mean sprint and circuit time(s), sprint and circuit decrement (%) and total distance covered (m). Reliability of the BEST was calculated using the intra-class correlation coefficient (ICC), typical error of measurement, coefficient of variation (CV) and 95% confidence intervals (CI) across the test-retest trials. Criterion validity was determined using Pearson Correlation analysis between each BEST measure and performance in the repeat-sprint protocol and Yo-Yo IRT.
Results: Test-retest reliability analysis revealed that mean sprint and circuit time and sprint and circuit decrement possessed high ICCs (0.92–0.99), while all measures exhibited low CVs (<5%) with the exception of sprint decrement (14.6%) and circuit decrement (16.8%). Criterion validity assessment showed significant (p<0.01) relationships between various BEST measures (mean sprint time, sprint decrement, mean circuit time and circuit decrement) and repeat-sprint performance (r=0.80–0.92), as well as Yo-Yo IRT distance (r=±0.71–0.85).
Discussion: The present results suggest that the BEST is a reliable field-based test that simulates the activity demands of adult male basketball competition. Furthermore, the criterion validity of the BEST was supported relative to repeat-sprint and intermittent-style fitness tests typically used within the sport. As such, the BEST may be reliably and validly used by basketball coaching and training staff in player assessment, conditioning, and within applied research projects.

352   Effects of habitual kendo practice on uric acid excretion

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Introduction: Previous studies have suggested that intense training may produce increased uric acid which potentially induces hyperuricemia followed by gout. Kendo, one of the martial arts, has been known as a vigorous sport. However, there is limited comprehensive research into uric acid associated with hydration status during habitual practice of collegiate kendo players. The purpose of this study was to determine the potential to induce hyperuricemia during three consecutive days of kendo practice.
Methods: Twenty one male collegiate kendo players served as the subjects [age: 19.7±1.1 year, height: 170.2±6.1 cm, body weight: 68.8±10.4 kg, BMI: 23.8±3.4 kg/m^2, Body fat: 16.7±11.8 % (mean±SD)]. Daily practice consisted of 5 min warm-up, 10 min suburi (unadorned swing with a shinai which is a traditional Japanese sword made of bamboo), 15 min kiri-kaeshi (practice of attacking and receiving strikes with a shinai), 40 min kihon-geiko (variety kinds of fundamental practice with a shinai), 25 min ji-geiko (undirected practice with a shinai), 20 min kakari-geiko (short, intense and attack practice with a shinai) and 5 min kiri-kaeshi. Daily practice lasted 2 hours. At Days 1 (the beginning of kendo practice), 3 and 5, spot urine was obtained for the later analysis of uric acid. Uric acid was determined with an enzymatic method. The urine specific gravity (USG) was also assessed using a handheld refractometer before (Pre) and after (Post) kendo practice.
Results: With regard to uric acid excretion, a two-way (time x phase) analysis of variances (ANOVA) with repeated measures demonstrated significant main effects for time (Pre: 53.1±30.2, Post: 56.5±24.5 for Day 1; Pre: 61.9±35.6, Post: 64.1±17.8 for Day 3; Pre: 57.2±31.9, Post: 58.0±22.1 mg/dL for Day 5, p<0.05), but no significant differences across phase. In terms of USG, ANOVA revealed no significant main effects for phase, whereas there were significant main effects for time (Pre=1.022±0.009, Post=1.029±0.006 for Day 1; Pre=1.020±0.006, Post=1.027±0.007 for Day 3; Pre=1.023±0.007, Post=1.028±0.006 for Day 5, p<0.05).
Discussion and Conclusions: These findings suggest that habitual kendo practice in most collegiate kendo players appears not to induce hyperuricemia at the basis of no cumulative effects of kendo practice on uric acid, but tended to be moderately dehydrated during daily practice. In this regard, this information could offer coaches, medical staff, and athletes insights into their training status for developing procedures to maintain good conditions.

353   Analysis of maximal oxygen uptake among male and female physical education students of different age groups

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Introduction: Maximal aerobic power is most common measurements made in exercise physiology laboratories. There has been great interest in identifying physiological factors that limit VO$_2$max and determining the role of this variable in endurance performance. The purpose of study was to analyze maximal oxygen uptake among male and female physical education students of different age groups.
Methodology: 149 students studying in department of physical education, Annamalai University, India were selected as subjects at random. Age of subjects was ranged from 19–22 years. Two groups were formed on basis of gender (male group with 80 men and female group with 61 students). Subjects were further divided into four age groups namely 19, 20, 21 and 22 years of age to see if any difference exists among them. Subjects were tested on selected variable using wet spirometer. Data were statistically analyzed with 2 x 4 factorial ANOVA. Since, four different age groups were compared in B factor, whenever obtained 'f' ratio was significant for B factor; Scheffe's post hoc test was used to find paired mean differences, if any.

Whenever obtained 'f' ratio for interaction (AB factor) was found significant, simple effect test was used as follow up test and if obtained 'f' ratio for the simple effect test was significant the Scheffe's post hoc test. Level of significance was set at .05.

Results: Finding indicates that obtained 'f' ratio for factor 'A' (sex) 99.46 which is greater than required table value 3.9095 for significance with df (1,141). Obtained 'f' ratio for the factor 'B' (age) 1.85 is lesser than required table value 2.6695 for significance with df (3,141). The interaction 'f' ratio for 'AxB' (sex and age) 0.70 is lesser than required table value 2.6695 for significance with df (3,141).

Discussion: It was concluded that there was a significant difference between male and female physical education students on maximal oxygen uptake. No significant difference was found among different age groups (19, 20, 21 and 22 years) on maximal oxygen uptake. Watson using English female physical education students on the bicycle ergometer measured and used maximum oxygen consumption as an index of aerobic work capacity. Relationships between maximum oxygen uptake and age and sex have been studied in male and female Japanese adolescents by Matsui and Miyashita and found that males had significantly higher oxygen capacities with increases in age.

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354   Effects of different training methods on sprinting performance

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Introduction: Interval method is perhaps most versatile method for improving endurance of various types. In interval method, exercise is done at relatively higher intensity with intervals of incomplete recovery. The purpose of study was to analyze effect of interval training method and repetition training method on performance of 200 meters sprint.

Methods: 30 male school students were divided into three equal groups. Group 'A' and 'B' were designated as experimental and given training for two months, five days a week while group 'C' act as control group. Pre test scores were collected for each group before administration of training programme. After end of training programme post test scores were collected on each group. Criterion measure chosen for study was performance of 200 meters recorded up to higher 1/10th of a second. Data were collected on each subject before and alter the training programme (pretest & post test) on 200 meters performance. To find out comparative effect of different training programmes analysis of covariance was applied.

Results: The analysis of covariance for 200metres sprint performance revealed that the obtained F-ratio value (.134) was not found to be significant in case of pre-test means which shows that pre-test mean do not differ significantly and the random assignment of the two groups was quite successful. The post-test means of both groups was not significant as the obtained F value (1.126) is less than the tabulated F value (3.35). Adjusted posttest means was found to be significant, as the obtained F value (7.784) is higher than the tabulated F value (3.37).

Discussion: (Webb, 1973) found that both short and mixed distance groups made significant improvement in VO$_2$ max. There was no significant difference in 880 yards sometime, while only the short distance group significantly improved the 220 yards time. He concluded the mix distance training was most effective but that it should be dominated by short distance. In the present study analysis of data revealed that the experimental groups trained by interval training method and repetition training method improved significantly on the performance of 200 meters sprint whereas the control group did not show any significant improvement. While studying the effect of two interval training program on running ability (Greenberg 1966) did not find significant difference in improvement of running ability over a 400 yards distance was found between the experimental groups.

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355   Relationship between sleep and bathing in college competitive swimmers

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Introduction: Sleep is homeostatically controlled and, after a prolonged period of stressful, we recognize importance of the sleep. It is suggested that the bathing is effective to the vascular dilatation, physical warming and the activation of sympathetic nerve. In addition, physical warming induces the expression of heat shock protein (HSP) family members. HSPs are an important family of endogenous protective proteins that are induced in response to a wide variety of stresses, such as heat shock, hypoxia, hydrogen peroxide, inflammation and ischemia. However, the effect to sleep by the different type of bathing is not examined. The purpose of this study was to examine the effect of different types of bathing on responses to sleep in colligate competitive swimmers.

Methods: Twelve healthy colligate competitive swimmers were participated in this study. The subjects were taken two different types of bathing; whole body immersion bathing (WBIB) and shower bathing (SB). The water temperature of both bathing was 42 degrees Celsius. To measure the sleep-wake cycle, accelerometers (Lifecorder GS, SUZUKEN, Japan) was used. The sleep – wake data were analysed by circadian rhythm analysis software (SleepSign Act, KISSEI COMTEC, Japan). Analysed a sleep variables were time in bed (TIB), sleep period time (SPT), total sleep time (TST), wake time after sleep onset (WASO), sleep efficiency (SE), sleep latency (SL), time of sleep onset, time of wake onset, and bed out latency (BOL).

Results and discussion: SL was significantly shorter (p<.05) in WBIB than that in SB. SE was significantly higher (p<.05) in WBIB than that in SB. SPT was significantly longer (p<.05) in WBIB than that in SB. Therefore, these results suggest that as WBIB could raise body core temperature enough, this hyperthermia may cause a deep sleep. The sleep after the WBIB seems to be extremely useful in the recovery from fatigue.

356 Exercise based cancer rehabilitation – from pilot to practice

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Background: Exercise based rehabilitation programmes have been established in many countries for chronic conditions such as cardiovascular disease, diabetes and chronic obstructive pulmonary disease. Cancer is now considered as a long term condition with over 2 million cancer survivors living in the UK. There are many evidence based physical and psychological benefits to staying active after a cancer diagnosis: prevent or slow down deconditioning during treatment, to combat treatment related side effects, assist survivors to get maintain a healthy lifestyle and potentially reduce the risk of cancer recurrence and all cause mortality.

Methods: Since 2001, selected groups of breast cancer patients in Scotland have contributed to a number of studies looking at the effect of a group community based exercise intervention during chemotherapy and radiotherapy. The positive effects of these published studies, including cost benefit analysis resulted in the development of a national health services (NHS) community based exercise rehabilitation incorporated into the cancer care programme.

Results: There are now two city wide Active ABC (after breast cancer) programmes running in Scotland. There is a referral pathway which allows women to enter the exercise programme at different stages of their cancer care pathway. A national occupational standard qualification has been established to ensure that all exercise instructors can confidently prescribe safe and effective programmes for anyone living with cancer. Women are offered exercise consultations, home based programmes and group exercises with the aim to help them to become independent exercisers. There are now plans to expand this to other cancer survivors including prostate, colorectal, gynaecological and haematological cancers.

Conclusions: A community based supervised group exercise programme incorporating behaviour change techniques and healthy lifestyle workshops provided lasting benefits for women in terms of higher levels of activity and positive mood. Regular activity is now encouraged for all women with breast cancer and is part of their cancer care package as this can have lasting implications for physical and psychological functioning.

357 Type 2 Diabetes incidence, physical activity levels and quality of life in a group of pre-diabetic and overweight subjects

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Introduction: The role of exercise in prevention programs and management of Type 2 Diabetes is decisive. Therefore, the aim of the study was to evaluated the relationships between Physical Activity Levels, Quality of life and risk to develop the Type 2 Diabetes in a group of overweight and pre-diabetic subjects.

Methods: thirty-three overweight and pre-diabetic subjects (25 female, 8 men; 55,6±5,38, years, Body Mass Index:35,57±6,05) were investigated. The short version of International Physical Activity Questionnaire (IPAQ) and Short-form Health Survey 36 (SF-36) were used to assess the different levels of Physical Activity (PA), time spent sitting (S), and Health Related Quality of Life (HRQoL), respectively. The risk to develop type 2 diabetes was calculated using a non-invasive model. The relationships between PA levels, HRQoL components, Mental (MSC) and Physical Summary Component (PSC) and Type 2 Diabetes risk score (T2DRS) were analyzed by Pearson's correlation.

Results: A significant correlation was found between energy expenditure during PA (kcal/week) and both MSC (r=0.48; p<0.05) and PSC (r=0.56; p<0.005). Moreover, the T2DRS was inversely associated with PSC (r=-0,60; p<0.005) and MSC (r=-0,46; p<0.05).

Discussion: Our results demonstrated that the high risk to develop the Type 2 diabetes was associated with low levels of HRQoL in pre-diabetic subjects. Based on these findings, it seems to be important emphasize the usefulness of HRQoL questionnaire during the baseline assessment and also to keep under control the variations produced by the physical training process.

358 Safety of a single WBV session for people with COPD

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Introduction: Chronic obstructive pulmonary disease (COPD) is a respiratory condition characterised by dyspnoea, excessive sputum production, chronic cough, and emphysema. Functionally, exercise tolerance is poor for people with COPD, resulting in for example, difficulty in performing daily tasks. Whole-body vibration (WBV) can be a very gentle mode of exercise known to improve exercise tolerance by strengthening the muscles of the lower limbs. Safety of WBV for people with COPD has never been investigated. Before longer intervention studies can be conducted, selected psychological and physiological responses to exercise should be profiled for people with COPD during WBV.

Methods: Following ethical approval, 17 adults with COPD (mean age=69±8 years, mean stature=1.69±0.9 metres, mean mass=83.9±19.2 kilograms, mean FEV_1/FVC=0.52±0.9, mean FEV_1=58% predicted±19%) consented to participate. All participants completed a single session of WBV consisting five 60 second bouts (25Hz, 2.0 peak-to-peak displacement, 2.5g). The dependent variables were; 1) Borg CR-10 visual analogue scale for dyspnoea, 2) heart rate, and, 3) saturation of haemoglobin. Data were collected at baseline and during the final WBV bout.

Results: With the Borg CR-10 scale, dyspnoea increased from 'very slight' to 'slight' (t=4.01, df=16, p=0.01) which resulted in a moderate effect size (Cohen's d=0.55). A 13% increase was observed in the heart rate response following WBV (t=10.8, df=16, p=0.01) which resulted in a large effect size (Cohen's d=0.91). Saturation of haemoglobin reduced by 1% during the WBV session (t=1.9, df=16, p=0.08).

Discussion: Three major findings emerged to support the safeness of WBV for people with COPD; 1) WBV caused an increase in rating of perceived dyspnoea from 'very slight' to 'slight', 2) WBV increased heart rate 13% higher than resting, and, 3) WBV caused a negligible reduction of 1% in saturation of haemoglobin. The results are supported by other research using exercise modes of various intensities. This study showed that a single session of WBV offers a form of exercise appropriate for people with COPD since the data resemble desirable and safe criteria for exercise.

The response to WBV was similar to previous results following resistance training and aerobic conditioning in people with COPD. Although WBV increased perceived breathlessness, the clinical merit was most likely negligible.

359 Long-term effects of WBV on gait of people with COPD

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Introduction: The World Health Organisation's current definition of chronic obstructive pulmonary disease (COPD) is a lung ailment fundamentally characterised by persistent blockage of airflow from the lungs. Since COPD diminishes the ability of the lungs to supply the body with oxygen, most modes of physical activity lead to breathlessness if the disease is progressed. Whole-body vibration (WBV) is a safe mode of exercise known to improve exercise tolerance by strengthening the muscles of the lower limbs. Gentle WBV was reported as a safe for people with COPD. However, long term effects of gentle WBV on selected kinematic variables of gait remain unknown for people with COPD.

Methods: Following ethical approval, 16 adults with COPD (mean age=71.6±7.3 years, mean stature=1.71±0.09 metres, mean mass=85.7± 20.4 kilograms, mean FEV1/FVC=0.52±0.1, mean FEV1=59% predicted±19%) consented to participate. All participants completed a six week WBV intervention consisting five 60 second bouts (25Hz, 2.0 peak-to-peak displacement, 2.5g) twice a week. After a two week washout, participants completed a six week placebo intervention (25Hz, 0.0 peak-to-peak displacement, 0.0 g). The dependent variables were; 1) stride time, 2) stride length, and, 3) stride velocity. Data were collected in the home of each participant with the GAITRite® electronic walkway.

Results: Gait improved across the WBV intervention for stride time ($F_{(1.63, 269.58)}$=8.20, p=0.01), stride length ($F_{(1.48, 244.07)}$=50.21, p=0.01) and stride velocity ($F_{(1.35, 223.37)}$=323.17, p=0.01). There was no improvement after the placebo intervention for stride time ($F_{(1.78, 140.41)}$=2.32, p=0.11), stride length ($F_{(1.79, 141.76)}$=1.46, p=0.24) or stride velocity ($F_{(2,158)}$=1.20, p=0.30).

Discussion: This was the first study to describe effects of WBV to improve selected kinematic variables of gait for people with COPD. Two major findings emerged to support efficacy of WBV; 1) the intervention improved walking ability, and, 2) effects of WBV were maintained eight weeks after the intervention was completed. These results are supported by other research of resistance training and aerobic conditioning and six minute walk test distance. This community based project supported efficacy of a long term WBV intervention for people with COPD. As a gentle mode of exercise for people with COPD, WBV can be easily completed in the comfort of the patient's home to improve kinematics of gait.

360 Cancer survivors' ratings of perceived exertion do not reflect actual workload

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Introduction: Rating of perceived exertion (RPE) is commonly used to judge intensity of exercise performed, especially in chronic disease populations who may not be able to tolerate normally prescribed exercise. However, the validation for RPE and correlations of its usage against objective measures, like heart rate during exercise, have mostly been done in athlete populations.

Methods: The objective of this study was to examine if session RPE ratings would be different between cancer survivors who exercised at different intensities. In this study, breast and prostate cancer survivors were divided into high intensity and low intensity exercise groups, which were prescribed objectively using VO_2peak and one repetition maximum (1RM). Actual work performed was objectively captured using the Team2 Polar Heart Rate Monitoring System and training logs.

Results: ANOVAs were used to compare groups on average VO_2 during aerobic exercise and total kilograms lifted during each exercise session. The low intensity group exercised at 60.3% VO_2peak, while the high intensity group exercised at 71.0% VO_2peak (p<0.000). The low intensity group performed 971.7 kilogram-repetitions per session on average, while the high intensity group performed 1355.3 kilogram-repetitions per session on average (p<0.000). These results indicate the groups truly exercised at significantly different levels, with the high intensity group experiencing significantly greater aerobic and resistance training stimuli. However, average RPE reported per session for both groups was 4.1 for the high intensity group and 3.7 for the low intensity group (p=0.081).

Discussion: Breast and prostate cancer survivors on average rate their exercise sessions as moderate to somewhat hard, regardless of the actual intensity of exercise performed. During training sessions, even when participants would verbally describe an exercise session as strenuous while performing the activities, they would still report the session RPE as only moderate. These results indicate that due to their personal views of RPE, the RPE system may not be a good tool for comparing exercise intensity between individual breast and prostate cancer survivors. A qualitative investigation is warranted to determine why cancer survivors seem to consistently underreport the strain of their exercise sessions.

361 Energy expenditure and intensity of physical activity during a training session in obese pre-diabetic women

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Introduction: The role of structured physical activity to reach health benefits and to increase energy expenditure is well known in the treatment of obesity. The purpose of this study was to estimate the energy expenditure and the intensity of physical activity (PA) during different phases of a training session (TS) in a group of deconditioned obese pre-diabetic individuals.

Methods: A sample of 10 obese (class 1) pre-diabetic women (56.3±6.7 years; Body Mass Index, 33.1±2.0 kg/m^2) completed the acute training protocol as follows: 20 minutes (min) of walking (W) activity (50%HRmax), 7 min of flexibility exercise (FE) and 15 min of Pilates Circuit Training (PCT) on mat. The PCT was composed by 10 sets of Pilates exercises (3 static sets and 7 dynamic sets) separated by 1 min of walking activity (30%HRmax). Each set of exercise was performed for 15 seconds (1 movement every two seconds). The energy expenditure (EE) and the intensity of PA (METs) were estimated during the different phases of the TS using the SenseWear Pro Armband (SWA). Paired-sample t-tests were used to determine differences in the metabolic equivalent (MET) and EE (Kcal) values between each TS phases.

Results: The EE of the subjects was 291.2±75.4 and intensity of PA during the TS ranged from light (2 to 3 METs) for FE, to vigorous (6 to 9 METs) for W. The PA intensity during the PCT phase was moderate for 87% of its time, while the W activity was vigorous for the 37% of its time. Among all the TS phases, the W (20.5±0.5 min; 5.6±0.8 METs; 153.8±45.7 kcal) and the PCT (15.1 min; 4.1±0.6 METs; 84.9±25.1 kcal) showed the highest MET and EE values.

Discussion: The adopted training protocol seems to be adequate to produce good training load, in line with the American College of Sport Medicine's Guideline. The application of Pilates exercises by means of Circuit Training method could effectively reduce the time devoted to strength training. Our results highlight the importance for health-care professionals to take into account not only the type of exercise but also the interaction between exercise intensity and energy expenditure during the different phases of a training session. By analyzing these variables during training session by mean of SenseWear Pro Armband device the health-care professionals can obtain an objective measurement of the patients' fitness levels.

362 Rule modification in junior sport: Does it change skill performance during games?

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Interest regarding the modification of game conditions has increased in the last two decades as it has the potential to influence participation and skill development in junior sport. Modifying the rules is a common method of manipulating game constraints in an attempt to achieve a certain outcome, such as increasing participation, creating a safer matchplay environment or improving skill performance. Although there is much interest surrounding rule modification in junior sport, there are few studies investigating rule modification and none that have quantitatively assessed how skills are actually performed when rules are modified in junior sport. The aim of this study therefore, is to determine the effects of rule modification on skill performance during matchplay in Junior Australian Football. The findings of this study will provide an insight into how rule modifications impact upon matchplay and will aid our understanding of enhancing skill performance and skill development in junior sport.

An observational measure of skill performance in Junior Australian Football matches has been developed to record and assess a range of in-game variables including the number and effectiveness of disposals (kicks and handballs), the number of tackles/marks/bounces/stoppages, the amount of pressure on the player in possession and where the relevant skills are performed (defence, midfield, forward). In total, 36 matches involving three different age groups (5–8, 9–10 and 11–12 years) will be analysed across four different Junior Australian Football leagues with varying levels of rule modification (none, some, complete) in comparison to the standard rules of the game. Examples of the rule modifications include a reduction in ground size and playing time, suitably modified equipment, introduction of zones, reduced team numbers, rotation of players through different positions and restrictions on bouncing and tackling. Skill performance during games with different levels of rule modification will be compared at three separate time points – early, midway through and late in the season. This will allow for analysis of how the rule modifications change the manner in which games are played and the manner in which skills are performed under different rule constraints.

363 Effect of dorsiflexor and plantar flexor activity induced at impact of ball kick in man

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Introduction: In certain situations, activity levels of agonistic and antagonistic muscles produce a necessary co-contraction. This is a strategy used by the CNS to stabilise a joint during unpredictable external perturbations. Co-contraction between agonistic and antagonistic ankle muscles is present at impact in strong ball kicking. However, the level of co-contraction at ball impact is yet to be clarified. We explored whether kicking involving co-contraction of agonistic and antagonistic ankle muscles leads to changes in the soleus (Sol) and tibialis anterior (TA) muscles.

Methods: Eight subjects sat on a purpose built experimental chair and were fixed in position with waist and shoulder straps. Subjects performed an instep kick at maximum effort. Knee range of motion was from about 90 deg to 0 deg. Electromyographic activity (EMG) was recorded from the Sol and TA with bipolar surface electrodes. The TA of the kicking leg was stimulated percutaneously with rectangular pluses of 1ms duration, delivered to the tibial nerve. The electrical stimulation was delivered randomly around the moment of ball impact. TA H-reflex was observed during the activation of agonistic and antagonistic ankle muscles.

Results and discussion: There were individual differences in TA-EMG activity at ball impact whereas Sol showed little change from -100ms to 100ms at ball impact (0ms) in most subjects. Furthermore, the ratio of TA and Sol activity (TA/Sol ratio) also changed with different timing of ball impact. Accordingly, TA/Sol ratio appears to be conditional on the timing of ball impact. Individual patterns of agonistic and antagonistic activity were observed among subjects. Therefore, there is a possibility that the pattern of activity indicates a difference in skill level. Similarly, the amplitude of H-reflex in TA revealed differences conditional on the timing of ball impact. These results could infer that there is some kind of defence mechanism present to prevent the ankle joint from being damaged with impact load to the ankle joint during ball kicking. Our results indicate that the co-contraction observed at ball impact may be controlled by the level of activation of the soleus muscle. From our findings, we recommend that the differences in activation of agonistic and antagonistic ankle muscles during ball kicking should be evaluated for use in the prevention of injury in soccer players.

364   Movement variability of pre- elite Australian Football athletes with and without a history of groin pain

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Introduction: The prevalence of, and complications associated with, groin injuries in Australian Football establishes it as one of the most debilitating overuse injuries a player can sustain. Overuse injury has been associated with decreased movement variability, and Australian Football is a game with highly repetitive movements such as cutting and running that have been linked with groin injury (Davies, Clarke, Gilmore, Wotherspoon, & Connell, 2009; Hiti, 2011). Therefore, this study aimed to determine whether movement variability during an unanticipated cut task differed between athletes with and without a history of groin injury.
Methods: Seventeen male Australian Football players either with a history (HISTORY; n=7) or without a history (CONTROL; n=10) of a groin injury performed 10 successful trials of an unanticipated cut task with a defensive opponent. During each trial, the participants' ground reaction forces three-dimensional kinematics, and surface electromyography were recorded with additional inclusion of an isokinetic hip muscular strength test.
Results: Participants with a HISTORY displayed decreased movement variability within the kinematics of the ankle, knee and T12-L1 joints, and ankle, knee and hip joint moments compared to the CONTROL group. Nevertheless, the HISTORY group displayed increased movement variability within the kinematics of the hip and L5-S1 joints, increased body mass, and decreased hip adduction muscular strength compared to CONTROL group.
Conclusion: Increased movement variability within lumbopelvic kinematics and decreased hip adduction muscular strength in participants with a history of groin injury support current groin rehabilitation methods of addressing lumbopelvic instability. Our results also highlighted decreased movement variability within the ankle, knee, L5-S1 and T12-L1, which clearly identifies the need for clinical management of the lower limb and thoracic segment to improve functional movement patterns.

365   Kinematics qnalysis of the barbell of youth Weightlifters during the snatch

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The majority of the research to date on weightlifting has focused on senior competitors. Thailand has two women weightlifters received two gold medals from the Olympic Game in 2004 and 2008. The performances of 6 women weightlifters were Thai Youth National Team and performing in the final selected for the representative of Thailand national weightlifter in the Youth Olympic Games 2010 competition in Singapore. The kinematics data of the barbell were recorded and analyzed using Peak Motion Analysis. 2D Motion Analysis system from the snatch lift including barbell resultant trajectory, vertical and horizontal displacement, peak height, velocity, and acceleration. The performance of the athletes competing in 69-kg class and 48-kg class and the average age 15.8 years old the snatch attempts only once performance with the maximum lifting. The results showed that the average of barbell peak height were 1.29 ± 0.1m, vertical barbell displacement 0.144 ± 0.03m, horizontal barbell displacement 0.180 ± 0.28 m, maximum vertical barbell velocity 2.84 ± 0.26 m/s at 31 ± 4 time % snatch, and maximum vertical barbell acceleration 23.59 ± 4.34m/s*s at 29 ± 6 time % snatch, respectively. The results of this study suggest that the appearance of the second pull in maximum vertical velocity and acceleration with time % snatch of weightlifters could be used as a criterion of lifting skill and a measure of performance.

366   Biceps femoris fascicle length is shorter in a previously hamstring injured athlete

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Introduction: Indirect evidence suggests hamstring muscle architecture (i.e. shorter fascicle length) is linked with an increased risk of recurrent hamstring strain injury (HSI) in athletes. This study used ultrasound to measure biceps femoris (BF) architecture and compared previously hamstring strain injured versus non-injured athletes. The purpose of the study was to determine if previous HSI resulted in shorter BF fascicle lengths, as this may suggest a mechanism whereby previous HSI increases the risk of future injury.
Methods: Recreational and elite athlete participants (n=31) were assessed using B-mode ultrasound. Eighteen had unilateral HSI previously and 13 had no history of lower limb injury. Variables measured were: fascicle length, muscle thickness and pennation angle.
Results: The previously injured leg in the unilateral injury group had shorter fascicle lengths and larger pennation angles compared to the non-injured leg, whilst muscle thickness showed no difference. In the control group, no between-leg differences were found for any of the variables measured.
Discussion: Previous speculation that injured hamstrings will exhibit shortened fascicles was supported. Regardless of whether this between-limb difference in BF fascicle length is the cause of or the result of HSI, this data indicates that architectural maladaptations associated with previous injury should be considered when determining successful rehabilitation. We propose that ultrasound provides a non-invasive and time efficient (<15min) assessment as a potential athlete monitoring tool.

367 The effect of balance training on attentional demand in balance-cognitive dual-task in young male athletes

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Most of the sport activities performed by athletes are in form of dual or multiple tasks and finding a way which can lead to a decrease in dual-task cost will probably help them to perform these activities more skillfully and prevent them from being less injured. The purpose of this study is to investigate whether a balance training program has an effect on attentional demand in balance-cognitive dual-tasks and leads to a decrease in dual-task costs in young healthy athletes. Thirty young male athletes participated in this experimental research. These subjects were randomly assigned to an intervention group (n=15) and a control group (n=15). All subjects of the intervention group received a 5 week balance training program, while subjects of the control group received no training. Measurements took place before and after the 5 week balance training program. During the training sessions the exercises were carried out with a gradual increase in difficulty and intensity. Dynamic balance tests were taken in four sensory conditions (instability of degree 4 and 8 for the eyes-opened and eyes-closed) on Biodex while the subjects were responding simultaneously to an auditory cognitive task called Oddball. Independent-Samples T-Test and Paired-Samples T-Test were used for analysis. According to the findings, no significant difference was found between control and intervention groups in none of this research tests. And it is concluded that balance training dose not lead to a decrease in dual-task cost and it does not lead to an improvement in balance and cognitive tasks consequently.

368 Effects on V-wave with skin and muscle cooling during %MVC

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Introduction: We have demonstrated that with skin cooling the amplitude of H-reflex is unchanged and the amplitude of V-wave increases more than under normal skin temperature conditions in the latter half of the %MVC. However, the effect of muscle cooling on V-wave is unknown. The purpose of this study was to investigate the effects of skin and muscle cooling on spinal and neural drive by analysing V-wave.
Methods: Six healthy adults volunteered for this study. The force of the isometric contraction and twitch of the triceps surae muscle were measured with a force transducer attached to a footplate apparatus. Electric signals were picked up by surface electrodes (10mm) on the belly of the soleus (SOL). This experiment was performed under three conditions that consisted of skin cooling (skin temp. 26 deg.; SC), muscle cooling (muscle temp. about 2 deg. less than normal: MC) and control (skin temp. about 33 deg.; NSC). A cooling pad, attached to the skin (SC: 3 minutes, MC: 5min), was used in the cooling conditions. Two 3 second maximal voluntary isometric contractions (MVC) were performed at the control temperature.
The force at every 10%MVC was calculated using the MVC under control temperature. H-reflexes, M-wave and V-wave were evoked in the soleus muscle by electrical stimulation of the posterior tibial nerve via a cathode ball electrode (5mm in diameter) pressed into the popliteal fossa. H-reflex and Mmax were obtained under the three conditions at rest. During sub-maximal contractions (10, 20, 30, 40, 50, 60, 70, 80 and 90% of one MVC) and MVC performance, a supra-maximal stimulus was delivered at supra-maximal intensity, which allowed us to record the superimposed M-wave (Msup) and V-wave of the SOL.
Results and discussion: There was no significant difference in Hmax, Mmax and H/M ratio under each condition. M-wave amplitude recorded during maximal voluntary plantar flexor contractions (Msup) was significantly greater than that recorded at rest (Mmax) in each condition. However, there was no significant difference between SC, MC and NSC. The amplitude of V-wave increased gradually with increased %MVC under the three conditions. The polynomial relationship indicated with skin cooling was higher than that of MC and NSC over 80%MVC (p<0.05). However, there was no significant difference between MC and NSC. These results suggest that the increase in V-wave response with skin cooling is related to elevated motorneuron excitability due to the influence of cutaneous inputs, especially cold receptors.

369 How to make surveillance for future athletes?

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The physical activity is the first step for the future athletes' development, and it promote direct benefits to the children and adolescents' health, such as reducing the risk of obesity and diabetes, development of social and physical skills (coordination, strength, flexibility). Children are highly susceptible to develop injuries in sports and these injuries could impact in adulthood, showing the necessity of a surveillance system for the young athlete's health. The aim of this study was to describe the surveillance system's health in 916 young athletes in a private sports club in Brazil. An interdisciplinary team develops the surveillance, with direct and indirect interventions for health promotion, injury's prevention and rehabilitation. The health promotion activities include health education, with activities for parents, coaches and athletes such as nutritional information, interventions to prevent abuse of alcohol and drugs and others. Before the start of training, the children have a pre-participation medical evaluation, to certify their health condition and security to practice and competition. These evaluations are performed annually. A pre-season evaluation is also accomplished to know the injuries risk factors, to define the sports profile and to screen whose athletes at high injury risk. Consequently, a pre- injury baseline for monitoring injured athletes is created, as well as data for health promotion, injury prevention and rehabilitation programs. A specific preventive interdisciplinary training developed for each sport is done periodically with exercises to improve the capacity of coordination, strength, stability and flexibility. Workshops with coaches are frequently performed to develop the knowledge involved in training such as training for emergency care, guidelines regarding control of training load and its impact on health. In addition, a team composed of health professionals and other partnerships as hospitals, imaging centers, laboratories, transportation services are available in case of an injury. The evaluation of this system is made by: a health indicator composed by the number of injuries per athlete and the absence at training sessions, as well a survey satisfaction answered by the sports departments and coaches to measure the quality and the effectiveness of these interventions. The health promotion and preventive injury programs are the best system to guarantee the surveillance of children's health to become healthy high-performance athletes.

370 Students' perceptions of exercise science professor's intelligence, based on professor body type

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Introduction: Appearance is the first piece of information available to many students and this can powerfully influence the perceivers' behaviour in the classroom.

Purpose: The purpose of this study was to determine the perceived intelligence of exercise science professors based on the professor's body type by health and wellness students from a Midwestern public university.

Methods: One hundred and seven undergraduate health and wellness students (major or minor in Exercise Science or Kinesiology and Sport Science) were given a survey packet in a counter-balanced order. The survey asked one question, showing a male and female photo of Sheldon's three somatotypes as well as a definition of the somatotype. A repeated measures analysis was run using the variables of mesomorph, ectomorph, and endomorph to gather descriptive statistics. A Wilks' Lambda analysis was conducted as an overall test for the equality of the mean ratings among the three professor's body types.

Results: The value for the Wilks' Lambda was 0.728 with a p-value of less than 0.001. This indicated that at least two of the means for the professor body type groups were statistically different. A pairwise comparison analysis was conducted which indicated that all of the group means were different from each other. The sample means from the descriptive statistics show that an ectomorph had the highest average value of perceived intelligence, followed by a mesomorph, and lastly an endomorph professor body type resulted in the lowest average value for a professor's perceived intelligence.

Conclusion: This study indicated that an endomorphic professor is perceived as less intelligent by health and wellness students. This outcome could negatively affect student learning by reducing the effectiveness of the endomorphic professor in the classroom.

371 Identifying and classifying stair ascending and descending using a single uni-axial body-worn accelerometry device

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Introduction: Regular stair use is seen as being an easy way to increase sedentary adult activity to moderately active levels and results in increased fitness and strength as well as weight loss and reduced risk of osteoporosis. Currently available multiple-sensor body-worn activity monitors can identify stair ascending and descending from habitual physical activity, but single unit activity monitors cannot. Single unit monitors can have considerable advantages when monitoring populations in terms of cost and convenience for the user. The activPAL™ activity monitor is a single unit monitor worn on the thigh, and classifies habitual activity into three categories (sedentary, upright and walking). This study aimed to use the acceleration output from the activPAL™ to identify stair ascending and descending as well as general walking.

Methods: Development data was collected from 25 participants (15 females; mean±SD age 40±13.43 years). Participants wore a single unit activity monitor (activPAL™) walking 0.2–1.5km at self selected slow, normal, fast and variable speed, and ascended and descended 110 stairs. The 10Hz acceleration signal from the monitor was divided into individual strides. Stride characteristics derived from the acceleration profile were used to first distinguish between stair descending and other steps, and then to distinguish between stair ascending and walking.

Results: A simple threshold, applied to the relationship between minimum and mean acceleration of the stride correctly identified 1157 strides (94%) as stair descending, and misclassified 372 ascending or walking strides (6%) as descending. A threshold assessing both the duration and amplitude of the stride correctly identified 890 strides (72%) as ascending and misclassified 1348 walking strides (24.5%). Additional analysis of the data, using a probabilistic approach to classification, comparisons of multiple characteristics and the consideration of the sequential pattern of strides improves the accuracy of classification.

Discussion: This algorithm can separate the majority of stair ascending and descending steps from general walking, which could be usefully applied to objective data of habitual physical activity in a public health setting. The algorithm for enhanced classification could be used to re-evaluate previous data sets in addition to future data collection.

372 Effect of skin cooling on pulmonary oxygen uptake and muscle oxygenation during moderate exercise

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Introduction: Skin cooling above active muscles, with a small decrease in muscle temperature, changes the pattern of motor unit recruitment during sub maximal voluntary contraction and enhances muscle activity during moderate exercise. However, there have been no studies investigating the effect of skin cooling on oxygen uptake and muscle oxygenation. The purpose of this study was to investigate the effect of skin cooling during constant endurance cycling exercise below Ventilatory Threshold (VT) on pulmonary oxygen uptake and target muscle oxygenation.

Methods: Ten healthy male participants performed two cycling exercise trials corresponding to 80% VT intensity for 15 minutes with skin cooling and without skin cooling as control. Skin surface cooling was applied to the quadriceps femoris muscle by circulating 5 degree water through cooling pads. The mean skin temperature was maintained at 25–26 degrees during exercise. Pulmonary gas exchange and ventilation were measured continuously using a gas analysis system, and beat by beat heart rate (HR) was recorded. Additionally, the electrical myography (EMG) activity and intramuscular oxygen saturation of the right vastus lateralis (VL) were measured. This muscle oxygenation status was monitored by near-infrared spectroscopy.

Results and discussion: The EMG activity during exercise was significantly higher with skin cooling than control. There were no significant differences in pulmonary oxygen uptake and HR during exercise between skin cooling and control. On the other hand, skin cooling showed significantly higher deoxyhemoglobin (HHb) in VL than control during exercise. Additionally, the increase in HHb for a given increase in pulmonary oxygen uptake (HHb/VO_2p) was greater in skin cooling than control. Thus, skin cooling enhances muscle activity and increases the intramuscular oxygen consumption of working muscle. The greater ratio of HHb/VO_2p in skin surface cooling also suggests that oxygen extraction during moderate intensity is not diminished. These results suggest that skin surface cooling above active muscle at 25–26 degrees influences muscle activity and the intramuscular oxygen environment during moderate exercise, both of which play an important role in exercise induced muscular hypertrophy. Namely, moderate exercise with skin surface cooling affords the same benefit as higher-intensity exercise does.

373   High performance school-age athletes: A study of conflicting demands

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The purpose of this paper is to report on the findings from, and consider the implications of, a doctoral study into high performance athletes who are still at school. High performance athletes are defined as those in national or international senior or age grade competition, or in academy/talent identification squads. These young people are, in effect, leading two full-time lives, that of a full-time school student and that of a full-time athlete. The research has focussed on how these athletes cope with these untypical demands, but also explores the perspectives of two groups who play a major role in their lives, their parents and their teachers. This qualitative, interpretivist study has involved in depth-interviews with thirty nine participants, including nineteen current and past school-age high performance athletes from a range of sports, ten parents of such athletes, and ten teachers. One important aim of the study has been to give voice to the athletes in an area previously untouched in research. The findings report on a range of issues identified by the athletes and their 'significant adults'; these include, physical, social, economic and educational issues. From these findings the paper explores the implications for policy and practice in schools and in sports, and makes suggestions for how young athletes, their parents and teachers can optimise the demanding situations in which the athletes find themselves.

374   Risk management considerations for ultra-endurance events and solo attempts

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Introduction: Ultra-endurance events are getting more popular, both in the categories of mass-participation and solo (often fund-raising for a nominated charity). However, part of the popularity and potential for charity fund-raising is connected to perceived and real risk of the event(s). The consequences of catastrophic outcome for a competitor are not well-defined in terms of insurance or legal liability, with these risk management considerations having the potential to cancel out the benefits of events. Ironically, often the publicity an event receives (positive benefit for fund-raising) is in direct proportion to the risk (negative) of catastrophic outcome (e.g. solo unassisted endurance attempts receive greater publicity than the same attempts made with a support team nearby).
Methods: Pubmed and Google scholar searches were performed for the terms "ultra-endurance risks", "triathlete risks" and "ultra-endurance liability". An emphasis on the literature and internet review was placed on risk management publications and descriptions of actual catastrophic outcomes to illustrate potential consequences that must be foreseen in a risk management appraisal of events. An attempt to summarise recommendations as medical, legal and ethical risks was made.
Results: No summary paper was found which gave a comprehensive overview of the factors needing to be considered by organisers, sponsors or participants. Multiple disasters were documented, particularly on internet resources. These included the Tony Bullimore rescue, Andrew McAuley's attempt to kayak from Australia to New Zealand, the Kimberley Ultramarathon bushfire, and various mountaineering and surf deaths. Successes were also documented, including Pat Farmer's 21,000 kilometre run from pole to pole.
Discussion and conclusion: For an ultra-endurance event to be successful, it generally requires publicity to generate sponsorship and fund-raising. A reality of competition in the media is that the riskier an activity is, the greater chance for generating this publicity. However, risky ultra-endurance events necessarily give rise to the chance of catastrophic outcome. For a sponsor, race organiser, promoter, insurer and competitor, a comprehensive risk management checklist is required in order to be associated with an event. Individuals who undertake these attempts, who are by nature risk-seekers, need to also accept some individual responsibility and discuss the risks with next of kin prior to embarking on an event/attempt. Medical screening (especially cardiac, renal, blood and musculoskeletal) prior to the event is advisable.

375   A comparison by position of play of in game performance of adolescent Netballers

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Introduction: It is important that Netballers develop fitness relevant to the demands of the game. Since research on demands of Netball for adult participants of the 1990s Netball rules have changed and the game has become more dynamic. There is no published data pertaining specifically to adolescent game demands.
Aim: This study sought to determine if, adolescent Netballers, the three different positions of play have differing in game demands.
Methods: Participants in the study were 14 Netball players (2 teams) of regional academy of sport level, mean age 16.2 yrs. Participants were classified according to position of play as Attack – players who played in goal attack or goal shooter position, Center – players who played wing attack, wing defense or center; or Defense – players who played goal keeper or goal defense. Participants took part in a game of Netball game playing in the same position throughout the game. The game was videotaped and video analyzed for each individual player. Cumulative and mean durations of standing, walking, jogging, running, sprinting and shuffling; number of jumps; number and types of passes; number of left and right changes of direction grouped by angle of change. T-Tests were used to investigate differences between the positions. Level of significance was set at <0.05.
Results: Significant differences between the positions Attack, Centre and Defense were found for: average cumulative duration per player standing (826, 502 and 622s); walking (1228, 634 and 1376s) ; jogging (273,860 and 324 s); sprinting (163, 446 and 98s); total number of jumps (163, 446 and 98), total passes (67,156 and 59); changes in direction left (84, 171 and 75) and right (66, 159 and 56). For all positions the majority (94–99%) of changes of direction were at angles of 45 and 90 degrees.
Discussion/Conclusions: At the regional academy of sport level the demands of Netball competition vary with position of play. Attack and Defense play results in very similar movement and game play patterns and frequency of actions. Center players are significantly more active than both Attack and Defense players in terms of locomotion jumping and passing. It is concluded that, for adolescents, game and thus fitness demands of Netball differ between the positions of play and that Center players may require greater level of overall fitness in comparison to Attack and Defense players. It is recommended that fitness training for this level of Netballer be position specific.

376 | Are there relationships between in game performance and fitness of adolescent Netballers?

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Introduction: Research needs to bring together fitness testing results and game analysis studies to formulate sports specific fitness training programs. This requires valid sport specific fitness assessment protocols. This is not possible with adolescent Netballers as relationships between fitness results and game performance remain relatively unknown.

Aim: This study sought to determine the relationships between fitness test results and game performance of adolescent Netballers at a regional academy of sport level, in order to inform the choice and use of fitness tests.

Methods: Participants were Netball players of regional academy of sport level, 13 players, mean age 16.1 yrs, completed all aspects of the study. Participants took part in a game of Netball game playing in the same position throughout the game. The game was videotaped and video analyzed for each individual player. Cumulative and mean durations of standing, walking, jogging, running, sprinting and shuffling; number of jumps; number and types of passes; number of left and right changes of direction grouped by angle of change. Fitness measurements included ISAK restricted profile anthropometry, 7 stage abdominal strength, sit & reach, vertical jump (Vertec), upper body push up endurance, 1 RM squat (Smith Machine), speed over 3, 5 & 10 m and 505 agility test both using light gates plus the Beep Test. Correlation analysis was used to determine relationships. Level of significance was set at <0.05.

Results: Significant relationships were found between anthropometric variables and game performance variables. Games performance variables were also significantly correlated to sit & reach, upper body endurance, 1 RM squat, agility and abdominal strength. Visual inspection of significant relationships graphs indicates they may be influence by playing position.

Discussion/conclusions: Relationships between fitness test results and movement patterns appears to be at least partially related to position of play, however the current study did not have sufficient statistical power to investigate this. Study findings may also have been influenced by: the relative lack of variation in fitness and levels of play of the participants; the possibility that the participants could be at fitness levels that were already at or above threshold levels required for their level of play. It is concluded that more research, which separates data by position of play, should be conducted with a participant population of greater range in Netball performance level before final recommendations on testing regimes in adolescent Netball are made.

377 | Metabolic profile of moderate-intensity interval swimming

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Introduction: The interval swimming at moderate-intensity has been widely used for endurance training in competitive swimming. Although there have been several studies of the metabolic profile during continuous swimming, few studies have attempted to investigate the metabolic profile during interval swimming. The purpose of this study was to evaluate the aerobic and the anaerobic energy release systems during moderate-intensity interval swimming in male competitive swimmers.

Methods: All experimental measurements were conducted in a swimming flume. The subjects performed 10 minutes continuous swimming test (CON), and two types of the interval swimming tests (10 bouts of 1 minute swim) with rest periods of 20 seconds (INT20) and 30 seconds (INT30). During these tests, each subject swam at the velocity of blood lactate accumulation of 4 mmol/L, which were estimated individually from the sub-maximal progressive swimming. Blood lactate accumulation was measured at the end of each trial. Expired gas was collected during the swimming and rest periods to estimate the oxygen demand, accumulated oxygen uptake and oxygen deficit. The oxygen deficit at each swimming period during INT20 and INT30 was taken as the difference between the estimated oxygen demand and the actual oxygen uptake.

Results and discussion: Blood lactate accumulation was significantly higher ($p<.05$) in CON than that in INT20 and INT30. There were no significant difference in blood lactate accumulation between INT20 and INT30. Significant differences ($p<.05$) were observed among the accumulated oxygen uptake (CON>INT20>INT30) and the accumulated oxygen deficit (INT30>INT20>CON). The ratio of relative aerobic and anaerobic energy release systems corresponds to the ratio of absolute accumulated oxygen uptake and oxygen deficit. Therefore, these results suggest that metabolic profile of moderate-intensity interval swimming would be significantly influenced by difference of 10 seconds in the rest period.

378 | Position of play differences in fitness and anthropometry of adolescent Netballers

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Introduction: Netball player fitness is an acknowledged contributor to performance. Fitness testing is routine for many teams. Norms for adult players are available across a range of abilities. However for adolescents published fitness data is largely nonexistent except for the elite level. Additionally it is not yet know whether such goals should differ according to position of play.

Aim: This study sought to determine if fitness of talent development quad adolescent netballers differed with position of play whilst adding to the information available on fitness of adolescent Netballers.

Methods: Participants in the study were 16 female Netball players of regional academy of sport level, mean age 16.1 yrs (SD 0.7). Participants were classified according to position of play as Attack (n=5) players who played in goal attack or goal shooter position, Center (n=6) players who played wing attack, wing defense or center; or Defense (n=5) if they played goal keeper or goal defense. Measurements included ISAK restricted profile anthropometry, 7 stage abdominal strength, sit & reach, vertical jump (Vertec), upper body push up endurance, 1 RM squat (Smith Machine), speed over 3, 5 & 10 m and 505 agility test both using light gates plus the Beep Test. T-Tests were used to investigate differences between the positions. Level of significance was set at <0.05.

Results: Mean height of the Center players of 1.65 m was significantly shorter than both Attack (1.73 m) and Defense (1.74 m) players, there were no other differences in anthropometry. In terms of fitness, Defense players achieved stage 6 or 7 in the abdominal strength test, this was significantly higher that the Attack players who achieved stages 3 to 5; Center players had mean upper body endurance of 48 reps which was significantly higher than both Attack (28 reps) and Defense (34 reps) players; Defense at a mean time of 0.529 s over 3 m were significantly faster than Attack (0.664 s) players however there were no differences in sprint time at 5 and 10 m. There were no other significant differences.

Discussion/conclusions: The finding that Attack and Defense players are taller than Center players is expected as height gives an advantage in goal shooting and defense. Game analysis research and a broader range of Netball abilities and performance level is required to determine if the differences in fitness between positions could be related to differing game demands for the positions of play.

379 African rhythm: The secret link to Kenya's running success?

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Distance running in Kenya. The first thought that comes to mind is altitude. And, with reason. 2000m elevations are common, and training at such altitudes help create the high aerobic capacity that is vital to distance running success. There is nothing accidental about the successes of Kenyan distance runners. They result from a combination of several factors including the high altitude, genetics, the environment, living conditions, government support and traditions such as cattle raiding. This study asks the question: 'Why have these circumstances been so much more helpful to Kenyan runners than other high altitude runners?' Similarities between Africa's polyrhythmic drumming and dancing rhythm and the rhythm of running cannot be denied and this study proposes a possible link between Kenya's running success and their culture of music, dance and rhythm. The study is conceptual in nature and focused on the analyses of Kenyan rural music, comparing the structure of Kenyan music with that of Western music and relating the findings to distance running. Important differences in musical culture that may impact on distance running was identified. In Western culture, we tend to think of the world as being divided into elements. This reality is also evident in the way we train our athletes: focusing on separating elements in running – breathing rhythm, arm rhythm and rhythm of the feet. Running is often over-analyzed to the extent that running becomes an 'unnatural' act. Music-making is such an important part of African social and cultural life that is performed regularly in a wide diversity of social settings.
When communicates in Africa comes together, music usually forms an integral part of the activities. Within the African culture it is assumed that all people have some musical ability, and are therefore capable of taking part in a musical performance. Musical performance can therefore not be separated from social and cultural activities. A great deal of Kenyan music is intended to reflect the rhythm of life, and in such cases, the rhythm leads to the music. Rhythm is often polyrhythmic – many African musicians can respond to numerous rhythms at the same time. The relationship between polyrhythms and running is further explained in the study. The results of the study have several important implications to distance training in Western countries. Recommendations as result of the study focus on changes in our perception of rhythm in running and therefore on rhythm training for athletes.

380 Self-perception of speed versus GPS recorded speeds in snow sports participants

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Introduction: Human self-perception of speed is required in activities where movement velocity greatly exceeds human walking or running speeds for which evolutionary capacity for self-judgement of speed of movement developed. Improving perception of speed travelled may improve safety across a range of sports.
Method: This study assessed actual and perceived distance and speeds travelled by participants over a day as well as in resort designated 'slow zones' in the 2010/11 season using a small GPS and accelerometer data-logging device (SPI Elite GPSports Pty Ltd). Participants completed a questionnaire describing their assessment of their maximum speed that day and their distance travelled.
Results: 102 participants travelled 4.5km or more during the data collection sessions. Mean age was 42.0, (9–80) years, with 39% females and 70% advanced/expert. Total skiing/boarding time was 497 hours (mean=4.52 hours) covering 4,475 km (mean=43.87km). Paired sample t-tests of the estimated and actual maximum speeds were significant ($p \leq .000$).
Discussion: Participants were consistently unable to estimate distances they travelled and were unable to accurately estimate maximum speeds they achieved, with most substantially underestimating the velocity they were travelling in "slow zones." This finding indicates the potential need for mechanisms for enhancing self-perception of speed in this sport.

381 Managing performance enhancing substance use by sports health professionals

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Introduction: The expanding list of substances with performance enhancing potential has seen calls for the professions to develop policy that regulates the use of such substances. This paper examines how Sports Medicine Australia might respond to a call to regulate the use of performance enhancing substances (PES) among sports health professionals.
Method: A thought experiment using the anti-doping framework as a guide is executed. This framework was chosen as the only mature policy response to manage PES. The assumption is made that PES work, with the corollary use means better performance than those who abstain (e.g. treat more clients more effectively).
Results: This thought experiment shows that the harms argued to emerge from doping in sport also emerge among sports health professionals, such as coercion (e.g. being forced to use PES to ensure competitiveness in the job market).
Conclusions: Applying anti-doping to sports health professionals indicates a deeper understanding and response is needed to understand how professional organisations such as Sports Medicine Australia can develop policy to regulate the use of PES among its members. Such an understanding may feed back into efforts to regulate PES use among athletes.

382   A single bout of eccentric exercise results in a type II muscle fiber specific increase in satellite cell content and activation status

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Introduction: Satellite cells (SCs) are instrumental for repair, regeneration and growth of human skeletal muscle tissue. Following a single bout of exercise skeletal muscle SC can activate, proliferate and differentiate to form new SCs. In accordance, increases in mixed muscle SC content have been reported after 24–48 h of recovery from a single bout of exercise. So far, little data exists on the fiber type-specific changes in SC content and activation status during post-exercise recovery. The present study investigates the impact of a single bout of eccentric exercise on skeletal muscle fiber type specific SC content and activation status following 24 h of post-exercise recovery.
Methods: Skeletal muscle biopsies were collected from the m. vastus lateralis of 10 healthy, recreationally active males (23±1y) prior to and 24 h after performing 300 high-force eccentric actions using the knee extensors. Muscle fiber type-specific SC content and activation status were assessed by immunohistochemical analyses. SC activation status was assessed by co-staining CD56 with DLK1 and Ki67. Statistical analysis was performed using a two-factor repeated measures analysis of variance (ANOVA) with the level of significance set at $P<0.05$.
Results: At baseline, no differences in SC content were observed between type I and type II muscle fibers. In addition, no differences were observed in the number of DLK1+and Ki67+SCs between fiber types. Following 24 h of post-exercise recovery, type II muscle fiber SC content had increased substantially from 0.085±0.012 to 0.133±0.016 ($P<0.05$). In contrast, no changes were observed in the type I muscle fibers (0.099±0.009 to 0.092±0.011; interaction between fiber types $P<0.05$). The number of DLK1+SCs increased in the type II muscle fibers only (from 0.027±0.008 to 0.070±0.017 DLK1+SCs per fiber; $P<0.01$). No significant differences were observed in the number of Ki67+SCs over time or between fiber types.
Conclusion: A single bout of eccentric exercise induces a type II muscle fiber type-specific increase in both SC content and activation status within 24h of post-exercise recovery.

383   Work process and challenges in the multidisciplinary support team for family health strategy (NASF)

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NASF is a multidisciplinary support team for Family health, created in 2008, which aims to extend the coverage and scope for the primary care in Brazilian public heatlh. It consists of a team, which performs the support to professionals in Family Health Teams (FHT), focusing on teamwork, on comprehensive care and empowerment of users and professionals working in health promotion and rehabilitation. The team composition is defined by epidemiological criteria and local needs. The aim of this study is to describe NASF's work process and interventions, in the Central South metropolitan area, in Belo Horizonte, Minas Gerais, Brazil. The area has three groups composed by Physiotherapists, speech therapists, nutritionists, psychologists, social workers, occupational therapists, pharmacists, athletics trainers, all supervised by a coordinator. Each group gives support to 10 FHTs. The working process is articulated by monthly meetings with each FHT. The demands are presented by the FHT and are discussed based on each clinical case. The therapeutic plan is based on a shared responsibility between NASF and FHT. This connection establishes a sharing process and longitudinal monitoring which helps to increase the capacity of analysis and intervention on health problems. The FHT members (physician, nurses and community health workers) present the demands specifying the patient's health condition and its background. During the monthly meeting the group defines which professional should take responsibility for the case and is given the goals for the health interventions, which include individual or group sessions, multiprofessional session and home care, according to clinical, social and environmental criteria. The home care gives priority to patients with reduced mobility. It can also be done when the knowledge of the home environment is a determinant for the therapeutic project construction, as in household adaptation to reduce falls' risk in the elderly. The patient is treated at home receiving regular visits by different professionals. The treatment also includes patient, family and care given's orientation. On the other hand, the group intervention is based on workshops or supervised physical activities. It is given information about health care and lifestyle, helping the population to take responsibility for their life and health. NASF enables the construction of a multidimensional and multidisciplinary care, focusing in family and socio-environmental background, improving health promotion and rehabilitation of individuals and communities. The challenges of this project are to strengthen teamwork and to create and follow organizational guidelines in a context of high demand with limited human resources.

384   Healthy Body Healthy Mind: Development of an exercise intervention for the management of youth depression

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Introduction: One in five young people in Australia will experience depression. Conventional treatments are primarily psychological interventions such as cognitive behavioural therapy or pharmacological approaches designed for adults, which have varied results in young people. Exercise has mood-elevating effects and exercise training is known to have positive effects on mood in adults with depression but this has not been established in youth. Youth with depression are difficult to engage therefore specific strategies to address motivation are a key component of the approach being trialled. Therefore the aim of the first stage of the Healthy Body Healthy Mind project is to determine the feasibility of a combined motivational interviewing (MI) and exercise-training program on depressive symptoms in youth aged 15–25 years.

Methods: Youth are being recruited through GP clinics and the University Counselling service. Following screening and confirmatory diagnosis (DSM-IV) of mild-moderate Major Depressive Disorder, participants participate in 1–2 sessions of MI (Quick Fix approach) with a clinical psychologist followed by 12 weeks of small group (5–6 per group) exercise scientist led exercise training combining both resistance and aerobic conditioning three times a week. Participants are also being encouraged to engage in self-determined physical activity on the other days of the week. A range of psychological (including Becks Depression Inventory II; BADS; measures of self efficacy and self esteem) and physical fitness (VO_2max; upper and lower body strength; body composition by bioelectrical impedance) measures are assessed before and after the exercise program. Physical activity is assessed by 7-day accelerometer records at baseline and 12 weeks. Participants provide regular online feedback regarding mood state, wellbeing, sleep, physical activity and inactivity time, with a more comprehensive review every two weeks.

Results: The basis for the development of the exercise model and the incorporation of MI to engage this population in exercise will be presented. MI in the pre-program component is delivered by a clinical psychologist and is being analysed for future presentation by exercise physiologists. MI strategies are also incorporated into the exercise sessions. The exercise program incorporates both resistance and aerobic training with progression to higher intensity activities.

Discussion: The results of this study will inform an RCT to further our understanding of the potential for exercise training to improve mood and depression symptoms in young people.

385   Understanding the physical activity promotion behaviours of podiatrists: A qualitative study

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Introduction: Health professionals from all disciplines are encouraged to play a part in reducing the health risks and the financial cost of physical inactivity. The podiatry setting may offer a unique opportunity to promote physical activity. However, at present, little is known about the extent to which podiatrists incorporate physical activity promotion into their clinical practice. The aim of this study is to explore the physical activity promotion attitudes, beliefs, knowledge and practice behaviour of podiatrists.

Methods: This qualitative study involved 20 semi-structured interviews with Tasmanian podiatrists, purposefully selected to represent diversity in clinical experience, age, gender, and type of practice. These interviews were designed within the Theory of Planned Behaviour theoretical framework to identify the beliefs, attitudes, knowledge and practice behaviours of practicing podiatrists. Demographic and personal physical activity behaviour information was also collected. Transcribed interviews were coded by two coders using an iterative thematic approach to identify major themes and salient beliefs.

Results: Overall participants had a positive attitude to physical activity promotion considering it to be a normal part of their role as a podiatrist and as a health professional concerned about the general well-being of the patient. They saw their role as giving information, encouraging activity and making recommendations, however, they were less inclined to provide physical activity counselling and to follow up on recommendations and monitor activity levels. Their approach is un-structured and the content of the promotion is dependent upon the presenting patient and their condition. They consider that there are opportunities to promote physical activity during regular consultations, however, in practice they are only likely to assess and promote physical activity to patients with chronic diseases such as type 2 Diabetes. The main barriers to assessing and promoting physical activity included unreceptive and unmotivated patients, lack of skills and resources and the lack of knowledge of local physical activity options available for patients.

Discussion: The podiatry profession has a unique patient-practitioner relationship where there is significant opportunity for health promotion during routine clinical care. There seems to be much scope for strategies to be employed that would address the major issues, barriers and opportunities revealed in this study and to provide a more structured approach to physical activity promotion by podiatrists. The information gained from this study is essential for communication with podiatrists in further studies examining physical activity promotion, and for future intervention studies.

386   An examination of the influence of body mass index on disease prevalence in a regional Australian population

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Introduction: A 2007–2008 report from the Australian Bureau of Statistics estimated that 61.4% of Australians are overweight or obese. Therefore, the aim of the present investigation was to further characterize the relationship between body mass index (BMI: kg ● m^{-2}) and several prevalent disease states. Methods: The Population Research Laboratory at Central Queensland University conducted a Computer-Assisted-Telephone-Interview survey (N=1289) during October–November 2010. Respondents were 18 years of age or older that could be contacted by a direct-dialed, land-based telephone service. A computer program containing telephone contact details was used to select, with replacement, a simple random sample of respondents. Separate bivariate logistic regression models were used to examine the associations between BMI (normal weight: 18.5–24.9; overweight: 25.0–29.9; obese: ≥30.0) and self-reported health information relating to disease states. For all analyses, normal weight was used as the reference group and significance was set at (p<0.05). Data are presented as raw and weighted odds ratios which were adjusted for age and geographic location. Results: Raw and weighted data yielded similar results for the increased presentation of diabetes (obese: 1.94, CI: 1.19 to 3.19; 2.09, CI: 1.17 to 3.71), arthritis (obese: 1.62, CI: 1.14 to 2.30; 1.63, CI: 1.10 to 2.42), and heart disease (obese: 1.75, CI: 1.06 to 2.89; 1.98, CI: 1.10 to 3.56), respectively. In this regard, being overweight or obese was found to significantly increase the presentation of hypertension (raw data: overweight: 1.75, CI: 1.27 to 2.41, obese: 2.72, CI: 1.95 to 3.79; weighted data: overweight: 1.85, CI: 1.29 to 2.66, obese: 3.63, CI: 2.52 to 5.23), hypercholesterolemia (raw data: overweight: 1.61, CI: 1.14 to 2.30, obese: 2.02, CI: 1.40 to 2.91; weighted data: overweight: 1.93, CI: 1.30 to 2.86, obese: 2.32, CI: 1.54 to 3.50), and osteopenia/osteoporosis (raw data: overweight: 1.99, CI: 1.07 to 3.70, obese: 2.33, CI: 1.23 to 4.40; weighted data: obese: 2.66, CI: 1.27 to 5.57). Raw data found an increase in BMI to increase the presentation of depression (obese: 1.52, CI: 1.06 to 2.20) and hyperlipidemia (overweight: 2.32, CI: 1.02 to 5.27; obese: 3.03, CI: 1.32 to 6.93). BMI did not influence the presentation of cancer or thyroid disorder. Discussion: The link between BMI and disease risk is concerning, particularly with obesity rates in Australia on the rise. Health education programs geared towards children and younger adults must be established in an attempt to reduce disease prevalence.

387   Adherence to anti-hypertensive treatment according to physical activity levels

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Introduction: Despite the availability of effective treatments, only one third of the patients receiving treatment for hypertension achieve desirable therapeutic levels. Non-adherence to the treatment is one of the most frequent causes for this negative situation. Adherence to the treatment is a multidimensional phenomenon, with several determinants already described in the literature. The aim of this study was to analyze the association between physical activity and adherence to the anti-hypertensive treatment in Southern Brazil. Methods: A cross-sectional study was carried out in 2010–2011 with a sample of hypertensive subjects aged 19 years or older living in the city of Bagé, Brazil. In order to measure the adherence to the anti-hypertensive treatment, two self-reported instruments were used: the Brief Medication Questionnaire (BMQ) and the Morisky Medication Adherence Scale, 8-itens (MMAS-8). Leisure-time physical activity was assessed thought the leisure time section of the International Physical Activity Questionnaire (IPAQ). Those practicing moderate-intensity physical activity for at least 30 minutes five or more days a week, or vigorous-intensity physical activity for at least 20 minutes three days or more per week were considered active. The description of the sample was followed by bivariate analysis between the two adherence outcomes and physical activity practice. Statistical significance was evaluated using the qui-square test (p<0.05). Results: The majority of the sample of 1,588 hypertensive people was female (71%) with white skin color (67%). The mean age was 61 years old (SD=13). About 19% (BMQ) and 48% (MMSA-8) of the sample were considered as adherent to the treatment. There was no difference in the adherence by sex, skin color and social economic level using both instruments. Only 8.3% (n=130) of the sample were considered active in leisure time. The proportion of adherence to the treatment according to BMQ was 27.5% for active hypertensive people and 18.2% for the others (p=0.01). The adherence was also higher among the physically active hypertensive people (60%) than the others (47.4%) using the MMAS-8 instrument (p=0.003). Discussion: Despite the different focus of the two instruments (BMQ aims to identify barriers to adherence and MMAS-8 aims to capture the patient's behavior regarding the habitual use of medicine), in both cases the adherence was higher among physically active individuals. Such association can be related to a cluster of healthy behaviors. Further studies are required to investigate whether people who comply with the medicine treatment also show healthier habits regarding other characteristics.

388   Effectiveness of an online physical activity intervention for adults with Type II diabetes

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Physical activity provides many health benefits for individuals diagnosed with Type II diabetes, but many do not engage in sufficient physical activity to receive such benefits. This study examined the effectiveness of an online program to increase physical activity in adults with Type II diabetes. Participants were randomly allocated into either a 12-week intervention (n=195) based on the Theory of Planned Behaviour and self-management principles or a control (n=202) group. Participants were assessed at baseline, 12 and 36-weeks. 47% of participants completed the 36-week follow up questionnaire. Outcomes assessed included physical activity, theory of planned behaviour variables (TPB), website satisfaction and website usage. Intention to treat analysis revealed significant time effects for improvements in physical activity but between group differences were not present. Completers analysis revealed a significant group-by-time interaction (p<0.05) for total physical activity, favouring the intervention group. There were significant negative effects for TPB variables with the control group reporting a greater decline in comparison to the intervention group. The intervention created high website satisfaction and engagement. Overall outcomes suggest that both groups significantly increased physical activity over time, with the majority of increases in physical activity occurring immediately post intervention (12-weeks). Online interventions show promise; however maintaining outcomes longer-term behaviour presents an issue.

389 Isometric handgrip, physical activity level and health related quality of life of Brazilian Judo Master athletes

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Introduction: Physical activity level (PAL) and physical fitness (PF) may be relevant to populational health-related quality of life (QoL) perception. Additionally, the engagement in moderate-to-vigorous physical activity (MVPA) contributes to lower disease risk, as a protector factor to metabolic syndrome and coronary disease and to longevity.
Objectives: To evaluate the PAL, isometric handgrip (IH) and QoL of judo master athletes over 45 years-old.
Material and Methods: From transversal observational study, 44 participants of the Pan American Masters Judo 2011 Championship, with 28 ± 14 years of practice, were enrolled in this study. After both hands HI assessment, the subjects filled a PAL questionnaire (GPAQ) and WHOQOL-Bref to QoL. The data collection was made during technical category registration. Age groups (40–45, 46–59 and more than 60 years) were compared through analysis of variance and Tukey test as post-hoc. Partial correlations, controlled by age groups, were also conducted.
Results: Groups did not differ in any analyzed variables (40–45 yrs group – HI right: 45.47 ± 6.3 kgf; HI left: 42.72 ± 4.9 kgf; MVPA: 666 ± 529 min/wk; WHOQOL total score: 82.06 ± 10.76; 46–59 yrs group – HI right: 44.23 ± 9.1 kgf; HI left: 41.89 ± 8.76 kgf; MVPA: 753 ± 412 min/wk; WHOQOL total score: 80.05 ± 6.96; >60 yrs group – HI right: $44.46\pm12,43$ kgf; HI left: 42.47 ± 11.33 kgf; MVPA: 797 ± 479 min/wk; WHOQOL total score: 78 ± 7). Significant correlations were observed between age and right side IH ($r=-.33$, $p=.038$), MVPA amount and two QoF domains, physical ($r=43$, $p=.006$) and psychological ($r=.38$, $p=.017$), as well as total score ($r=.47$, $p=.002$).
Discussion: To these master judo athletes, IH have no difference over the years and they practice several minutes of moderate-to-vigorous physical activities. In this population, the MVPA amount, but not light activities, was correlated with different QoL domains, providing maintenance of athletes' functional status and can be stimulated in this population.

390 Daily physical activity pattern related to total body fat and abdominal fat in younger children

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Introduction: Lack of physical activity is generally thought to be associated with obesity in children. Previous studies have, however, produced conflicting results. We assessed if different aspects of physical activity is related to different measurements of body fat in children aged 8 to 11 years.
Methods: Cross-sectional study of 226 children (125 boys and 101 girls), recruited from a population-based cohort. Accelerometers measured minutes of inactivity (IA), moderate and vigorous physical activity (MVPA) and vigorous physical activity (VPA) per day. Total body fat mass and abdominal fat mass were measured by a DXA scan. Total body fat was expressed as percentage of body mass (BF%). Skewed values were normalised by natural logarithm.
Results: Boys performed significantly more minutes of MVPA and VPA per day compared to girls (MVPA 45 ± 20 vs 35 ± 13 and VPA 15 ± 10 vs 11 ± 7, all $P<0.05$). No difference was found for IA (508 ± 75 vs 522 ± 68, $P=0.13$). Girls had higher BF% than boys (22 ± 9 vs 16 ± 9, $P<0.05$) and more AFM (3.3 ± 2.4 vs.2.4 ± 2.3, $P<0.05$). Pearson correlation indicated a significant association in boys between MVPA and VPA vs BF% ($r=-0.29$ and -0.32, $P<0.05$) and vs AFM ($r=-0.28$ and -0.31, $P<0.05$). IA was not related to BF% or AFM ($r=0.12$ and 0.12, $P>0.05$). The corresponding findings in girls; MVPA and VPA vs BF% ($r=-0.38$ and -0.47, $P<0.05$) and vs AFM ($r=-0.31$ and -0.41, $P<0.05$). IA was not related to BF% or AFM in boys ($r=0.12$ and 0.12, $P>0.05$) or in girls ($r=-0.08$ and -0.13, $P>0.05$).
Conclusions: In this population-based cohort of children minutes of MVPA and VPA per day were related to amount of body fat in both boys and girls, whereas minutes of IA per day was not. This indicates that low physical activity, not inactivity, can be a contributing factor in the development and/or maintenance of obesity in children.

391 Daily physical activity pattern related to aerobic fitness in young children

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Introduction: Aerobic fitness (VO_2peak) is a strong, independent risk factor for cardiovascular disease and mortality in adults. It is therefore of interest to investigate how VO_2peak is related to different aspects of daily physical activity already in childhood. We assessed if different measures of physical activity is related to VO_2peak in children aged 8 to 11 years.
Methods: Cross-sectional study of 226 children (127 boys and 101 girls), recruited from a population-based cohort. Accelerometers measured minutes of inactivity (IA), moderate and vigorous physical activity (MVPA) and vigorous physical activity (VPA) per day. VO_2PEAK was assessed by indirect calorimetry during a maximal exercise test and scaled by body mass (ml/min/kg).
Results: Boys had higher VO_2peak than girls (45.8 ± 7.4 vs 34.7 ± 6.3, $P<0.05$). Boys performed significantly more minutes of MVPA and VPA per day than girls (MVPA 46 ± 20 vs 35 ± 13 min, VPA 15 ± 10 vs 11 ± 7 min, all $P<0.05$). There was no difference in IA (506 ± 77 vs 522 ± 68 min, $P=0.09$). Pearson correlation indicated a significant association between MVPA and VPA versus VO_2peak . In boys $r=0.32$ and 0.26, and in girls $r=0.30$ and 0.31, all $P<0.05$. IA was not related to VO_2peak, in boys $r=0.05$, and in girls $r=0.07$, both $P>0.05$.
Conclusions: In this population-based cohort of children minutes of MVPA and VPA per day were related to VO_2peak in both boys and girls, whereas minutes of IA was not.

392 Metabolic health in the overweight and obese, what is the role of physical activity?

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Introduction: The prevalence of overweight and obesity is increasing worldwide. In Ireland, approximately two-thirds of the population are overweight or obese. It is well established that physical inactivity plays a major role in the development of overweight and obesity and that being overweight and obese predisposes an individual to metabolic abnormalities. But some individuals maintain metabolic health despite being overweight and obese and the mechanism for this is unclear. The objectives of this paper are to establish the prevalence of metabolically healthy overweight and obese in middle-aged Irish adults and to examine the effect of physical activity on metabolic health among overweight and obese.

Methods: A population representative random sample of men and women were recruited from a large primary care centre in Mitchelstown, County Cork, Ireland. Baseline assessment included a health questionnaire and a physical examination undertaken by trained study nurses and included standardised measurement of height, weight, blood pressure, and venous blood sampling. Physical activity was measured with the International Physical Activity Questionnaire (IPAQ) and categorised into high, moderate and low levels. Participants were classified as overweight, BMI≥25kg/m^{2}, or obese, BMI≥30kg/m^{2}. Metabolically healthy was defined as; blood pressure <140 mmHg systolic and <90 mmHg diastolic, fasting blood glucose <6.1mmol/L, HDL cholesterol >0.9 mmol/L in males and >1.0 mmol/L in females, and fasting triglycerides <1.7mmol/L.
Results: The cohort includes 2047 men and women aged 46–74 years of whom 1593 (77.8%; 95% CI 75.9%–79.6%) are overweight or obese. The overall prevalence of metabolically healthy overweight and obese in middle-aged Irish population is 34.2% (n=700; 95% CI 32.1%–36.3%). The prevalence was higher in women (32%; 95% CI 29.2%–34.9%) than in men (36.3%; 95% CI 33.4%–39.3%). Among overweight and obese, moderate and high physical activity levels were significant predictors of metabolic health (OR=1.47; 95% CI 1.15–1.88, OR=1.40; 95% CI 1.07–1.83). In a multivariate model, adjusted for age, gender, smoking and education, both moderate and high physical activity remained significant predictors of metabolic health [OR 1.53; 95% CI 1.18–1.98 and OR 1.70; 95% CI 1.27–2.28]. Overweight and obese women were twice as likely to be metabolically healthy than overweight and obese men [OR 2.05; 95% CI 1.63–2.59].
Discussion: Physical activity provides protection against metabolic abnormalities among the overweight and obese. Current recommendations for physical activity should continue to be advised and further research should be undertaken in the area of physical activity and metabolic health.

393 Identifying physically inactive Parkinson's Disease patients

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Introduction: Daily physical activity is commonly measured with self-reports, but these include a risk for validity problems. In this study, Parkinson's Disease (PD) patients were screened on the basis of their self-reported daily physical activity. Daily physical activity of patients who reported themselves to physically inactive was additionally measured in a performance-based way. The aim of this study was to examine the performance-based level of daily physical activity, thereby examining whether self-reports of daily physical activity are an appropriate tool to identify actual physically inactive PD patients.
Methods: Daily physical activity of 586 PD patients, who reported themselves to be physically inactive, was measured with the Direct-Life accelerometer for 7 consecutive days. Primary outcome was daily energy expenditure in kilocalories. According to the 30-minutes daily physical activity guideline, the self-reported physically inactive patients were classified as 'physically active', 'semi-active' or 'physically inactive' based on their performance-based measurements.
Results: In total, 329 patients had sufficient accelerometer data for further analyses. Median daily energy expenditure was 498 kcal (IQR 280). Of these, 42.kcal (IQR 89) or 9.7 minutes (IQR 19.7) were spent on moderately intensive physical activities and 1.8 kcal (IQR 15.5) or 1.4 minutes (IQR 1.8) on vigorously intensive physical activities. Only one patient was physically active, 55 (17%) were semi-active and 273 (83%) were physically inactive.
Discussion: Most PD patients who reported to be physically inactive, were able to make an appropriate estimation of their true daily physical activity level. This indicates that self-reported daily physical activity is a valid screening tool to identify actual physically inactive PD patients.

394 Sedentary time, breaks in sedentary time, moderate-to-vigorous physical activity and metabolic risk in young adults at high risk

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Introduction: Evidence suggests that sedentary behaviour is detrimental for health and this association may be independent of physical activity levels. Sedentary behaviour, however, has typically been measured using self-report and accelerometers. These methods have substantial limitations. Inclinometers are able to provide a more accurate assessment of sitting time by measuring body posture. Using inclinometers (activPAL™) to measure sedentary behaviour and ActiGraph accelerometers to measure moderate-to-vigorous physical activity (MVPA), this study was to examined the association between objectively measured sedentary time, breaks in sedentary time, MVPA and metabolic risk in a sample of young adults identified as being at a high risk of developing type 2 diabetes.
Methods: 82 women and 33 men (mean age 32.7±5.6 years, mean; BMI 34.4±5.1kg/m^{2}) were recruited from general practices based on known risk factors such as obesity. Sedentary (sitting/lying activity) time and breaks in sedentary time were measured using the activPAL™ inclinometer. MVPA was assessed by ActiGraph accelerometer. Both devices were worn for 10 consecutive days. Fasting plasma glucose, 2-h plasma glucose (measured using an oral glucose tolerance test), waist circumference, blood pressure, and blood lipids were measured using standardised criteria. Linear regression models (adjusted for age, gender, ethnicity, smoking status, social deprivation) examined the associations of sedentary time, breaks in sedentary time, MVPA and metabolic risk variables.
Results: Sedentary time was positively associated with 2-h plasma glucose (β=0.22, p=0.026), triacylglycerols (β=0.19, p=0.037) and total cholesterol (β=0.19, p=0.046). However, after further adjustment for MVPA models were no longer statistically significant. Breaks in sedentary time were not associated with any metabolic risk factors. MVPA was negatively associated with fasting plasma glucose (β=-0.20, p=0.042), triacylglycerols (β=-0.31, p=0.001), systolic blood pressure (β=-0.22, p=0.012) and diastolic blood pressure (β=-0.34, p=0.001). After further adjustment for sedentary time and BMI, all associations remained significant (β=-0.30, p=0.002; β=-0.29, p=0.005; β=-0.23, p=0.018; β=-0.31, p=0.003 respectively).
Discussion: These results suggest that sedentary time is linked to metabolic risk factors but this relationship is not independent of MVPA in this young at risk population. MVPA was strongly linked to metabolic risk and suggests the promotion of physical activity should remain the primary focus in this population.

395   The DALICO Study

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Introduction: Physical activity as a treatment is gravely under-used in health care. One problem is determining the appropriate level of activity for the individual patient; another is maintaining activity over time. We have chosen to introduce a computer-based questionnaire to give the health-care provider a better overview of the patient's health status, activity level and motivation to change. This information will enable the care-giver (physiotherapist, psychologist, physician, etc.) to tailor the intervention to his/her patients. The primary aim is to monitor the effect of intervention on physical activity (measured in met-minutes) and to detect changes in metabolism over time. An additional major goal is to postpone medical treatment.

Methods: At the health care centre in Dalby, Sweden, patients with newly diagnosed hypertension or type II diabetes are being continually enrolled in the study. All participants undergo 24-h ambulatory blood pressure monitoring. A parallel group at a nearby health care centre constitutes a control group. Participants are asked to fill in a questionnaire assessing levels of physical activity and attitudes towards physical activity, and undergo a 6-minute walking test as basic data for physical fitness. Following this, motivational interviewing by specially trained staff takes place, e.g. to identify hindrance for physical activity. Clinical data (blood pressure, ECG, lab tests) and data on quality of life are also being collected.

Results: As of March 2012, 33 patients had been recruited to the study (27 in the intervention group and 6 in the control group). 15 patients declined to participate, in most cases due to lack of time. 2 patients dropped out of the study because of difficulty completing the computer interview. We have encountered no problems with patients' ability to follow the protocol. At the time of writing, individual patients had participated in the study for up to 15 months. All patients who have participated for 6 months or longer have reported increased physical activity, regardless of the activity level at the start of the study.

Discussion: The intervention may improve disease control and quality of life, and reduce medication costs. Our results further suggest that physical activity can be a treatment method in many conditions, and thus highlight its importance. A health economics analysis will follow, possibly showing better health economics overall with this treatment concept. However, additional scientific evidence is needed before physical activity can be used as a treatment method within the entire health care system.

396   The effect of exercise consultation and exercise therapy on quality of life in women with type 2 diabetes: A randomized clinical trial

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Introduction: Diabetes is a progressive chronic disease that affects various aspects of human life. Sedentary lifestyle and obesity are important risk factors of Diabetes Mellitus; therefore, lifestyle modification and exercise therapy has a crucial role in prevention and treatment of diabetes. In review of insufficient studies in this field in Iran, the objective of this research is to compare the effect of supervised group exercise therapy with home-based exercise therapy on quality of life in Iranian women with type 2 diabetes.

Methods: One-hundred and two diabetic women were randomly enrolled in exercise program and divided in two groups; supervised and home-based group. All patients received diabetes education namely self-care, diet and the role of exercise as a component for disease control. Quality of life components (using the Short Form Health Survey (SF-36)), biochemistry tests (Total cholesterol, LDL, HDL, FBS, HbA1c) and anthropometric parameters (height, weight, waist circumference, BMI, skin folds) were assessed at first and after 6 weeks of study. The women registered in supervised group exercise therapy received eighteen sessions of strength training program for six weeks, also they were encouraged to perform their endurance exercise. The home- based group received educational booklet with administrating exercise program for exercising individually. To evaluate duration and intensity of daily walking, all patients were provided with Pedometer device. Mann-Whitney test was used to analyse the effect of exercise therapy on anthropometric parameters (weight, waist circumference, BMI, skin folds), biochemistry tests (Total cholesterol, LDL, HDL, FBS, HbA1c) and steps number, also using Paired sample T-test for analysing quality of life components.

Results: Although, there was significant reduction in FBS and HBA1c ($P < 0.05$) in supervised group after intervention ,we could not find any significant difference between supervised and home based group in fasting glucose, HbA1c, HDL cholesterol and LDL cholesterol levels. About psychometrics outcomes, supervised group compared to home based group showed better result in seven scales(physical functioning , physical role functioning, vitality, social role functioning, emotional role functioning, mental health) of Short Form Health Survey (SF-36) ($P < 0.05$).

Discussion: These outcomes show the positive effect of supervised group exercise therapy on quality of life and better control of diabetes in short time period. If supervised group exercise program for diabetic patients continue for longer time period, Its effect on most assessed parameters in this research may be more significant than home based exercise program.

397   Barriers to engagement in physical activity among adults and elderly non-participants of a physical activity intervention in primary health care

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Introduction: Physical activity (PA) practice has been recommended to promote health around the world. PA interventions in primary health care (PHC) settings have been a convenient field to implement health promotion actions since the attended group has been shown to be exposed to be highly physical inactivity. The determinants of physical inactive are multifactorial, including different barriers to engagement. The identification of these barriers can contribute with effective intervention planning.

Objectives: The aim of the study was to compare barriers to engage in PA by participants of a physical activity intervention in PHC units with matched non-participants.

Methods: A cross sectional study was conducted in seven PHC units in Rio Claro-SP, Brazil. The sample included 111 women participating in the 'Saúde Ativa Rio Claro' (SARC) intervention (mean age: 58±13 years). For each participant, we matched a non-participant considering age (±5 years) and neighborhood. The SARC program was launched in 2001 and provides 1-hour aerobic, neuromuscular and recreational exercise twice a week. PA was measured using the long version of the International Physical Activity Questionnaire and the barriers were measure though the questionnaire QBPAFI with the following domains: physical, psychological-social, psychological-belief, psychological-motivational and external. We conducted descriptive statistics and chi-square test.

Results: While 18.0% of the non participants reported practicing 150 min/wk of leisure-time PA or more, 61.3% of participants achieved such threshold (P<0.001). The most reported barriers by non-participants were: lack of body energy (38.7%), belief to be sufficiently active (37.8%), lack of money (37.8%), presence of injury or disease (31.5%), lack of persistence/motivation(30.9%) and disliking exercise (25.5%). Out of 22 barriers, the non-participants were different from participants in 13 of them. The barriers without different between the non-participants and participants were: lack of company, bad experience with PA, fear of injury or fall, too obese or too lean to exercise, urinary incontinence, appropriate places to exercise near home and weather.

Discussion: The psychological-belief and psychological -motivational domains of barriers were the most relevant to physical inactive among non-participants of the PA intervention in primary PHC settings. The results indicate that primary health care units should provide more physician counseling, information and dissemination about the benefits of physical activity practice, strategies to get people more active in usual daily routine movements and free physical activity interventions.

398 Effect of gender, infarction history, exercise modality, blood pressure and metabolic conditions on cardiac rehabilitation outcomes

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Introduction: This study investigates the impact of gender, myocardial infarction (MI) history, exercise modality, metabolic comorbidities, and resting systolic blood pressure (SBP) on cardiac rehabilitation (CR) outcomes

Methods: This was a retrospective review of 774 patients who completed outpatient CR programs at two public hospitals from 2006 to 2008. The CR interventions consisted of 6–8 exercise programs based either on a high-intensity interval training modality (IT, n=619) or a low-moderate intensity endurance training modality (ET, n=155). All data were corrected for: a) gender, history of MI, and exercise modality (ET versus IT); and b) gender, history of MI, pre-program resting SBP, and metabolic classification (M-Cat) based on the number of metabolic comorbidities (including diabetes, hypercholesterolemia, obesity and hypertension).

Results: Outcomes highlighted include only statistically significant outcomes. Correcting for gender, history of MI, and exercise modality: a) females in the IT program with no history of MI and those with a single MI achieved average resting HR reductions, while those with multiple MI achieved an average resting HR increase; b) average resting SBP outcomes in males with no MI in the IT program represented a decrease, while those with a single MI achieved an increase; c) females in the IT program with a single MI achieved a decrease in resting SBP, while females with multiple MI achieved an average increase; d) the only patient subgroup in the ET program to achieve a significant change in resting SBP were males with no MI; e) resting diastolic blood pressure outcomes were significant in males with multiple MI in the IT program. When outcomes were corrected for gender, history of MI, pre-program resting SBP and M-Cat classification: a) those patients with pre-program SBP<100 mmHg (SB1 subgroup) generally achieved increases, whilst those with pre-program SBP>130 mmHg (SB3 subgroup) achieved decreases, in resting SBP; b) patients classified as SB1 and SB3 within a similar M-Cat classification achieved outcomes of the same absolute value; and c) patients within a particular M-Cat subgroup generally achieved outcomes of greater absolute value than the lower M-Cat subgroup within the same MI and SB subgroups.

Discussion: These results demonstrate that gender, history of MI, pre-program SBP and metabolic comorbidities significantly influence short-term CR outcomes in resting HR and SBP, explaining variable outcomes reported in the literature. Further, the findings of the present study reinforce the need for pathology-specific outpatient CR protocols.

399 The use of physical activity intensity as a predictor of body fatness and the effect of gender: The energy balance study

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Introduction: Significant research has focused on the physiological and behavioral determinants of body fatness. Our purpose was to test the hypothesis that energy expenditure stratified by intensity could be used to predict body fatness in a population of adult women and men.

Methods: Data were collected on 154 healthy women and men aged 21 to 35 years. Participants were within a BMI of 20 to 35 kg/m². Daily levels of physical activity were determined using the SenseWear armband over a period of 10 days. Intensities were defined as low (LOW, <3 METS), moderate (MOD, 3–5.9 METS) and vigorous (VIG, 6 or more METS) and included measurements of energy expenditure by body weight. Body fatness was determined by dual x-ray absorptiometry (DXA). Following calculation of descriptive statistics, correlations were determined between each energy expenditure value by intensity and body fatness. Regression modeling was performed to evaluate the association intensity levels to body fatness. Analyses were gender-specific results and adjusted for age.

Results: Participants included 88 women and 66 men. The descriptive statistics indicated an average age of 25.6±3.6 and 26.1±3.9 years and average body fat percent of 34.4±7.2 and 19.2±87, females and males respectively. Total daily energy expenditure for women was 35.7±5.1 kcals/kg/day (KKD) and stratified into intensity levels at 27.8±1.6 KKD (LOW), 6.9±3.5 KKD (MOD), and 1.0±2.1 KKD (VIG). Results for men were 39.7±5.1 KKD (total), 27.9±1.5 KKD (LOW), 10.1±4.0 KKD (MOD), and 1.7±2.1 KKD (VIG). Correlational analyses for both genders indicated significant relationships between body fatness and MOD and VIG (p≤0.001). The relationship between body fatness and LOW was significant in women (p=0.001), but not significant in men (p=0.41). Regression analysis for women indicated that LOW and MOD significantly predicted body fatness (β=-.603, p<0.001), while in men body fatness was predicted by MOD and VIG (β=-.452, p=0.001).

Discussion: Female participants had a higher percentage of total energy expenditure per body weight provided by low intensity activity, and low intensity activity correlated with body fatness for women but not men. Fatness in women was predicted by a combination of low and moderate energy expenditure while the model for men included moderate and vigorous energy expenditure. Since there was no significant difference in total energy expenditure by body weight, the findings suggest that difference in activity intensity is a mediator for the difference in body fatness for women and men.

400 Sedentary behaviour characteristics in 8–10 year old children at risk for obesity

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Introduction: Sedentary behaviour (SED) is recognized as distinct from physical activity (PA), not merely representing the low-end of the PA continuum or a lack of moderate-to-vigorous PA (MVPA). Current Canadian Guidelines for children recommend ≤2hr/day screen time and ≥60min/day PA. This study aims to describe SED characteristics in a cohort of children at risk of obesity.

Methods: Participants were 534 boys and girls aged 8–10 years with baseline data in the QUebec Adipose and Lifestyle InvesTigation in Youth (QUALITY) study; inclusion criteria included ≥1 parent clinically obese. SED and PA were measured by accelerometer over a 1 week period (SED≤100 cpm; MVPA≥2296 cpm; mean min/day), and specific SED behaviours assessed by self-report. Height, weight, and waist circumference were measured, cardiovascular fitness determined by maximal bike protocol, and additional data gathered by self-report.

Results: About 5% of children were in the highest SED tertile but also the highest MVPA tertile, while 20% were in both the highest SED tertile and the lowest MVPA tertile. About 19% of boys and 46% of girls met screen time guidelines but not PA guidelines, while 28% of boys and 5% of girls met PA guidelines but not screen time guidelines; 36% of children met neither guideline. Screen time, homework, reading, and phone time accounted for 60–80% of total SED; absolute time spent in these specific behaviours was highest in children in the highest SED tertile, but these children also had the highest proportion of SED time remaining unaccounted for. Compared to children in the lowest SED tertile, children in the highest SED tertile were significantly older, more advanced Tanner stage, and had older parents; had a higher BMI and waist circumference; accumulated less MVPA, were less likely to meet PA guidelines, less likely to have ≥2 PE classes per week, and had lower cardiovascular fitness; and were more likely to report weight concerns and less likely to report excellent health.

Discussion: A large proportion of childhood SED time remains unspecified, especially in the most sedentary children. Being non-sedentary or meeting screen time guidelines is not exclusive of inactivity. The most sedentary children are older, more biologically mature, less active and less fit, and more overweight/obese, abdominally obese and likely to have weight concerns, compared to less sedentary children. Understanding of SED and its correlates is a public health priority in terms of reducing SED and its health consequences in the population.

401 Exercise behavior and physical activity in patients after open heart surgery

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Introduction: Open heart surgery helps piece up cardiac disorder and improve functional capacity in cardiac patients. Patients after open heart surgery usually receive structured in-hospital cardiac rehabilitation which builds up physical ability and educates patients to lead active lifestyle. However, whether they maintain regular exercise behavior and perceive adequate physical activity (PA) level after discharge was still unknown. The purposes of this study were to assess exercise behavior and PA level at 6 months after discharge of open heart surgery and possible related factors.

Methods: This is a prospective cohort study. There were 153 patients after open heart surgery (73% men, aged 62.4±12.1 years, 55.2% coronary bypass grafting and 40.0% valvular heart surgery) were enrolled into the study. 27 completed follow up at 6 months. Both their exercise behavior and physical activity were followed up at 6 months after discharge of open heart surgery. The stage of change based on trans-theoretical model was used to survey their exercise behavior. Physical activity duration and metabolic equivalent (MET) were calculated from self-reported International Physical Activity Questionnaire (IPAQ). Possible related factors, including demography, clinical features, cardiac rehabilitation (CR) participation and PA before operation, were also collected in this study.

Results: At 6 months after discharge of open heart surgery, most cardiac patients were in the stage of pre-contemplation (29.6%) and contemplation (44.4%). There were only 22.2% cardiac patients in action stage and 3.7% cardiac patients in maintenance stage. But their PA level increased in average from 866±959 METs/week (pre-operation) to 1743±1962 METs/week (6 months after discharge). Exercise behavior at 6 months after discharge was not significantly different among gender, age level (above 65 years or less), out-patient CR participation and previous PA level. Even though 37% patients were ready for exercise and then attended out-patient CR at discharge of heart surgery, but 29.6% didn't participate any exercise at home 6 months after.

Conclusions: Subjects after open heart surgery may reach satisfying PA level at 6 month after discharge; however, they seldom maintain regular exercise behavior, which is essential for cardiac health, even in subjects attending structured out-patient cardiac rehabilitation program. Medical staff in Taiwan may focus more on how to translate monitored exercise program to daily activity at home and exercise behavior build up as well.

402 Efficacy of referral for physical activity counseling: Protocol for an RCT to compare face-to-face and telephone counseling

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Introduction: Primary care is a key setting for the promotion of physical activity (PA). The exercise referral scheme involves the identification and referral of sedentary individuals to a third party service (usually a sports centre or leisure facility) by GPs. This service then prescribes and monitors an exercise program tailored to the individual needs of the patient. Considerable uncertainty remains as to the effectiveness of exercise referral schemes for increasing PA, fitness, or health indicators, and it is not known whether they are an efficient use of resources for sedentary people with or without a medical diagnosis. It is also unknown if the contradictory results from previous trials are due to self-report evaluation techniques or the use of non-qualified exercise counselors. The NewCOACH (Comparison of Activity Counseling for Health) trial aims to establish the efficacy of referral of insufficiently active primary care patients to exercise physiologists (EPs) for activity counseling, with eligibility and outcomes assessed via pedometry. Since access to specialised activity counseling by EPs would be increased if telephone counseling were equally efficacious as face-to-face counseling, the NewCOACH trial also compares face-to-face and telephone counseling.

Methods: Multicentre, three arm parallel patient-randomised controlled trial with a usual care control group and two intervention groups: 1) Usual care involves provision of generic print material designed to promote PA; 2) referral for five face-to-face consultations with an EP over a three-month period; 3) referral for one face-to-face consultation with an EP followed by four coaching telephone calls over a three-month period. The primary outcome is change in mean daily step count at 12 months post randomization. Eligibility is restricted to adults averaging less than 7000 steps/day. Participating EPs undergo study-specific training on patient-centered PA counseling techniques. Fidelity is assessed by EP-completed checklists and randomly selected recording and external coding of PA counseling sessions.

Results: To date, we have recruited and trained nine EPs to deliver the intervention and five field staff who recruit participants across 27 local practices. The study is in progress and recruitment and eligibility data will be presented.

Discussion: Results of this trial will provide evidence of the efficacy of referral of insufficiently active adults from primary care for tailored activity counseling with an EP, and whether telephone counseling is equally efficacious as face-to-face PA counseling.

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403   Combining biosensors with social media for weight loss intervention

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Introduction: The integration of biosensor technology with activity promotion and weight management solutions is an emerging area. Advancement of bio-sensing technology, cellphone platforms, and social media provide the potential tools to integrate scalable wellness solutions more effectively and efficiently.

Methods: 21 women age 47+8 years old with a Body Mass Index 35+5 kg/m^2 were recruited into a 5 week protocol (1 week of baseline measurement and 4 weeks of intervention). We developed an interface whereby biosensor data could be integrated with a social media platform and a remote expert Health Trainer. The biosensor provided continuous daytime monitoring of physical activity using a tri-axial accelerometer; subjects also had access to their own data display pages through a computer interface. Activity data were consolidated so that the user and trainer could access a participant's progress. We measured the effectiveness of the intervention using a mobile laboratory that contained: equipment for anthropometry measures, satellite data connection (for setting up and validating the biosensors), confidential medical record systems and private assessment space. Week 1 and Week 5 measurements include height, weight, blood pressure and waist/hip circumference were measured on day 1 and at the end of the study. After a week of baseline measurement, the four week intervention began. The Health Trainer opened a private Facebook Group to disseminate educational material, and promote nutritional change and physical activity through group interaction, blogging and positive behavioral feedback.

Results: We addressed the primary hypothesis that the integrated intervention increased daily physical activity at four weeks. From baseline to 4-weeks post intervention, participant activity increased 53% 3.03x10^6 AU at baseline, to 4.43x10^6 at 5 weeks (p<0.0001). Activity also increased in light, moderate, and intense activity levels by 34+58 min/day (p<0.01), 15+14 min/day (p<0.0001), and 32+23 min/day (p<0.0001) respectively. Sedentary time decreased by, 81+73 min/day (p<0.0001). Weight decreased on average 2.1+1.7 kg (p<0.0001). Waist circumference decreased 2.1+4.0 cm. Diastolic blood pressure decreased 3.9+8.4 mmHg.

Discussion: Here we demonstrate that it is feasible to deliver scalable, high quality, and effective health promoting material efficiently through popular social media networks by integrating biosensing technology, a skilled health care professional. In addition, using a mobile health care facility is an effective means to obtaining biometric data.

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404   The cardiorespiratory fitness of adolescents with different BMI

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Introduction: Puberty is a critical period of physical fitness development, and also is a sensitive period to overweight or obesity. Pubertal obesity might lead to impaired cardiopulmonary function, and increase potential risk of cardiovascular disease in adult. The present study aims to explore the cardiorespiratory fitness of adolescents with different BMI by comparing the cardiopulmonary response of adolescents with different BMI during ergometer exercise testing.

Methods: 75 boys and girls aged 13~14-yr were recruited from a middle school. According to BMI classification criteria of research group on obesity of China, they were divided into 3 groups: 19 for overweight group (9 boys and 10 girls, BMI=23.4±0.8 kg/m^2), 17 for obesity group (11 boys and 6 girls, BMI=28.8±2.2 kg/m^2), and 39 for normal body weight group (20 boys and 19 girls, BMI=18.8±1.7 kg/m^2). CRF was determined by a maximal cycle ergometer test, using Monark 874 Ergomedic cycle ergometer. The starting workload was 25 W, and automatically increased by 25 W every 2 minute until exhaustion. The criteria for exhaustion were as follows: 1) Heart rate above or equal to 185 beats per minute; 2) Adolescent could not maintain 60 rpm cycling at least 30 revolutions per minute; 3) Subjective judgment by the observer according to ECG and BP response; 4) CALER scale scores above 9 and they couldn't continue.

Results: 1) resting HR, HRmax and HR of 3min post-exercise showed no significant difference between different BMI groups both boys and girls. 2) resting and post-exercise systolic blood pressure (SBP) and diastolic blood pressure (DBP) were demonstrated as normal group < overweight group < obesity group (P<0.05); 3) body weight adjusted VO2peak was demonstrated as normal group > overweight > obese group (P<0.05). 4) BMI negatively correlated with VO$_2$peak/BM, O2pulse/BM, VTpeak/BW, VEpeak/BW (r=-0.595, -0.532, -0.526 and -0.526 respectively, p<0.001).

Discussion: Cardiorespiratory fitness of overweight or obese adolescents was significantly lower than that of normal individuals, which demonstrated as higher resting blood pressure and lower VO$_2$peak, slower blood pressure recovery after exercise testing. Ventilation function and oxygen transportation ability was restricted in overweight and obese adolescents. School-based physical activity intervention program aiming to improve CRF should be developed for overweight and obese individuals, especially for pubertal boys and girls.

405   Prevalence of overweight and obesity among Chinese children and adolescents, 1985–2010

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Introduction: Student's Physical Fitness and Health Survey have been conducted by the Minister of Education and the Physical Fitness Surveillance Center since 1979 by about 5-year-cycles in China.

Methods: The Survey consists of questionnaire and physical examination, which includes measurements of weight and height, cardiorespiratory fitness, muscular fitness and motor fitness. Urban and rural samples collected according to the same sampling procedure (a complex multi-stage, 31 province-covered samples aged 7 to 22-y-old) were included in 1985, 1995, 2000, 2005 and 2010 surveys, which provide data for this analysis. The present study aims to analyze the secular change of overweight and obesity prevalence in Chinese students between 1985 and 2010. Weight for height standard defined in 1985 was used in this analysis.

Results: 1) the prevalence of overweight and obesity of Chinese children and adolescents aged 7~22-yr in 2010 was 10.89%, 7.64% respectively, (comparing with 2.66%, 0.41% in 1985); especially for boys of urban areas, the prevalence of overweight and obesity was up to 14.81%, 13.33% respectively in 2010. 2) the higher risk age of overweight and obesity for Chinese girls and boys were pre-pubertal and pubertal periods. Overweight prevalence for 10-yr-old urban boys was 19.00%, and obesity prevalence for 11-yr-old urban boys was 18.13%. The prevalence of overweight and obesity for 12-yr-old urban girls was 14.07%, 9.34% respectively. 3) according to the annual growing rate of overweight and obesity prevalence, Chinese children and adolescents have been experienced the secular acceleration since 1985, the fastest growing was 1995 to 2000 for urban areas, and 2005~2010 for rural areas.

Discussion: overweight and obesity secular acceleration has brought significant influence on Chinese children and adolescents both urban and rural areas, which might be attributed to Chinese people's lifestyle changes in past 30 years, including social-economic status and nutrition improvement, accompany with insufficient healthy lifestyle knowledge and skills, including unreasonable diet structure and physical inactivity. Scientific and enough volume of exercise training in school physical education and after-school program should be encouraged. School health education should focus on establishment of health lifestyle belief and training of health skills.

406   Improving communication skills and exercise compliance in physiotherapy (CONNECT) trial: Examining intervention implementation fidelity

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Introduction: Low back pain (LBP) is a significant global health problem, second only to the common cold as a reason for work absences. Physical activity and exercise therapy are among the accepted LBP rehabilitation guidelines, but patient adherence is often poor. CONNECT is a communication skills training program, grounded in self-determination theory, designed to enhance physiotherapists' autonomy support in order to increase chronic LBP patients' adherence, thereby improving treatment outcomes. A cluster randomised controlled trial of CONNECT is underway. The purpose of the current study was to examine intervention implementation fidelity.

Methods: Two Dublin-area hospital clinics were randomly assigned to the experimental arm. Physiotherapists (n=12) received eight hours of communication skills training focused on 18 strategies organized into five categories (Ask, Advise, Assist, Agree, Arrange). Physiotherapists (n=12) from two other Dublin-area hospital clinics formed a waitlist control arm. Verbal communication between each physiotherapist and a patient was audio recorded during the patient's initial appointment. Independent, blinded raters used the Health Care Climate Questionnaire (HCCQ) to assess physiotherapists' autonomy support (primary outcome). Raters also assessed the physiotherapists' implementation of the 18 strategies taught during the training (secondary outcome). Finally, patients and physiotherapists independently completed the HCCQ after each session (secondary outcomes).

Results: Independent ratings of autonomy support (HCCQ) favored the experimental arm (p<.01, Cohen's d=2.28), as did independent ratings of the Ask, Advise, Agree, and Assist strategies (p<.01, d=.50 to 2.29). Ratings of Arrange strategies did not differ between the two arms (p=.75), perhaps because some Arrange behaviors were not audio recorded when experimental group physiotherapists left the treatment room with the patient to book the next appointment. Patients' ratings of physiotherapists' autonomy support tended to favor the experimental arm (p=.14, d=.63). Physiotherapists' ratings of their own behavior tended to favor the control arm (p=.07, d=.77), perhaps because experimental arm physiotherapists became more aware of the degree to which they were autonomy-supportive. Overall, physiotherapists' autonomy support ratings were higher than patients' autonomy support ratings (p<.01, d=1.64), which were higher than independent autonomy support ratings (p<.01, d=1.05).

Discussion: Physiotherapists who completed CONNECT were able to implement autonomy supportive communication strategies. Research is needed to examine long-term maintenance. Results from the main trial will determine the effects of CONNECT on patients' adherence and LBP outcomes.

407   Adherence to dietary patterns by physical activity level: 15 years old – Cohort 1993 – Pelotas/RS/Brazil

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Introduction: Studies have shown that eating habits established in childhood and adolescence are likely to track into adulthood. Furthermore, studies point to a clustering effect of healthy or unhealthy behaviors. Thus, it is important to assess behaviors related to diet and physical activity (PA) among adolescents. The present study aimed to assess adherence to dietary patterns (DP) according to PA level of adolescents at 15 years of age belonging to a cohort study in the city of Pelotas, Brazil.

Methods: In 1993 all hospital births in the city were monitored. Since then, several follow-ups were performed. In 2008, 82.5% were located from the original cohort (N=4349). The eating habits of adolescents were assessed using a food frequency questionnaire (FFQ–81 items). Principal component analysis (PCA) was used for the construction of DP, which consisted of 46 items (food groups). PA level was assessed using a validated questionnaire. Analyses were stratified by sex and adjusted for the educational level of the head of household, assets index, and nutritional status of adolescents.

Results: The study showed that those adolescents who ranked in the top tertile of PA, adhered to DP consisting of more fruits and vegetables as well as protein-rich foods, which was composed of all meats types, sandwiches or cheeseburgers, and barbeque than their less active counterparts. Those in the lower third tertile of PA exhibited higher adherence to the DP of the traditional Brazilian diet (rice, beans, coffee and sugar) and dairy products, chocolate milk powder, white bread and ham. After adjustment, boys more active during leisure-time had a higher prevalence of adherence to patterns of fruit and vegetable and proteins consumption. Girls more active during leisure-time showed a greater adherence to patterns of fruit and vegetable, protein, and sweet consumption.

Discussion: Adolescents who have positive behavior in relation to physical activity had a higher adherence to more healthy dietary patterns. Girls adhered to healthier patterns but also showed a strong adherence to patterns of sweet consumption. Findings of this study confirm the existence of the clustering of healthy behaviors during adolescence. Actions to increase physical activity and modify dietary patterns should occur early to establish healthy lifestyles.

408 Low intensity exercise may have no long term impact on VO$_2$peak and by extension cancer survival

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Introduction: No research to date has shown that cancer survivors who exercise at higher intensities will benefit more than exercising at lower intensities. While one would suppose this would be true, the matter is complicated due to treatment side effects, ability to adapt to exercise stimulus, and ability to exercise at higher intensities due to treatment side effects, especially cancer related fatigue.

Methods: The objective of this study was to examine VO$_2$peak at baseline, after an 8-week exercise intervention, and at 24 weeks, among breast and prostate cancer survivors randomized to either high intensity (75–80% VO$_2$peak) or low intensity (60–65% VO$_2$peak) exercise. A control group was tested at baseline and after 8 weeks. These results were generated while the project was still being undertaken, and provide partial results of the research. Specifically, the research was almost finished with the intervention phase, but had performed few follow up assessments.

Results: At baseline, the high intensity exercise group (HG, n=18) had an average VO$_2$peak of 23.2 mL/kg/min, the low intensity exercise group (LG, n=25) averaged 25.4 mL/kg/min, and the control group (CG, n=29) averaged 25.4 mL/kg/min (p=0.376). After 8 weeks, the HG (n=18), LG (n=23), and CG (n=11) had VO$_2$peaks of 25.0, 27.8, and 24.5 mL/kg/min, respectively (p=0.155). At the follow up, the HG (n=9) averaged 25.1 mL/kg/min while the LG (n=5) averaged 20.4 mL/kg/min (p=0.034). Analysis of pre to post intervention change, combined between the two intervention groups, indicated that participants trended toward but did not significantly improve their VO$_2$peak in 8 weeks (p=0.071). There was also no difference between groups at post test. However, at follow up, the HG had a significantly higher mean VO$_2$peak than the LG (p=0.011), with the LG significantly dropping by more than 7 mL/kg/min, or two METs, while the HG maintained their VO$_2$peak.

Discussion: Overall, these preliminary results indicate that while in the short term, there is no difference in benefit for breast and prostate cancer survivors between exercising at low versus high intensity, that over 6 months, those who exercise at a low intensity will end up with a significantly worse VO$_2$peak than those who exercise at a high intensity, by as much as two METs. Higher VO$_2$peaks have been linked to improved survival, and it is possible that a decrease in VO$_2$peak of the magnitudes seen in the follow up from this study may indicate 50% shorter, or worse, survival for those patients.

409 Staff and participant insights of group-based physical activity interventions for Type 2 Diabetes in a clinical practice setting

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Introduction: Physical activity is an important component of Type 2 Diabetes management. Group-based physical activity interventions have been shown to be effective. However, translation of research findings into clinical practice settings is challenging. Evaluating the experiences of both staff and participants can provide useful insight in relation to the development of effective service provision.

Methods: Investigation of this issue was undertaken as part of a larger systematic review of studies reporting implementation of physical activity interventions for Type 2 Diabetes in real-world rather than research settings. An extensive search of electronic databases and grey literature was performed to locate potential publications reporting aspects of implementation. Information relating to the views and opinions of staff and patient participation in group-based interventions was subsequently extracted and analysed.

Results: A total of 3237 articles were identified, of which 50 relevant full text articles were independently reviewed. Twelve articles were found to report aspects of implementation of physical activity interventions in real world settings, of which 4 reported insight from staff and participants via the use of focus groups, interviews and questionnaires. The main findings were: 1) Participants: the opportunity to share stories and ideas with peers was a common theme, in addition to feelings of 'not being alone'. Participants reported the group environment had a motivational influence towards adhering to their goals and welcomed the presence of the same member of staff delivering the interventions. 2) Staff: staff delivering the group sessions reported that participants responded to incentives (e.g. pedometers) and suggested the use of more hands-on practical activities. They also found the weekly overview content of sessions repetitive; however, this was not reflected in the participant view, as they welcomed the review from previous sessions to consolidate their knowledge. Success of the group intervention was perceived in their ability to provide participants with a sense of ownership in relation to their tasks and goals. Staff also reported that successful delivery was attributed to their ability to maintain group control, maintain a current knowledge of diabetes, and present an outgoing approachable personality to facilitate question and answer sessions.

Discussion: Participants and staff report group-based physical activity interventions play a positive role in physical activity behavior change, predominantly through peer-focused motivation and support. Clinical managers should facilitate the delivery of group-based interventions by providing ongoing support and training of skilled staff, the use of more hands-on activities, and continuity in staff delivery.

410 How hard is it? Physical activity and obesity: The patient's perspective

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Introduction: Medical practitioners are in an ideal position to provide physical activity advice to obese patients. However, little is known about how they provide this advice and how it is understood and acted on by their patients. Patient's knowledge and understanding of physical activity guidelines is also likely to influence their level of participation. The aim of this study was to explore obese patients' views of how physical activity advice is provided by their doctor and how they understand and act on it.

Methods: Purposive sampling and semi-structured interviewing was undertaken with 28 obese or formerly obese patients attending a medical practitioner for weight loss advice, lap band information or follow-up, or responding to advertising. Patients were interviewed about their experiences with their medical practitioner; and about their understanding of recommended guidelines and their actual participation in physical activity. Interviews ranged from 30 minutes to one hour and were audiotaped and transcribed. Data collection ended after the 28th interview when saturation was reached and no new themes emerged. The data were organised, coded and analysed using the qualitative software package QSR NUD*IST 6.0.

Results: Participants perceived their medical practitioner advice in relation to physical activity to be related to health benefits and could range from being vague to fairly detailed. Failure to refer on and lack of adequate follow-up of physical activity by their doctors were perceived as shortcomings, and were attributed by participants to a lack of time. Most participants understood the recommended levels of activity as described by Australian physical activity guidelines. Participants believed they could be fit and healthy despite being obese and that the impetus for being active came from within. They described their involvement in a range of levels and types of physical activity; and reported difficulty increasing or resuming physical activity. Barriers to physical activity included lack of time, family commitment and stigmatisation.

Discussion: With an increasing obese and sedentary population, medical practitioners are in an ideal position to provide advice and supportive encouragement about the benefits of physical activity. Practitioners need to understand the physical difficulties and barriers facing obese people in becoming more active and recognise the increased level of support that may be required. Increased and appropriate referral would transfer follow-up to an appropriate alternative professional and allow the medical practitioner to focus on the medical problem.

411 Physical activity amongst people with chronic back pain: An investigation of perceived barriers and facilitators to inform intervention development

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Introduction: Previous research has indicated people with non-specific low back pain who are physically inactive face a poorer prognosis than people with back pain who participate in low or moderate intensity physical activity. They also face a greater risk of other lifestyle related health conditions, such as diabetes and heart disease. For these reasons, contemporary non-surgical interventions for low back pain aim to incorporate a return to physical activity. However, there is a lack of empirical evidence supporting physical activity interventions for this purpose. It is likely that people with low back pain face additional challenges when trying to commence (or return to) regular physical activity. This exploratory qualitative research aimed to map out perceived barriers and facilitators to undertaking physical activity among people with non-specific low back pain to inform future intervention development.

Methods: A convenience sample of patients with non-specific low back pain (n=84) receiving physiotherapy or multidisciplinary conservative treatment at a tertiary hospital facility completed a qualitative survey. Patients were prompted to list barriers in their life that make it "more difficult to be physically active" and things facilitators that make it "easier to be physically active." Thematic analysis of responses was undertaken.

Each phrase was coded and arranged into categories. Categories were aligned under emerging themes by two independent researchers. A third researcher was available to arbitrate any disagreement but was not required.

Results: All participants (n=84) completed the survey. There were eight emerging barrier themes: Existing Health Conditions, Pain, Time, Function Impairment, Emotions & Cognitions, Environment & Access and Social Support. The number of categories within each barrier theme ranged from two to thirteen. Eight facilitator themes were identified: Better Health, Being Active, Social Support, Environment and Access, Opportunities in Daily Living, Pain Relief, Emotions & Cognitions and Time. The number of categories within each theme ranged from three to six.

Discussion: A wide range of perceived barriers and facilitators to physical activity were reported by people with back pain. Some themes, such as Time restrictions and Environment & Access, are consistent with prior research among the general population. However, other themes, such as Pain and Function Impairment, highlight additional challenges faced by people with back pain. Interventions to increase physical activity levels amongst people with back pain should address these perceived barriers. Facilitators identified in this study also provide a useful point of reference for physical activity intervention development for this clinical population.

412 The relationship of body composition with physical fitness in the 14 years adolescents residing within the Tlokwe Local Municipality, South Africa: The PAHL-Study

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Background: Little is known about the relationship of body composition with physical fitness in the 14 years high school adolescents residing within the Tlokwe Local Municipality of South Africa. The objectives of this study are therefore in twofold: to determine the prevalence of underweight, normal weight and overweight among adolescents aged 14 years old in the Tlokwe Local Municipality of North West province of South Africa, and to assess the association between physical fitness and body composition separately for boys and girls adjusted for race and locality.

Methods: Baseline data within the 5 years longitudinal study consisted of 256 (100 boys and 156 girls) adolescents aged 14 years was used in the study. Body weight, height and skinfolds were measured according to the standard procedure of International Society for the Advancement of Kinanthropometry, and percentage body fat and body mass index (BMI) was calculated. BMI was used to determine underweight, normal weight and overweight. Standing broad jump, bent arm hang and sit-ups were assessed according to the EUROFIT fitness standard procedures. Multinomial logistic regression analyses stratified for gender and adjusted for race (black or white), and the locality (urban or township) of the schools analyzed the data.

Results: The prevalence of underweight was 35.9% and overweight was 13.7% for the total group sample. When data was analyzed for separately by gender, underweight was 44% in boys and 30.7% in girls, whilst the prevalence of overweight was 8% in boys and 17.3% in girls. Strong and significant positive associations between physical fitness and BMI for the underweight girls with high physical fitness scores (OR, 10.69 [95% CI: 2.81–40.73], and overweight girls with high physical fitness scores (OR, 0.11 [95% CI: 0.03–0.50]) were found. Whilst, non-significant weaker positive relationship between physical fitness and BMI for the underweight boys with the high physical fitness scores (OR, 1.80 [95% CI: 0.63–5.09]), and the overweight boys with high physical fitness scores (OR, 0.18 [95% CI: 0.02–1.78]) were found.

Conclusion: In our study of 14 years adolescents residing within the Tlokwe Local Municipality the coexistent of both underweight and overweight exist. Additionally, a strong relationship between body composition and physical fitness in overweight girls was found. A similar but much weaker relationship was observed in boys. It is important to note that the overweight adolescents performed poor in physical fitness. As such strategic intervention plans are urgently required so as to address the problems revealed in this study.

413   Influence of body fat and physical activity on rate-pressure product at rest in pre-school children

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Introduction: The rate pressure product (RPP) has strong correlation with the maximal oxygen consumption and is an indicator of myocardium stress being considered as the best indirect method to measure myocardial oxygen consumption. However, to the best of our knowledge, no studies have addressed in preschool children. The aim of this study was to analyze the influence of Body Fat (%BF) and Physical Activity (PA) patterns on Rate-Pressure Product at Rest (RPPrest) as a marker of cardiac load in Pre-School Children.

Methods: The study comprised 593 preschool children aged 3–6 years-old. Heart rate (HR), systolic (SBP) and diastolic (DBP) blood pressure were taken at rest. The RPP was then calculated. The %BF was estimated from four skinfolds thicknesses and PA was assessed during 7 consecutive days by accelerometry.

Results: Our data showed that only %BF ($p \leq 0.001$) and Vigorous PA ($p \leq 0.05$) contributed significantly towards RPPrest variation. However, the multivariate analysis showed that only %BF ($p \leq 0.05$) had a significant influence on RPPrest variation. These findings suggest that on pre-schoolers there is an association between rate pressure product at rest and body fat percentage.

414   Development of physical activity components for a peer delivered intervention to reduce obesity: Team up for healthy living

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Introduction: Health risk behaviors including unhealthy eating and physical inactivity are often established during adolescence and contribute to the development of obesity. Although adolescent obesity is an urgent public health issue, effective interventions are limited. Team Up for Healthy Living is a cluster-randomized trial utilizing an academia-community partnership approach using college students as peer facilitators to prevent obesity among adolescents. The current study describes the development of the Team Up for Healthy Living curriculum with emphasis on the physical activity components.

Methods: Six months prior to delivering the intervention, a multidisciplinary team of researchers/investigators representing the fields of Kinesiology, Medicine, Nutrition, Psychology, and Public Health began to dissect and refine a curriculum that had been pilot tested and described in a grant funded research proposal. Of interest to the current study was the need to develop more tailored and structured physical activity components with the latest evidence supported tools. The methodology for modifying and refining these intervention components included regular team meetings, incorporation of content based on reviews of the literature and latest evidence supported tools. Feedback from peer facilitators after participating in didactics and activities lead by investigators was attained.

Results: The combination of efforts resulted in a modified and refined 8-week curriculum including two sessions on physical activity: Small Steps Count and Active Living. These weekly sessions introduced guidelines and types of physical activities; fitness principles; and taught self-monitoring of active and inactive behaviors. Goal-setting was a major emphasis. Included in the sessions were activities utilizing pedometers and strength bands.

Discussion: The intervention is currently being successfully delivered and the research team continues to have weekly debriefing and intervention development meetings to better refine this approach for year two of the program. This program may meet the critical community needs for adolescent obesity prevention by engaging higher education institutions and students in service, and fostering within them an ethic of civic responsibility.

The program may be easily transferable from research to action without substantial additional resources and will be a sustainable win-win program for both the community and the academy.

415 Comparison of academic and behavioural performance between athletes and non-athletes

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The Toronto Charter for Physical Activity (2010) and several national physical activity plans advocate sports participation as an important part of population targeted physical activity for youth. Emerging research evidence also suggests that sport participation in youth is linked to significant positive correlations with academic and behavioural performance. The purpose of this study was to compare academic and behavioural performance between male and female public school athletes (Total N=11,139; 38% Female) and non-athletes (Total N=23,891; 52% Female) in a convenient, ethnicity diverse, sample (grades 7–12) from the state of Texas (USA).

Methods: We examined the passing rates of individual athletes and non-athletes on standardized tests (Texas Essential Knowledge and Skills, TEKS) for math, language arts, reading, writing, science, and social studies. We also examined the percentage of athletes and non-athletes for being "at risk," for dropping out of school and for the total average number of disciplinary actions. All data were collected from Texas school districts (N=7) with the help of leaders from the Texas High School Coaches Association (THSCA). Institutional Review Board approval from Texas State University for human subjects research was acquired prior to data analyses.

Results: It was estimated that athletes were physically active at moderate- to vigorous- intensities for a minimum of 8 hours per week (state practice rule limitations) and that they were more physically active than non-athletes. Assumptions were based on the Centers for Disease Control and Prevention (CDC) Youth Behaviour Risk Surveillance System (YRBS) 2009 data for high school youth in Texas, which showed that 41.2% did not play on sports teams, and only 53.4% were active at least 60 minutes per day for less than 5 days. Chi-Square statistical analyses comparing athletes to non-athletes showed that athletes scored significantly better ($p < 0.05$) on all standardized tests compared to non-athletes (passing rate ranges ranged from 77.1% to 92.9% versus 27.7% to 66.5% respectively). Athletes were at lower risk for dropout compared to non-athletes (35.6% versus 49.24%; $p < 0.05$), and they had fewer disciplinary actions (mean of 0.85 per athletes per year versus 1.23 for non-athletes; $p < 0.05$).

Discussion: Our results support the research findings of others that participation in school sports is positively correlated to better academic and behavioural performances for athletes compared to non-athletes. Further studies are warranted to determine if there are causal associations between academic and behavioural performances between athletes and non-athletes.

416 Perceived influence of power shortage and release of radiation caused by the Great East Japan Earthquake on physical activity participation

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Introduction: The ecological model assumes that physical activity is influenced by not only personal factors but also by multi-level environmental factors. The Great East Japan Earthquake caused the power shortage and release of radiation in vast area of Japan, which might influence physical activity participation among Japanese people. The purpose of this study was to investigate the perceived influences of the power shortage and release of radiation on physical activity participation.

Methods: An Internet-based survey was conducted to 10,444 Japanese people (20–69 years old) during 11 to 18 September 2011. Among them, 2,400 individuals (23.0%) answered the survey. We asked respondents whether the power shortage and the release of radiation influenced on their participations in physical activity by 4 choices (not influenced; little influenced; somewhat influenced; strongly influenced). Also, those who chose somewhat or strongly influenced were asked to answer perceived changes in 4 types of physical activities (usages of steps and bicycle; household and occupational activities; walking behaviors; exercise and sports opportunities) by 4 choices (very increased; slightly increased; slightly decreased; very decreased) respectively.

Results: Among respondents, 19.1% of them answered that their physical activity participations were somewhat or strongly influenced by the power shortage and the release of radiation. Regarding the perceived changes caused by the release of radiation, the rates of those who answered "decreased" (slightly or very) were higher than those who answered "increased" in all types of activities (59.3% [95% CI: 54.8 to 63.8] answered "decreased" in usages of steps and bicycle; 64.1% [95% CI: 59.7 to 68.5] in household and occupational activities; 71.9% [95% CI: 67.8 to 76.0] in walking behaviors; 82.6% [95% CI: 79.1 to 86.1] in exercise and sports opportunities). Regarding the changes caused by the power shortage, 69.3% (95% CI: 65.1 to 73.5) of them answered that their usage of stair and bicycle were increased, and 55.5% (95% CI: 51.0 to 60.0) answered that their household and occupational activities were increased by power shortage, while the majority (75.6% [95% CI: 71.7 to 79.5]) answered their exercise and sports opportunities were decreased.

Discussion: These results suggest a possibility that the power shortage might raise perceived importance of environmental sustainability and motivates people to engage in such types of physical activities, while the release of radiation would negatively influence on physical activity participation.

417 Exercise for health and fitness

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Introduction: The evidence assembled to show exercise and physical activity is good for health is extensive and expanding. There is now irrefutable substantiation of the exercise-derived physiological adaptations that lead to improved fitness, performance, quality of life and life expectancy.

Methods: We gathered information to detail the breadth and quality of published evidence on the effects of exercise for health and performance. The evidence was restricted to meta-analyses, systematic reviews, randomised control trials and longitudinal cohort studies. The data were categorised, using a biological systems approach, into acute and chronic adaptations. The benefits ranged from whole body performance measures to sub-cellular adaptations that were linked to health and performance enhancements. Exercise-related benefits for clinical and special populations were also identified.

Results: To date we include over 200 specific adaptations involving every system.

Discussion: It is paradoxical that as life expectancy increases in most countries chronic illness is also rapidly rising. However, this is manifest as a growing divide between healthy years of life and overall life expectancy. This situation is problematic because of the expense of care, the growing ageing population and the corresponding reduction in the proportion of carers. Much of the life expectancy gain can be explained by the growing reliance on pharmaceutical and surgical health care treatments typically targeting one system or risk factor. While these treatments are important

the growth in these health care approaches is unsustainable. This study reinforces the importance for health professionals to educate the general population, media, and policy makers about the enormous range of benefits derived from exercise per se. Equally, it is important to promote the fact the range of benefits cannot be replicated through artificial methods that typically focus on a narrow physiological target.

418   Leisure time physical activity levels and prevalence of associated diseases in adults of Rio Claro City – SP – Brazil

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Introduction: Many studies support the evidence that physically active lifestyle has a lower risk of developing heart disease, diabetes, obesity and some cancers. However, for health benefits must be performed a minimum of physical activity (PA). Several organizations recommend the accumulation of 150 minutes of PA per week. The aim of this study was to analyse the distribution of the PA according to disease prevalence and to determine risk of diseases related to physical inactivity, age and gender.

Methods: the study design was cross-sectional population-based. The target population are adults (20 years or older and of both genders) of Rio Claro City – state of Sao Paulo – Brazil. The study included 1373 adults, 791 women and 582 men aged 45.1 ± 17 years. The level of habitual PA was evaluated through the long version of the International Physical Activity Questionnaire (IPAQ). For dichotomous classification on the usual level of leisure PA (active and inactive), the time spent in minutes in each component was summed and then the sum total by the equation {moderate PA +(2x vigorous PA)}. Individuals were classified as active (≥150 min/wk) and sedentary (<150 min/wk) in leisure time. To survey the prevalence of diseases, a questionnaire was designed enumerating several diseases. It was emphasized to participants that would be considered if the disease was diagnosed by a doctor or health professional. Age and gender were also studied. Statistical analysis was performed Binomial Logistic Regression Forward Stepwise Ward (SPSS 13.0). In all tests we adopted a significance level of $p < 0.05$.

Results and discussion: The inactive lifestyle in leisure time had larger prevalence and higher disease risk than people who are physically active mainly for diseases: hypertension (OR=1.56, CI=1.17–2.08), rheumatic disease (OR=1.51, CI=1.02–2.23), heart disease (OR=2.03, CI=1.21–3.04), osteoporosis (OR=1.80, CI=1.02–3.185). The risk of disease increases from 40 years of age (OR=3.23, CI=1.80 to 5.81) and the male has a higher risk (OR=1.70, CI=1.27–2.28) for disease compared with women. These results show that a physically inactive lifestyle and the aging process are associated with several chronic diseases mainly in males. Public politics are needed to encourage the population to increase the recommended time physical activity during leisure time.

419   Cardiovascular risk factors in relation to leisure-time physical activity and fruit-vegetable consumption

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Introduction: While there are many studies regarding lifestyle in youth, little is known about the lifestyle during the university period. The purpose of this study was to determine the relationships between different cardiovascular risk factors and both physical activity and fruit-vegetable consumption.

Methods: A descriptive cross-sectional study was carried out in a sample of 210 female nursing students with a mean age of 22 years. Two indicators of lifestyle were analyzed through self-administered questionnaire: leisure-time physical activity (GPAQ; Global Physical Activity Questionnaire) and fruit-vegetable consumption. Four cardiovascular risk factors were measured: body mass index (BMI), percentage of fat mass (bioelectrical impedance analysis), visceral fatness (waist-to-hip ratio) and blood pressure.

Results: Both systolic and diastolic blood pressure were significantly lower ($p<0.05$) in active students (>600 MET·min/week) in comparison to insufficiently active students (<600 MET). Regarding fruit-vegetable consumption, those students who reported to consume ≥5 portions per day of fruits and vegetables showed significantly lower BMI and, systolic and diastolic blood pressure ($p<0.05$). No significant differences were observed in body fat measures taking into account physical activity and fruit-vegetable consumption.

Discussion: These findings suggest that strategies to reduce cardiovascular risk among university students should be based on increasing physical activity levels and fruit-vegetable consumption.

420   Objectively measured physical activity and body composition indices in Brazilian adolescents

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Introduction: Adolescent obesity has increased not only in developed societies, but also in some low- and middle-income countries. The aim of the study was to explore the association between objectively measured physical activity and body composition indices in 13-year old adolescents living in Brazil, a country undergoing rapid nutritional transition.

Methods: A population-based cross-sectional study nested within the 1993 Pelotas (Brazil) Birth Cohort was undertaken. A total of 457 boys and girls (80.5% of the target sample, 52.1% boys) participated in the study. Physical activity was measured by the GT1M Actigraph accelerometer for 5 consecutive days and expressed as total physical activity (i.e. average intensity, counts per minute) and time (min per day) spent at moderate and vigorous intensity activity. The outcomes investigated were sum of triceps and subscapular skinfolds, waist circumference, waist-to-hip ratio and waist-to-thigh ratio.

Results: After adjustment for sex, socioeconomic status, age, Tanner stage of sexual maturation, diet pattern, height, and birth weight, time (min/day) spent at vigorous intensity activity was inversely associated with waist circumference and sum of skinfolds. A one minute increase in vigorous intensity physical activity was associated with a reduction of 0.15cm in waist circumference (p=0.007) and 0.20mm in sum of skinfold thicknesses (p=0.02). Total activity and time spent in moderate intensity physical activities were not associated with any of the outcomes in the adjusted analyses.

Discussion: Our data showed an inverse association between vigorous intensity activity and waist circumference and sum of skinfolds thicknesses which persisted after adjustment for several potential confounders. Total activity and time spent in MPA were not associated with any of the outcomes in the adjusted analyses. The 1993 Pelotas (Brazil) Cohort is an ongoing study that constitutes a distinctive opportunity to investigate several research questions in a middle-income setting. In future follow-up visits of the same cohort, we plan to collect the same physical activity data and other anthropometric variables. This will allow us to explore the longitudinal association between physical activity measured by accelerometers in early and mid-adolescence and body composition indices to be collected in late adolescence and early adulthood.

421 The influence of physical activity and sitting time on health and quality of life: Results from The 45 and Up Study

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Introduction: Previous studies have shown that physical activity (PA) levels and sitting time (SIT) independently contribute to chronic disease morbidity and mortality risk. Little work, however, has focused on PA and SIT for promotion of positive health outcomes (versus disease prevention). The purpose of this study was to determine associations between the exposures of moderate-to-vigorous PA and SIT and outcomes of excellent health (ExH) and excellent quality of life (ExQoL) in Australian middle-aged and older adults.

Methods: The 45 and Up Study is a large prospective cohort study of 266,848 individuals from across New South Wales, the most populous state in Australia. Present analyses are from 156,106 participants (51% male; aged 61±10.5 yrs) who provided complete self-reported baseline questionnaire data, obtained between February 2006 and December 2008. The Active Australia survey was used to assess the PA components of walking, other moderate PA, and vigorous PA. SIT was determined by asking participants to indicate how many hours in each 24-hour period were usually spent sitting. Participants rated separately their overall health and quality of life, using a five-point scale (excellent to poor). Logistic regression models were used to analyze predictive influence of PA and SIT on ExH and ExQoL, controlling for categories of education level, income, age group, sex, weight status, marital status, number of chronic diseases, functional limitation, standing time, smoking history, residential remoteness, and residential economic advantage.

Results: Nearly 17% of this sample reported having ExH, and 25% reported having ExQoL. In fully adjusted models, PA was positively associated with ExH (AOR=adjusted odds ratio for highest versus lowest quartile=2.17, 95% CI=2.07, 2.27; P_{trend}<0.001) and ExQoL (AOR for highest versus lowest quartile=1.82, 95% CI=1.75, 1.89; P_{trend}<0.001). In fully adjusted models, SIT was inversely associated with ExH (AOR for highest versus lowest quartile=0.85, 95% CI=0.79, 0.90; P_{trend}<0.001) and ExQoL (AOR for highest versus lowest quartile=0.89, 95% CI=0.84, 0.94; P_{trend}<0.001).

Discussion: PA and SIT independently showed clear dose-response patterns of influence on excellent health and quality of life, when controlling for other key behavioral and environmental influences. These findings bolster evidence to inform health promotion efforts to increase PA and decrease SIT. Future prospective analyses from The 45 and Up Study should investigate the influence of PA and SIT on these important health-related outcomes over time.

422 Determinants of body weight and body composition in young adults

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Introduction: Despite considerable examinations of the topic, the determinants of body weight and body composition are imprecisely known. Specifically, the role of total energy expenditure (TEE), physical activity level (PAL), and resting metabolic rate (RMR) on body weight status and composition in the literature is highly variable and inconsistent. The purpose of this analysis is to determine the relationship between TEE, PAL, and RMR on body weight and body composition in young adults.

Methods: TEE was assessed using an arm-based physical activity monitor worn at all times for 10 consecutive days. RMR was measured using a ventilated hood system. Participants arrived fasted for at least 12 hrs and having refrained from alcohol or exercise for at least 24 hrs. Participants rested in a supine position under a ventilated hood for 30 minutes, followed by a 30 minute RMR gas collection period. PAL, a method used to express TEE relative to RMR, was calculated as PAL=TEE/RMR. Body weight (BW) and height were measured and body fat (BF) was calculated as the percentage of total weight identified as fat tissue by dual x-ray absorptiometry (DXA).

Results: 200 healthy adults (85 males and 115 females; mean age±standard deviation 26±4 years) participated in the study. The mean BMI for the sample was 25.2 (no significant difference between sexes) with a mean percent BF of 28.3 (men: 19.9±8.6; women: 34.5±7.6). RMR ranged from 0.13 to 0.32 L/min resulting in a mean relative RMR of 3.01±0.4 ml/kg/min (men: 3.09±0.3; women: 2.96±0.4). Activity monitor compliance was excellent, with a mean wear-time of 9.9 days and 23.2 hours/day. The mean TEE was 2704±498 (men: 3112±400; women: 2405±318) and mean PAL was 1.72±0.19 (men: 1.77±0.19; women: 1.68±0.19). Separate multivariate models were created for males, females, and combined sexes to predict both body weight and body fat. The final model for the combined cohort included TEE, PAL, and RMR and explained 96.8% of body weight, and sex, TEE, PAL, and RMR explained 72.4% of body fat. The results were similar in the separate analyses for men and women, though TEE was not statistically significant in the model for body fat for either sex.

Discussion: The results of this study suggest TEE is not predictive of BF in a cohort of young adults. The findings also emphasize the role of RMR on body weight status and body composition. Future research examining the intensity of physical activity rather than total energy expended should be conducted.

423 What factors are associated with physical activity participation and sedentary behaviour among post-treatment breast cancer survivors?

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Introduction: Breast cancer survivors are at an increased risk of ill health compared to the non cancer population and many are burdened by late effects of treatment. Regular physical activity (PA) can help to negate this risk and improve the quality of life of breast cancer survivors. Effective PA programs that are based on sound behavioural theory and address the key determinants of PA adoption and maintenance among breast cancer survivors are needed. This study aims to explore possible determinants of PA among breast cancer survivors to help inform future intervention research.

Method: Cross-sectional data were obtained from 327 post treatment breast cancer survivors participating in the Australian Move More for Life study. Interactions between demographic, social cognitive theory (SCT), health status and environmental factors on physical activity (self-reported aerobic and resistance activity and step counts) and sedentary behaviour (self-reported sitting time) were analysed with multilevel regression modelling.

Results: Key demographic, SCT, health status and environmental factors associated with PA and sedentary behaviour were identified.
Discussion: This study provides much needed data on the possible determinants of PA and sedentary behaviour among breast cancer survivors. Furthermore, it is one of the first to explore factors associated with resistance training and sedentary behaviour among this population. Implications for theory-based interventions are discussed.

424 The efficacy of two theoretically-based print interventions for promoting PA behaviour among post-treatment breast cancer survivors: A nationally-based 3-arm RCT

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Introduction: Despite the known benefits of physical activity (PA) for cancer recovery, the majority of breast cancer survivors are inactive. To overcome this, there is a need for supportive care interventions that provide PA advice beyond the treatment phase in a cost-effective and sustainable way. These interventions should be theory-based and address the unique determinants of PA behaviour in this group. This study aims to assess the relative efficacy of two promising theory-based, print interventions (tailored and targeted-print) designed to promote regular PA amongst breast cancer survivors.
Method: 327 breast cancer survivors were recruited from across Australia. Participants were randomised into one of three groups: 1) A tailored-print intervention group, 2) a targeted-print intervention group, or 3) a standard recommendation control group. Participants in the tailored-print intervention group recieved 3 tailored newsletters computed specifically for them based on previous assessments in the mail over a three month period. Participants in the targeted-print group received a previously developed physical activity guidebook designed specifically for breast cancer survivors immediately after baseline. Participants in the standard recommendation control received a brochure detailing the physical activity guidelines for Australian adults. All participants were assessed at baseline, and at 4 months post-baseline (i.e. 1 month after intervention). Intervention efficacy for changing the primary outcomes (mins/wk aerobic PA; sessions/exercises per week resistance PA) and secondary outcomes (steps per day, health-related quality life, compliance with PA guidelines, fatigue) were assessed using ANCOVA. Participants will also be assessed at 10-months post-baseline (i.e. 7-month post-intervention follow-up).
Results: The four month follow-up data is currently being collected. Based on predictions of the Elaboration Likelihood Model, which proposes that more personalized information will be more likely to be processed in a way conducive to behavior change, we expect that participants in the tailored-print group will experience significantly greater improvements across all primary and secondary outcomes compared to participants in the targeted-print and standard recommendation control group.
Discussion: This study addresses a seminal research question in distance-based supportive care – is tailoring or targeting health education messages a more efficacious approach to health behaviour change in the PA domain? Furthermore, this study will be one of the first to promote a pattern of PA that addresses the advantages of completing both aerobic and resistance-training exercises and the metabolic consequences of unbroken sedentary behaviours in this population. The limitations reported in previous research will be addressed by examining adherence after the intervention period and by utilising an objective measure of PA behaviour (i.e. pedometers).

425 Acceptability of a text message-delivered physical activity and dietary behavior change intervention in breast cancer survivors

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Introduction: A growing body of evidence supports the efficacy of mobile phone text messaging as a broad-reach intervention delivery modality for promoting health behavior change. However, applications among breast cancer survivors, who have much to gain from engaging in physical activity and following a healthy diet, have yet to be evaluated. The aim of this study was to establish the acceptability of text messaging to support physical activity and dietary behavior change in breast cancer survivors.
Methods: In a qualitative pilot study design, eight breast cancer survivors: 1) completed a telephone interview to set physical activity and diet goals, and nominated preferences for the content, frequency, and timing of messages; 2) received individually tailored text messages for a period of two weeks; and 3) participated in a face-to-face or telephone feedback interview. Participants received five different types of text messages that aligned with evidence-based behavior change constructs and strategies. These messages aimed to: 1) prompt a planned behavior; 2) reinforce problem solving skills; 3) provide general encouragement; 4) check on goal attainment; or 5) provide tailored feedback based on goal attainment. Acceptability was determined via thematic analysis of the feedback interview data which examined common themes among participants' experiences of receiving the text messages, including likes and dislikes, and the type of messages most supportive of behavior change.
Results: Median age of participants was 49 years (IQR=39–58.25 years). Most women opted to receive one or two messages per day for one or both behaviors (median=18 texts per fortnight; IQR=11–25 texts per fortnight). Participants liked the ability to individually tailor the content, frequency, and timing of messages. The majority of women reported that the two types of messages that were most supportive of behavior change were ones that 'prompted a planned behavior' and 'provided feedback on goal attainment'. Providing relatively immediate feedback in response to goal attainment was reported to be very important in maintaining program credibility, participant accountability, and counselor-participant rapport.
Discussion: The outcomes of this research suggest text messaging is an acceptable intervention delivery modality to support physical activity and dietary behavior change in breast cancer survivors. The findings from this study provided clear guidance for the development of a larger text message-delivered intervention to be evaluated in a randomized trial.

426   Acceptability of home-based resistance training for cancer survivors

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Introduction: Resistance training (RT) is recommended in physical activity guidelines for cancer survivors. Trials of RT in cancer survivors have mostly been supervised, structured programs, conducted at gyms or hospitals. Little is known about the acceptability of unsupervised, home-based RT for cancer survivors. This paper describes the acceptability and feasibility (adherence, safety) of using elastic resistance devices (i.e. Gymsticks).
Methods: Data are drawn from two home-based RT programs for cancer survivors. The ENRICH (Exercise and Nutrition Routine Improving Cancer Health) program is a supervised, 6 session face-to-face healthy eating, physical activity, and RT program for survivors of any cancer type and their carers (n=100). Participants progress from the supervised sessions to completing a home-based program. Get PHITT (Prostate Health Improved Through Training) is a 12 week, home-based RT program for men with prostate cancer (n=39). Participants (ENRICH n=100; Get PHITT n=18 respectively) provided acceptability questionnaire data and self-report recall of falls/injuries at the end of each program. Get PHITT RT log books (n=18) were analyzed to assess program adherence.
Results: ENRICH intervention participants reported increases in the frequency (mean 1.0 sessions/week) and duration (mean 20 minutes/week) of RT at the end of the intervention. Compliance with the Get PHITT program was high with 61% of participants meeting the program goals, during the course of the intervention, of 5 exercises per session, 3 sessions per week. No participants in either study reported sustaining injuries or adverse effects during the activity sessions or assessments. Retention was high for Get PHITT (90%) and lower for ENRICH (75%), although this was related to scheduling challenges and cancer recurrence rather than a lack of program acceptability. The majority of participants in both studies enjoyed using the Gymstick (83% ENRICH; 72% Get PHITT) reported that the program was relevant (93%; 83% respectively), and that they would recommend the program to other cancer survivors (93%; 100% respectively).
Discussion: Participants in both interventions were able to safely perform unsupervised RT at home. High levels of acceptability and program adherence indicate the potential for exploring the efficacy of home-based RT programs in cancer survivors using Gymsticks. The Gymstick allows RT to be tailored to cancer survivors of varying ability and strength, without the need for specialized gym equipment.

427   Knowing is half the battle: Heart health and exercise knowledge protect against mortality

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Background: Higher levels of heart health knowledge relate to greater use of preventive services, improved quality in chronic disease self-management, and overall better health. However, it is unknown if heart health knowledge will, in turn, relate to lower mortality risk. This study examined the relationship between heart health knowledge, particularly the benefits of exercise, and the risk of all-cause and cardiovascular disease (CVD) mortality in Canadian adults.
Methods: The sample included 11,219 adults (18–74 y) from the Canadian Heart Health Surveys (1986–95). In an interviewer-administered questionnaire, participants were asked to list the major causes of heart disease or heart problems. Participant responses were categorized as: lack of exercise; arteriosclerosis; dietary (poor diet, foods with high cholesterol, excess fats, or excess salt); hereditary; high blood cholesterol; high blood pressure; overweight; overwork or fatigue; smoking; stress or worry; or do not know. Mortality linkage was conducted using the Canadian Mortality Database. Cox proportional hazard regression models were used to estimate relative risks of all-cause and CVD mortality. Each model included a response category as the independent variable, controlling for age, sex, body mass index, history of high blood cholesterol, history of high blood pressure, examination year, exercise (≥1x/week), alcohol use, smoking status, and educational attainment.
Results: There were 1174 deaths (410 CVD) over 13.3 (range 0.5–16.0) years of follow-up. Participants who listed "lack of exercise" as a major cause of heart disease or heart problems had significantly lower all-cause mortality risk (hazard ratio, 95% CI: 0.62, 0.48–0.81) and lower CVD (0.57, 0.40–0.82) mortality risk than those who did not. Those who did not report any cause had a significantly higher all-cause mortality risk (1.22, 1.01–1.47) than those who indicated even a minimal level of heart health knowledge. No other response categories were significantly related to mortality.
Conclusion: Knowing that lack of exercise can cause heart disease was associated with a lower risk of all-cause and CVD mortality, even when current exercise, body mass index, health history, health behaviors, education, and demographic characteristics were included as covariates. In contrast, not knowing any causes of heart disease was related to an increased risk of mortality. Future research should investigate lifestyle behaviors and management of care as potential mediators between health knowledge and mortality.

428   Associations between vigorous intensity physical activity and sleep quality outcomes in regularly active adults

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Introduction: A positive relationship between physical activity and sleep outcomes has been demonstrated in epidemiological studies, although most findings refer to moderate to light intensity activity. Fewer data are available for vigorous physical activity, and studies in elite sportspeople suggest that high intensity training may be associated with greater sleep disturbance. This study investigates the association between regular vigorous intensity physical activity and sleep quality in non-elite active adults.
Method: Cross-sectional data were collected from 3654 participants (51.1% male) with a mean age of 43.9±10.9 years and a mean BMI of 24.0±3.3, who reported regular (at least once per week) physical activity of vigorous intensity. Instruments completed were the International Physical Activity Questionnaire (IPAQ) short form and the Pittsburgh Sleep Quality Inventory (PSQI).

Results: A total of 1146 (31.4%) participants met criteria for poor sleep quality (PSQI global score of >5). This proportion was not significantly different for those vigorously active 1–2 times per week (32.8%), 3–4 times per week (31.7%), or 5–7 times per week (29.5%) [$\chi2$=2.499; df=3; p=0.29]. Furthermore, proportions of poor sleepers were similar for participants performing a total volume of weekly vigorous activity of <90 minutes (33.2%), 90–179 minutes (32.7%), 180–239 minutes (31.2%), and ≥240 minutes (29.2%) [$\chi2$=4.517; df=3; p=0.21]. Of the individual sleep outcomes assessed by the PSQI, only daytime dysfunction showed a significant association with vigorous intensity activity, whereby greater frequency (p=0.001) and weekly volume (p=0.001) of vigorously intense activity were negatively associated with difficulty staying awake during daytime activities.

Discussion: Data from regularly active adults suggest no negative association between frequency or volume of vigorous intensity physical activity and sleep quality. The finding that greater volume and frequency of vigorous activity is associated with lower reports of daytime dysfunction warrants further investigation, given the potentially serious consequences of this symptom.

429 High-risk individuals' perspective on risk of Type 2 Diabetes and physical activity in the prevention of diabetes. A qualitative study

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Introduction: Screening of type 2 diabetes provides a valuable opportunity for people at risk of diabetes to re-evaluate their current lifestyle and conduct modifications to prevent diabetes. It has been suggested that risk perception predicts protective behaviour. However, the evidence with regard to risk perceptions of type 2 diabetes and behaviour change is limited. The awareness of the actual risk status is often poorly reported, although it's relevance to the risk perceptions. This qualitative study was conducted to understand the risk perceptions and perspectives on physical activity behaviour change of individuals aware of having a high risk for type 2 diabetes.

Methods: We recruited participants of a community-based lifestyle intervention within a large diabetes prevention programme in primary health care (FIN-D2D) to participate in semi-structured individual interviews. Fourteen participants with a wide age-range (37–64 years) completed an interview in the beginning (2006) and after (2008) the intervention. The risk status of the participants was verified with the oral glucose tolerance test within the intervention. A total of 28 interviews were analysed using inductive content analysis.

Results: Two major themes of risk experience were drawn from the data; the risk was perceived as a serious threat or the risk was rejected by the person. Perceiving the risk as a serious threat was based on unexpectedness of the identified risk factors and belonging to the risk-group. It was also described by the increased awareness. The risk caused these people anxiety and disappointment. Nevertheless, hope was strongly present among those who perceived the risk as a serious threat. Rejecting was based on scepticism toward the existing risk. In addition, these individuals were not touched by the risk for various reasons, nor did they perceive the risk as an urgent issue. Furthermore, their descriptions revealed the importance of defending one's current identity. Participants in general viewed physical activity positively. However, the 'rejecters' failed with their attempts to increase their physical activity, and expressed the need for external prompts whereas the others often described successful behaviour change, emphasising the role of everyday physical activities. Maintenance was achieved through incremental progression.

Discussion: Present findings indicate that without realising the seriousness of the risk of diabetes, increased physical activity levels among the high risk population seem unlikely. Understanding the factors that individuals' risk perceptions are based on is ethically important. Furthermore, it helps the development of future interventions and guides health professionals in their counselling practices.

430 The design and feasability of a web-based physical activity program for patients with osteoarthritis of hip or knee

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Introduction: A large proportion of patients with osteoarthritis (OA) do not meet the recommended levels of physical activity (PA). Although inactivity may enhance in short-term pain reduction, prolonged inactivity may augment functional decline. Therefore, we developed a web-based intervention that provides a highly individualized behaviourally based PA program for patients with knee and/or hip OA. The aim of this study is to describe the systematic development process, preliminary effectiveness and usability of a 9-week web-based intervention on PA behaviour change in individuals with hip and/or knee OA.

Methods: An iterative design approach was used to develop, test and enhance various prototypes. End-users (i.e. patients with knee and/hip OA) were involved continuously throughout the development process. The intervention incorporates core principles of the behaviour graded activity theory. A pilot study prototype was tested through a non-randomized pilot study among 20 patients with hip and/or knee OA. PA levels, pain scores and physical function were measured through online questionnaires (week 0, 6 and 12). Subsequently, the usability of the intervention was tested.

Results: After several iterations of testing and revising, we developed the final version of the intervention. Based on 16 the interviews after the pilot study, we adjusted the rigid character of the intervention into a more flexible format. The PA program includes an introduction module (module 1) and 8 text based week assignments (module 2). OA patients, between 50 and 80 years of age, participated in the pilot study and received the intervention. After 12 weeks, there was a non-significant increase in PA (1697 to 2044 minutes per week). After six weeks, pain scores increased from 5.3 to 6.6 (p=0.04). After 12 weeks, however, this significant increase disappeared. The usability of the final version was tested by four experts and five OA patients.

Conclusion: This paper outlines the preliminary effectiveness, development and usability of a web-based PA intervention. The results suggest that the intervention is feasible in promotion of PA among patients with hip and/or knee OA. The intervention was easy to use and the satisfaction with the program was high. Preliminary results from the pilot study revealed that PA scores increased, although differences were not statistical significant. Pain scores increased significantly after six week and decreased to baseline values after twelve weeks. Findings require validation in other studies. Therefore, the intervention will be further tested in a one year randomized controlled trial.

431 The influence of sport participation on physical function in patients with osteoarthritis during and after exercise therapy

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Introduction: The objectives of this study were to investigate 1) in which sports activities patients with osteoarthritis (OA) participate, 2) the cross sectional differences in functional outcome between sports participants and nonsports participants and 3) the influence of regular sports participation on the effectiveness of exercise therapy with respect to physical function.

Methods: A prospective observational follow-up study was performed investigating the influence of sport participation on patients' outcome. Data were obtained from a single blinded randomized controlled trial comparing two different exercise therapy interventions in 200 patients with hip and knee OA. At baseline, after 3 and 15 months, primary (self-reported physical function) and secondary patient outcome and sport participation were obtained. Patients were defined as sports participants when they performed a sport activity for at least 60 minutes per week at the time of assessment (regardless the kind and intensity of the sport activity) or as non-sports participants when they did not perform a sport activity for at least 60 minutes per week. Patients were defined as regular sports participants if they participated in sports activities at two out of three assessment moments.

Results: Thirty-eight percent of the patients with OA participated in 11 different sports activities. Sports participants had a higher level of physical function at baseline, 3 and 15 months' assessments. Physical function improved significantly within both the regular sports participants SP and the non-regular sports participants at 3 and 15 months' assessments. However, the regular group improved significantly more compared to the non-regular group.

Conclusion: A minority of patients with OA participated in sports activities. The sports activities in which they participated had a moderate to vigorous intensity. The influence of participation in sports activities on physical function and the effect of exercise therapy seems positive. The influence of sports participation on physical function and the effect of exercise therapy seems positive within patients who underwent an exercise therapy intervention. Therefore, we confirm the opinion that patients with OA should continue participating in sports which do not provoke their pain, as well as that patients with OA should be stimulated to participate in sports activities.

432 Health and blood profiles for masters athletes at the Pan Pacific Masters Games

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Introduction: The importance of regular physical activity for all age groups is well documented. As events such as the Pan Pacific Masters Games (PPMG) were seen as contributing to the health of older individuals it was important to confirm that competitors at these events were classified as healthy according to common measures.

Aim: To report the average health profile of competitors at the 2010 PPMG and compare this to common recommendations. It was hypothesized that the health of the PPMG competitors would in general fall within published health guideline (such as the World Health Organisation) recommended ranges.

Methods: This study was conducted with university ethics committee approval and in accordance with the ethical standards of the Helsinki Declaration. A total of 1590 athletes, (739 male and 851 female, age mean=49.1 years, SD±9.0, range=25–83) competing at the 2010 PPMG, completed an online survey created using Limesurvey. Means and standard deviations for each health measure included in the survey were then calculated and compared to conventionally recommended health guideline reference values.

Results and Discussion: The blood and health profiles of PPMG respondents were in general within health guideline recommended ranges. Waist circumference (males: mean=93.5cm, SD=14.0; females: mean=81.9cm, SD=14.3), SBP (mean=117mmHg, SD=17) and DBP (mean=75mmHg, SD=12), total cholesterol (mean=4.42mmol/l, SD=1.55), HDL (mean=1.49mmol/l, SD=0.78) and LDL (mean=2.67mmol/l, SD=1.33) and fasting plasma glucose (mean=5.38mmol/l, SD=2.33) were all within recommended ranges. The HDL/LDL ratio of 0.56 was also favourable. In contrast, the mean BMI (Mean=26.7, SD=4.4) and triglyceride levels (mean=2.63mmol/l, SD=1.1) were not within recommended ranges. It is possible that due to increased sports training and/or competition, respondents to the survey had propensity for greater muscle mass than the general population. This may have contributed to elevation of BMI values. Furthermore, the greater risk of cardiovascular disease from elevated triglyceride levels reported might possibly be mediated to a degree by HDL and LDL levels falling within recommended values.

Conclusion: The blood profiles and health data gathered from the 2010 PPMG were generally within acceptable guidelines. It was possible that the variables which fell outside of the recommendations may not have had such significant negative effects on participants' health, when considered in context of mitigating factors (namely increased muscularity and both HDL and LDL levels within normal ranges). This research further confirmed that masters events such as the PPMG may be efficacious in improving or maintaining the health status of older populations.

433 Knowledge of eating disorders among high school students in Poland

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Introduction: Eating disorders is a group of problems of a complex course. In addition to the typical ones (anorexia, bulimia), inappropriate diet contributes to malnutrition or obesity. Continuous growth of pathological phenomena related to nutrition among youth makes eating disorders a major problem in the social and health area. The objective of the research was to assess the state of knowledge of nutrition disorders issues among junior and high school students according to demographic factors.

Methods: The study involved 210 students (57.1% girls, 42.9%, boys aged 13–18) of junior and high school. A 34-question questionnaire was used regarding: demographic data, general information about the surveyed (weight, height) and testing questions about eating disorders viewing students' knowledge. To calculate the correct body weight the Body Mass Index was used. Collected material was subjected to statistical analysis using StatsDirect. To compare two independent groups non-parametric test was used accepting significant differences at p<0.05, while the relationship was examined using Pearson correlations.

Results: The average BMI, expressed as the arithmetic mean, was 20.35. The BMI of women was significantly lower than men's BMI. Data on weight and height showed that 73% is of normal weight (BMI 18.5–24.9). While inappropriate BMI can be observed in 27%, most of which are people with malnutrition. Subjects' BMI was significantly and positively correlated with parents' education, showing no statistically significant correlation with the interviewees' knowledge, which indicates the lack of correlation between theoretical knowledge and its application in everyday life. Average level of knowledge about eating disorders is observed. Youth understand obesity and malnutrition as diseases associated with the development of civilization, or pathological diseases; 73% of respondents as the cause of obesity shows an excess of food and low physical activity, and 48% as a cause of malnutrition suggests the economic situation. Statistical analysis showed that gender and residence do not correlate positively with the final test result. While subjects' age, parents' education were positively correlated with number of correct responses.

Discussion: Determining the possibilities for better education on prevention of eating disorders among children and adolescents becomes a problem. It is necessary to improve teenagers' knowledge about proper nutrition and a healthy lifestyle and to promote health values. Using diverse sources of knowledge is suggested, including the mass media to promote physical activity, sport and active leisure to prevent spreading obesity and malnutrition.

434 High risk for obesity in children with a subtype of developmental coordination disorder

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Introduction: Developmental coordination disorder (DCD) is a neurodevelopmental disorder characterized by poor motor skills leading to a significant impairment in activities of daily living. Children with DCD were less fit and more likely to be obese compared to typically developing (TD) children. Previous studies have reported that obesity may be associated with poor motor coordination ability and particularly in relation to balance ability. The purpose of this study was to compare the prevalence of overweight and obesity among children with DCD and balance problems (DCD-BP), children with DCD and no balance problems (DCD-no BP), and TD children.

Methods: 2057 children (1095 boys, 962 girls) aged 9 to 12 years were recruited randomly from elementary schools in Taiwan. The Movement Assessment Battery for Children test (MABC test) was used to evaluate the motor coordination ability. According to international cut-off points for body mass index (BMI) from Cole et al. (2000), all participants were classified as being normal-weight, overweight or obese. A Pearson Chi-Square analysis was used to compare the prevalence of overweight and obese children within the DCD-BP, DCD-no BP and TD groups.

Results: In this study, 178, 329 and 1087 children met criteria for the DCD-BP, DCD-no BP and TD groups, respectively. Even though the prevalence of overweight was higher in the DCD-BP and DCD-no BP groups than those in the TD group, there was no statistically significant difference between groups. Compared with TD children, DCD-BP children increased the odds for obesity two fold (odds ratio [OR]=2.28; 95% confidence interval [CI] 1.41–3.68; p<.01). DCD-BP children were more likely to be obese (19.71%) compared to DCD-no BP children (12.05%) (OR=1.79; 95% CI 1.02–3.16; p<.05).

Discussion: A subtype of DCD-BP children had a significant increased risk for obesity compared to the TD and DCD-no BP children. This issue of children's obesity and motor coordination problem should be concerned and proper intervention and fitness programs should be emphasized. In the future, more longitudinal studies to monitor relationships between obesity and motor coordination ability in different ages of children and adolescents are urgently needed.

435 Daily pedometer steps among older men: Associations with health-related quality of life and psychosocial health

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Introduction: Physical activity is associated with HRQoL and psychosocial health among older adults. Less is known specifically about walking, and objective indices of walking behavior among older adults. The purpose of this study was to determine the associations of daily pedometer steps (steps per day) with health-related quality of life (HRQoL) and psychosocial health among older men.

Methods: This study was a cross-sectional design. Older aged men (55 years of age and older) from Alberta, Canada completed a mailed survey that assessed HRQoL (RAND-12), depression, anxiety, and satisfaction with life. Steps per day were assessed with a SC-01 StepsCount pedometer via a 3-day step monitoring protocol. Average pedometer steps per day were categorized into quartiles. The primary model assessed the association between average pedometer steps per day as the independent variable of interest and our dependent variables of interest (physical, mental, and global health component scores of the RAND12, depression, anxiety, and satisfaction with life).

Results: Participants (N=385) averaged 8,539 steps per day (SD=4,244). Quartile (Q) cut-points for average pedometer steps per day were <5,570 (Q1), 5,570 to <8,116 (Q2), 8,116 to <11,392 (Q3), and >=11,392 steps (Q4). For HRQoL, all three adjusted models (i.e. physical, mental, and global health) indicated a significant linear trend between HRQoL indices across pedometer step quartiles (Q). For the physical health index, significant differences emerged between Q1 and Q3 (Mdiff=2.8, p=0.012) and Q1 and Q4 (Mdiff=3.3, p<0.01). For the mental health index, significant differences emerged between Q1 and Q3 (Mdiff=3.5, p=0.011) and Q1 and Q4 (Mdiff=3.7, p<0.01). For the global health index, significant differences also emerged between Q1 and Q3 (Mdiff=3.4, p<0.01) and Q1 and Q4 (Mdiff=3.8, p<0.01). For depression, significant differences were observed between Q1 and Q3 (Mdiff=3.3, p=0.006) and Q1 and Q4 (Mdiff=2.7, p=0.025).

Discussion: Steps per day was significantly associated with HRQoL and depression symptoms. Older men in the higher quartiles of pedometer steps per day reported less depressive symptoms compared to those in the lowest steps per day quartile. Our data suggest that lower step counts (<10,000 steps per day) among older groups are a meaningful target as it relates to HRQoL and psychosocial health.

436   Prevalence of hypertension and physical activity among Brazilian adults and elderly: A national analysis

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The demographic, nutritional and epidemiological transitions happened very rapidly in Brazil. As a consequence, non-communicable diseases (NCDs) are responsible for most deaths in the country. Hypertension is responsible for cardiovascular, brain, coronary, renal and peripheral vascular conditions. Hypertension is highly prevalent and tends to increase at older ages. Studies indicate that physically inactive adults have a 30% increased risk of developing hypertension as compared with their active peers. Obesity is also an important risk factor for hypertension. These findings indicate the need for preventive programs to reduce the incidence of chronic diseases, through the incorporation of behavioral changes such as healthy eating and regular physical activity. A cross-sectional study was conducted with a sample of 12,324 adults and 6,580 elderly individuals aged 60 years or more in the urban area of 100 municipalities in 23 Brazilian states (AQUARES-UFPPEL). These subjects answered questions about the reported diagnosis of hypertension and participation in physical activity during leisure time (IPAQ). The prevalence of reported diagnosis of hypertension was 16.3% (95% CI 15.6 to 16.9) among adults and 51.8% (95% CI 50.6 to 53.0) among the elderly. Among adults, the prevalence of hypertension was 14.4% in males and 17.8% in women (p<0.001). Inactive adults were more likely to present hypertension as compared to their active peers (p=0.01). Regarding the elderly, the prevalence of hypertension was 44.6% in men and 56.9%in women (p<0.001). Inactive elderly subjects were more likely to present hypertension than their active peers(p=0.002). The results show that the prevalence of physical inactivity among adults and elderly hypertensive patients is high and that policies to promote physical activity are urgently needed.

437   Prevalence of diabetes and physical activity among Brazilian adults and the elderly: A countrywide analysis

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In many countries the prevalence of diabetes has risen reaching epidemic proportions, and demand high economic and social cost. According to the World Health Organization there are currently 347 million diabetics worldwide. In developing countries, diabetes prevalence is rising in all age groups, therefore negatively affecting the quality of life of these people. A cross-sectional study was conducted with a sample of 5,333 adults aged 40–59 years old and 6,582 adults aged 60 years or more. The study took place in the urban area of 100 municipalities in 23 Brazilian states. Individuals answered questions about diagnosis of diabetes and leisure-time physical activity. The prevalence of self-reported diabetes was 6.3% (95% CI 5.7 to 7.0) among adults and 16.9% (95% CI 15.9 to 17.8) among the elderly. Among adults, the prevalence of diabetes was 5.6% in males and 6.9% in women (p=0.06). In both adults and the elderly, physical inactivity (<150 min/wk) was cross-sectionally unrelated to self-reported diabetes, probably due to reverse causality. Prospective studies in low and middle income countries are warranted in order to evaluate the association between physical activity and diabetes in such settings.

438   Trends in weight status, sufficient physical activity and inactivity among South Australian adults, 2001–2010

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Introduction: Overweight and obesity have been identified as barriers to physical activity participation. Current guidelines for sufficient physical activity relate to the importance of physical activity for health, not necessarily for weight loss. This study examined trends in self-reported weight status and physical activity behaviours among South Australian adults between 2001 and 2010.

Methods: The South Australian Physical Activity Survey has been conducted every three years since 1998. The questionnaire is administered by computer-assisted telephone interview. Telephone numbers are randomly selected from the Adelaide metropolitan and country Electronic White Pages listings. Within households, the person >18 years with the most recent birthday was selected for interview. In 2001 (n=3006) and 2010 (n=3078), items were included that related specifically to weight status physical activity and inactivity.

Results: From 2001–2010, sufficient physical activity increased by 4.3% among adults in the healthy weight range (from 47.6% to 51.9%) and inactivity decreased by 3%. Among overweight adults sufficient physical activity has increased by 10.8% (from 36.9% in 2001 to 47.7% in 2010) and inactivity has decreased by 4.7%. Sufficient physical activity among obese adults has increased from 27.8% in 2001 to 40.1% in 2010 a dramatic 12.3% difference. Conversely inactivity has remained relatively constant among obese adults (19.5% in 2001 and 2010). Healthy weight decreased by 2.1% (from 40.6% to 38.5%), overweight increased by 1.5% (34.7% to 33.2% and obesity increased by 3.7% (15.9% to 19.6%).

Discussion: The results of this study indicate that the prevalence of those who undertake sufficient physical activity is higher in those in the healthy weight range compared to those who are overweight or obese. However, between 2001 and 2010 there has been a far greater increase in sufficient activity in those in the higher weight categories. This indicates despite increases in self reported BMI, participation in sufficient activity is increasing; this suggests that the public health messages in relation to the benefits of physical activity for health may have made a positive impact at population levels; however these recommendations are insufficient to promote weight loss.

439   Factors related to dropout from sport among children and adolescents: A systematic review

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Introduction: Sport is a subset of physical activity that is structured, goal-oriented, and contest-based. It is estimated that 50-million North American children and youth and over 400-million Europeans participate in sport. However, approximately 35% of children/youth dropout from sport yearly. Understanding why children/youth drop out has the potential to minimize barriers and optimize the experience of sport. The aim of this review was to examine the factors associated with dropout from sport among children and adolescents and identify the methodological strengths and weaknesses of studies examining dropout from sport.

Methods: Key word searches for the population terms "child, youth, or adolescence" combined with "dropout, attrition, or disengagement" and "sport, organized sport, or recreation" identified articles from Academic Search Complete, Cochrane Database of Systematic Reviews, ERIC, Health Source,

MEDLINE, PsycINFO, and SPORTDiscus. This produced a total of 555 citations. Published English language literature that empirically examined dropout of organized sport among children or youth (5–19 years of age) was included; 42 studies met this criterion. Characteristics of participants, study design, outcome measures, analyses, and factors associated with dropout were extracted. Study quality was assessed using a scale derived from the CONSORT statement. Data were synthesized using the Leisure Constraints Model. Factors were categorized as structural (external factors), interpersonal (social factors), or intrapersonal constraints (psychological factors).

Results: Interpersonal and intrapersonal constraints were the most frequently reported factors for dropout (38 and 31 studies, respectively). The most common interpersonal constraint was pressure from: peers to do other things, and families and coaches to perform. Associated with pressure were the intrapersonal constraints of youth's perceptions of ability and performance. Structural constraints were cited less frequently (23 studies). Typically, these constraints were: lack of time, cost of participation, and injuries. This review also identified several methodological limitations. Eighty-nine percent of the studies' participants were male and only 2% of the studies focused on children. We also found that 67% of the studies focused on a specific sport and there was no follow up on the impact of dropping-out on subsequent participation.

Discussion: These findings suggest that the reasons for dropout are multi-faceted. In addition, there are aspects of the youth experience of sport that could be targeted for intervention such as decreasing negative pressures and enhancing perceptions of ability. More work is needed with children and girls; and the impact of dropout on subsequent participation in sport and habitual physical activity is necessary.

440 'More of a chore than pleasure': Insights into relapse from exercise

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Introduction: Irrespective of the health benefits to be gained through regular physical activity, many people experience difficulty maintaining their involvement to make any significant gains. Although a number of predictors and correlates of relapse have been identified, the high attrition rate suggests that much is still to be learned regarding this phenomenon. The purpose of this study was to investigate the reasons for and meaning of relapse from the perspective of those who reverted to a more sedentary than active lifestyle.

Methods: Seven women and three men, aged 25 to 59 years who relapsed from exercise participated in semi-structured interviews. As well as the reason(s) for relapse, the meanings and values participants attributed to exercise at various times in their life were also explored. A thematic analysis of the interviews resulted in seven themes being identified, each of which captured a specific aspect of what relapse from exercise means as 'lived' by the participant.

Results: Stories of personal barriers frequented participants' conversations. However, these must be considered within a wider context including the meaning participants attached to exercise, their perception that exercise was no longer 'needed', feelings of guilt and a loss of pleasure leading to a sense of 'having to' exercise. The inter-relationship between these factors reflected participants' 'road to relapse'.

Discussion: Outwardly the results suggest relatively simple ways could be identified that would ensure participants were able to maintain an active lifestyle. It is apparent when these are considered in the context of other aspects of life the complexities of engaging in exercise become all too evident. The reasons for so-called barriers such as lack of time, loss of social support and disruption to daily routines are very personalized and hence, each has a number of unique characteristics relative to the self. Another noticeable factor to emerge is the meanings of engaging in exercise and the pleasure – or lack thereof – individuals attribute to their experiences change over time and are very influential in the decision to disengage. Although conscious that regular exercise is 'good for you', the findings identified noticeable differences between the scientific reasons for exercising on a regular basis and the socially and culturally constructed meanings of being physical active within the context of one's life. Is it possible that relapse is a part of the (dis)engagement of an active lifestyle over time?

441 Coach behaviour and lesson context relevant to physical activity during girls' organised sports in Australia

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Introduction: Participation in organised sports (OS) has been recommended as an opportunity to increase young peoples' physical activity (PA) levels. Girls, however, spend a substantial proportion of time during OS training and games inactive. Therefore the purpose of this study was to document lesson context and coach behavior during OS practices and games, which may assist in identifying opportunities to increase PA in OS.

Methods: A cross-sectional design was used. Participants were 94 girls, mean (±SD) age 13.4±2.2 yr, recruited from 10 teams in three OS (netball, basketball, soccer) in the Western Suburbs of Sydney, Australia. One training session and one game were observed for each team using the SOFIT direct observation system to document lesson context and coach behavior. Coach behaviour was coded using a hierarchical format to record PA promotion, discouragement, and demonstration. Lesson context was coded into one of six categories: management, knowledge delivery, fitness, skill practice, game play, and free play.

Results: An average of 13.0±11.5 and 15.8±9.6 occurrences/hr were observed during training and games where coaches promoted PA. Few occurrences/hr were observed during training and games where coaches discouraged PA (1.9±2.9 vs 1.2±1.5). Across OS, there were considerably more occurrences/hr of coaches demonstrating PA during training than during games (7.6±6.1 vs 2.7±4.4). Across OS, a significantly higher mean percentage of time during games were spent in game play compared to training sessions (69.4±9.0% vs 22.6±24.9%), whereas a significantly higher mean percentage of time during training sessions were spent in skill practice (34.9±18.2% vs 6.9±4.6%) and fitness (8.5±5.8% vs 2.3±2.4%) compared to games. Across OS games and training, a considerable percentage of time was spent in management (11.1±3.9 % vs 15.0±4.7%) and knowledge delivery (8.8±4.4% vs 18.5±13.7%). Low percentages of time were observed for free play across OS, for both games and training (1.6±4.6% vs 0.5±0.6%).

Discussion: Observations suggest that across OS, coaches promoted PA more than they discouraged PA which may influence girls' PA levels. Considerable percentages of time, however, were spent in management and knowledge delivery, where it is likely that girls would be relatively inactive. There may be potential for improvement within OS to optimise girls' PA levels of by continuing to promote PA and reducing management and knowledge delivery content without interfering with fundamental learning opportunities and skill development that occur in OS. This information on OS can be used to develop strategies to increase girls' PA levels through sport.

442   Sports day in Canada: A national celebration of sport

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Introduction: Sport is an important source of physical activity, particularly for children and youth. However, participation in sports has steadily declined among Canadians over the past 10 years.
The Program: Sports Day in Canada
Sports Day in Canada (SDC) is a national celebration of sport, from grassroots to high-performance levels, in communities. The vision of SDC is to reach out to all Canadians to build, solidify and celebrate the role of sport in our country. SDC was presented by Canada's national sports broadcaster, ParticipACTION and True Sport. It was guided by a committee of national sporting organizations and their networks of coaches, athletes and enthusiasts. The objectives were to: Create a more robust sport culture; encourage greater participation in sport; raise the appreciation level for the role that sport plays in fostering a better, stronger society; create more political capital in sport leading to greater investments of public and private funding.
Results: Local organizations hosted events in every province and territory (N=1,300), representing approximately 425 communities across Canada. Customizable promotional tools and an interactive website were developed to support organizers and participants with updated events. SDC content was provided to over 100,000 fans on Facebook and over 4,200 Twitter followers. A SDC 'Game On' App was also created.
Over 75% of event organizers agreed their organizations benefited from Sports Day participation. Twenty-three percent of event organizers saw an increase in registration or participation in their programs. Ninety-seven percent are likely to participate again. Aided awareness of SDC by Canadians was 47%. SDC was comprised of activities including promotional initiatives, resource development/distribution, broadcast elements, and public relations. The cumulative effects of these components resulted in engaging 23% of Canadians in SDC (watched the broadcast, volunteered or attended a local event, played a sport); Canadians felt that Sports Day in Canada contributed to making their country a better place by: promoting healthy and active living (82%), building self-esteem (73%), making friends and being social (74%), building and/or strengthening communities (69%); Fifty-four percent of those aware of Sports Day said the program increased their intention to become more healthy and active; and forty-five percent of those aware of Sports Day said the program increased their intention to participate in sports.
Discussion: Single day events such as SDC that focus attention on, and celebrate sport participation, have potential to promote physical activity and health.

443   Physical Education+: Practicing health at school – A physical activity intervention proposal

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Introduction: Physical Education (PE) classes are considered to be an effective context for physical activity (PA) interventions. The aim of this work was to evaluate the adherence from PE teachers to an educational intervention during his/her classes as part of a pilot-study for the program "Physical Education+: Practicing Health at School."
Methods: The intervention program has four main components: a) Teacher training: a course of eight hours is offered for all PE teachers from the participating schools; b) PE curriculum: proposal of contents to be taught for each grade from the 5th grade – elementary school to 3rd grade – secondary school. The teacher receives a textbook where each chapter includes a supporting text, examples of classes and suggestions of evaluation activities; c) Media: seven posters will be delivered over the year (once a month) in the schools. These posters will have instructional or motivational characteristics about PA; and d) Event: An event will be held at the university in order to create opportunities to exchange experiences in PA promotion in the school. The Pilot-study involved 32 teachers from public schools of two small cities from south of Brazil. Only the teacher training and the delivery of textbooks for the 5th and 7th grade from elementary school and 1st grade of secondary school were carried. Face to face interviews were carried out with teachers three months after the training course and feedback was provided about the intervention material.
Results: A total of 47% of the teachers proposed at least one educational activity during the PE classes. The main barriers to comply to the intervention were: students resistance to have other classes than sports practice; lack of time to prepare the proposed classes; self reported lack of confidence to work with the material; structural problems and; load of theoretical classes in the textbooks. On the other hand, teachers who used the textbooks reported good advances in the PE classes despite the resistance from the students at first. One important achievement was a positive recognition from the students about the importance of PE in terms of health education in the school.
Discussion: Implementation of different practices in PE classes in Brazil is a challenge. The promotion of healthy habits through PE classes needs be considered as a priority, but teachers should be aware of the strong influence of sports practice in the implementation of other activities.

444   Physical fitness level and movement skills of 7 year old girls depending on their physical activities and hyperactivity problems

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Introduction: The problem of physical hyperactivity is currently one of the most common developmental issues faced by children. Spontaneous physical activity becomes one of the possible techniques which helps a hyperactive child control her energy. The goal of the research study was to determine the level of motor skills and the degree of mastering simple physical tasks by girls with various levels of spontaneous physical activity and hyperactivity disorder as compared to their peers who do not exhibit such problems.
Material and methods: The research study served as an integral part of a nationwide diagnosis of school maturity of children which was conducted in 2006/2007. As many as 10502 seven-year-old girls participated in the research. A diagnosis of the level of physical performance was conducted using the EUROFIT test as well as the assessment of simple physical tasks such as: throws and catches of ball, jumps, ball kicks and run. The parents were asked to complete Goodman's SDQ test and provide information regarding spontaneous physical activity throughout the day. A two-factor variance analysis was conducted using the statistical package SPSS.

Results: It was observed that hyperactive girls compared to others achieve lower average results in most trials assessing physical performance. The differences are statistically significant for the speed of hand movement ($p \leq 0,05$), standing broad jump ($p \leq 0,01$), running speed ($p \leq 0,001$) and for most of the analyzed physical abilities. Major differences in physical activity as indicated by the parents only pertain to the sense of balance: girls who are physically inactive achieve a greater average. There were no significant effects of interaction noted although the results revealed a tendency to achieve higher marks across all age groups in the area of the presented physical abilities and lower marks in the area of physical performance among hyperactive girls.

Discussion: One may state that hyperactive children are subject to a deficit in motor potential, which in the future may weaken their functioning in the school environment. The research results reveal the importance of the use of spontaneous physical activity in motor education in children from an early age. The therapy for hyperactive children should be based on a steady use of physical activity in order to reduce emotional strain, improve concentration and teach concentration using physical exercises which produce positive emotions in children and are enjoyable.

445 Physical inactivity of preschool teachers from public schools of a southern city of Brazil

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Introduction: The early childhood education, as the first stage of basic education, assumes an increasingly prominent place in the discussion of Brazilian education. Nevertheless, there is little concern with professionals who work on this field. An example are the few studies investigating this population, especially when it comes to the level of physical inactivity. The aim of this study was to determine the prevalence of leisure-time and total physical inactivity of preschool teachers from the public schools of Pelotas, RS.

Methods: A descriptive census was performed in municipal and state schools of the city which offered preschool classes. The questionnaire comprehended socio-demographic, behavior, nutritional and health questions. International Physical Activity Questionnaire (IPAQ) long version was used to check total and leisure physical inactivity of these professionals.

Results: All teachers were female, more than 55% were classified as overweight and 12.6% smoking at the present time. The prevalence of back, thoracic, neck and shoulder pain was high, and 17.8% tested positive for minor psychiatric disorders. Respectively almost 3/4 and 47.8% of preschool teachers were physically inactive on leisure and total time.

Discussion: The preschool teachers presented high levels of leisure and total physical inactivity. This condition becomes more dangerous when added to other important prevalences recognized as risk factors for health.

446 Predictors of adolescent fitness levels among Swedish adolescents, a longitudinal study

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Introduction: It has been consistently demonstrated that low aerobic fitness is causally linked to increased cardio-metabolic risk. Aerobic fitness has also been causally related to cognitive function. From adolescence and onwards, the inter-individual stability ("tracking") in fitness is fairly high. An individual´s fitness level in adolescence is therefore a central determinant for future health. However, childhood predictors of adolescent fitness levels are largely unknown. The present study aimed at identifying personal, school-specific and structural determinants in childhood (age 10 yrs) for adolescent aerobic fitness (at age 16 yrs).

Methods: Body mass index-based overweight status (normal weight vs overweight/obese, according to Cole et al.) and gross motor skills (based on the Tidén-Nyberg test) were measured at baseline in 209 Swedish children (mean [SD] age 9.8 [0.60] yrs) from randomly selected schools on Sweden. Immigration status (self-report) and average household income in quartiles on community level (register obtained) were used as possible structural confounders. Data on educational status of the PE teacher and lesson structure (gender-separated vs mixed classes) was obtained from the PE teacher. At the reexamination (at age 15.8 [0.33] yrs), aerobic fitness was estimated using the Åstrand-Ryhming nomogram. Low aerobic fitness was defined as below the first quartile (29.7 mL x min^{-1} x kg^{-1}). Risk for low aerobic fitness was assessed using logistic regression.

Results: Risk for low aerobic fitness at follow-up was lower in children who were normal weight (OR: 0.23.95% CI: 0.10 to 0.49) and in children with trained PE-teachers (OR: 0.40, 95% CI: 0.17 to 0.93), but higher among children with poor gross motor skills (OR:1.84, 95% CI 1.08 to 3.13) at baseline. Gender, immigration history, neighborhood economical status and lesson structure were all non-significant predictors of low adolescent fitness.

Discussion: The results stress the importance for early overweight prevention and treatment and for professional identification and treatment of children with impaired gross motor skills at young ages. In Sweden, a lagre proportion of PE-teachers in lower grades lack formal PE-teacher education, which according to the present study poses a threat to children´s future health. Early screening and treatment of children with limited motor proficiencies seems may help children adapting a physically active lifestyle and avoiding low fitness levels in adolescence and young adulthood.

447 Fundamental movement skills, physical fitness, and physical activity among Australian children with juvenile idiopathic arthritis

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Introduction: International data indicates that children with juvenile idiopathic arthritis (JIA) have poorer physical fitness and are less physically active than their healthy peers. However, there is currently a lack of physical fitness and physical activity data among Australian children with JIA. The aim of this study was to describe fundamental motor skills (FMS), physical fitness, and level of physical activity among Australian children with JIA, and compare this with healthy peers.

Methods: Children with JIA, aged 6–16 years, were recruited from rheumatology clinics at The Children's Hospital at Westmead and from private rheumatology rooms in Sydney. All children attended an assessment day, where FMS were assessed by a senior paediatric physiotherapist, physical fitness was assessed using the multistage 20 metre shuttle run test, and physical activity, physical and psychosocial well-being were assessed with questionnaires. These results were compared to age and gender matched peers from the NSW Schools Physical Activity and Nutrition Survey and the Health of Young Victorians Study. The relationship between FMS and physical fitness was also investigated using a Pearson correlation coefficient.

Results: A total of 20 children with JIA were recruited and assessed for this study. There were no significant differences in the proportion of children mastering FMS between children with JIA and their healthy peers. However, children with JIA were found to have poorer physical fitness and were less physically active than healthy peers. Parents of children with JIA indicated for several psychosocial domains more problems among their children and among themselves compared to their healthy peers.

Discussion: This study has, for the first time, described the impact of JIA on FMS, physical fitness, and physical activity among 6–16 year old Australian children. Due to the low number of children recruited in this study it is not possible to make strong assumptions about differences between children with JIA and their healthy peers. However, based on preliminary results it seems that Australian children with JIA have lower aerobic capacity, are less physically active, and experience more physical and psychosocial problems than their peers. Despite this, children with JIA have similar ability in basic fundamental movement skills than their peers.

448 The impact of changes to the school play environment on children's confidence and play behaviour: A Principals perspective

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Introduction: Improving school playgrounds to enhance physical activity in children (PLAY) is an environmental intervention currently being developed in the New Zealand (NZ) primary school setting, to encourage increased physical activity in children. PLAY has been developed as new evidence emerges for the efficacy of well set up school plays grounds and play policies for both health and educational outcomes. PLAY offers a comparatively inexpensive and perhaps more permanent method for increasing physical activity in children, than approaches requiring significant adult involvement.

Methods: The PLAY intervention involves providing financial support and assistance for schools to upgrade and develop playground equipment for improved physical activity in students. Discussed are the methods, used to introduce the concept of the multiple benefits of outdoor play, and managing expectations of new equipment and policies in the school environment. Students are providing input into the preferred design of their playgrounds and play policies throughout the development process. Here we describe in detail the effect of the implementation of playground equipment and more efficient use of existing environments has had on one participating school. Furthermore the removal of prevailing rules and regulations in the playground, providing permission to play in previously out of bounds areas, and the addition of loose parts to traditional playground spaces. Changes could be as simple as leaving the remains of pruned logs and branches in the playground, leaving areas of grass uncut for unstructured play, or removing rules banning tree climbing. An in-depth interview was conducted with the school principal of one participating schools 6 months after the implementation of playground equipment and policy, to elucidate on the changes made to his school environment. We examine the effect these changes to playground equipment and policy have had on student's attitudes to play, general playground behaviour and usage of not only traditional playground equipment but also an altered play environment.

Results: Our results revealed a high level of acceptance to suggested playground equipment and policy by the principal, Board of Trustee's and parents. Preliminary findings indicate an increase in confidence and engagement in playground behaviours of students.

Discussion: The implementation of child directed equipment and changing school playground policy has encouraged confidence and inclusiveness in children's interaction with the equipment and behaviour within a changed playground environment.

449 Process evaluation of the method sCOOLsport

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Introduction: Childhood obesity has increased rapidly worldwide. Primary schools could play a major role in prevention of childhood obesity. sCOOLsport is a method that primary schools can use to implement health policy and interventions promoting a healthy lifestyle. sCOOLsport focuses on four main topics: daily physical activity, healthy weight, physical competence and adequate motor skills. sCOOLsport is a practice-based intervention. Twelve primary schools in The Netherlands already used the method. In order to deserve the title of "sCOOLsport school", the school has to meet twenty one fixed (minimum) quality marks. The aim of the current study was to investigate to what extent schools comply with the quality marks within a three year period. In addition, factors facilitating and inhibiting implementation were investigated.

Methods: A process evaluation was performed at the level of the intervention owner (SportZeeland), the primary schools and the most important collaborating partners. In phase one, SportZeeland was questioned in a face-to-face interview. In phase two, questionnaires were sent to the twelve primary schools. In phase three, group interviews were conducted with teachers and pupils. The three most important collaborating partners of the schools were interviewed by telephone.

Results: All schools paid attention to the four main topics of sCOOLsport. Compliance with the quality marks, however, varied strongly between schools. The school that performed best complied to sixteen quality marks, the school that performed worst complied to only eight quality marks. A minority of schools complied to the following quality marks: Four hours per week to devote to sCOOLsport, a program for children who are not meeting physical activity guidelines, parental involvement, a method aimed at physical activity and healthy eating and a program for physical competence in all groups. Important factors facilitating implementation of sCOOLsport were support of SportZeeland, support of sport students and collaboration with partners. No or limited support for sCOOLsport within the school team was the most important inhibiting factor.

Discussion: The results indicate that all schools paid attention to the four main topics of sCOOLsport. The results also indicate, however, that it is difficult for schools to comply to all quality marks, even in a period of three years. Therefore, it should be questioned if a school should meet all quality marks to be named a sCOOLsport school. In addition, SportZeeland can use the results to further improve the method and facilitate future implementation.

450 Rationale and intervention description of the Supporting Children's Outcomes using Rewards, Exercise and Skills physical activity intervention

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Introduction: National data in Australia indicates that at least one third of children are not accumulating sufficient physical activity to accrue the associated health benefits. Moreover, children from high socio-economic status (SES) backgrounds are typically more active than those from middle and low SES groups. Fundamental movement skills (FMS) are considered to be the building blocks that lead to specialized movement sequences required for participation in organised and non-organized physical activities for children, adolescents and adults. Ideally developed in childhood and subsequently refined into context- and sport-specific skills, they include locomotor, manipulative or object control, and stability skills. There is strong evidence for a positive association between FMS competency and physical activity in children, and an inverse relationship between FMS competency and weight status.

Methods: This study will evaluate a primary school-based intervention to promote physical activity and improve FMS proficiency in children attending schools in low-income communities. The Supporting Children's Outcomes using Rewards, Exercise and Skills (SCORES) intervention is being evaluated using a group randomised controlled trial. Children in grades 3 and 4 (N=460) from 8 primary schools in low-income communities in the Newcastle region of New South Wales, Australia were recruited. The multi-component intervention is based on Harter's Competence Motivation Theory and is being implemented using a socio-ecological framework to promote physical activity. The 12-month intervention includes teacher professional development, student leadership workshops, physical activity policy review, physical activity equipment packs, parental engagement via newsletters, FMS homework and parent evenings, and community partnerships with local sporting organisations. The following outcomes were assessed at baseline and will be repeated at 6- (mid-intervention) and 12-months (post-intervention): physical activity (accelerometers), FMS proficiency (TGMD II) and cardio-respiratory fitness (20m shuttle test) are the primary outcomes, and secondary outcomes include body mass index (BMI), self-concept (global self-worth and athletic competence) (questionnaire), resilience (questionnaire), enjoyment of PA (questionnaire), social support for PA (questionnaire), and screen time (questionnaire). Activity and instruction time in physical education will be assessed using the System for Observing Fitness Instruction Time.

Results/discussion: SCORES is an innovative school-based physical activity and FMS intervention designed to support students attending schools in low-income communities to be more skilled and active. The findings from the study may be used to guide teacher pre-service education, professional development and school policy in primary schools.

451 Assessment of the role of active commuting in meeting physical activity guidelines

M. Granat[1]* ▪ G. MacLellan[1] ▪ [1]Glasgow Caledonian University

Introduction: Walking for transport to work, both for complete journeys and for travel to and from public transport stops, has been shown to contribute to increased physical activity [PA] in terms of number of steps and time spent in moderate to vigorous PA [MVPA]. Much of this evidence has been based on self-report data or obtained from travel survey information. The aim of this study was to explore, using objective data, the contribution that active commuting makes to total accumulated steps and to total MVPA by combining data from an activity monitor with precise location information from a GPS system.

Methods: 26 office workers [17F; mean age 38 (range 23–65)], in the greater Glasgow area, wore an activPAL™ activity monitor and a GPS systems continuously for 7 days. Commuting periods were determined from the GPS data. Duration of MVPA was calculated using time spent in stepping at a cadence equal to, or greater than, 109 steps/min. Both MVPA and number of steps were calculated for the whole 7 days and for the commuting times alone.

Results: On average 32% [SD 11%] of weekly total steps and 66% [SD 23%] of weekly MVPA were due to active commuting. Walking whilst at work made up a further contribution of 40% to total steps and 22% to MVPA totals. There were no significant relationships between distance people had to commute to work and steps or MVPA.

Discussion: Active commuting to work contributes a very high proportion of an individual's weekly MVPA but, makes a more modest contribution to weekly total steps. Only 33% of MVPA comes from non-commuting time and only 12% from activities not associated with going to or being at the workplace. This has could have an important message for public health interventions and public health strategies.

452   Event-based analysis of free-living behaviour

M. Granat[1]* ▪ [1]Glasgow Caledonian University

Introduction: The quantification of free-living physical activities (PA) is important in understanding how physical activity and sedentary behaviour impact on health and how interventions might modify free-living behaviour to enhance health. Quantification, and the terminology used, has often been determined by the choice of measurement technique. Many systems use cumulated acceleration over fixed epochs resulting in outcomes of counts which do not have any real physical units and can be difficult to interpret. The aims of this paper are to describe a systematic approach for the analysis of PA.
Methods: A terminology and a systematic approach for the analysis of free-living activity information based on event-based activity data using a flexible hierarchical classification of events were developed.
Results: An event is consecutive periods of activities and all events have an event label, a start time and a duration. All physical activities are initially classified into upright events and sedentary events and at this level analysis can be undertaken separately on each of these events and on the patterning of these two types of events. At the next level upright events are divided into standing events and stepping events. This data stream can then be analysed as a sequence of sedentary and upright events or separately as a sequence of sedentary, standing and stepping events. In addition to start time and duration the stepping event will have another parameter which is the number of steps contained within that stepping event. Average cadence for the stepping event can then become a derived output associated with this event. In the older adult population we have used this approach to understand differences in sub-populations that illuminate fundamental differences in the way in which both sedentary and upright time are accumulated. Here, although there were volumetric differences in the data, there was also a fundamental difference in the pattern of these events providing evidence of differences in behaviour.
Discussion: The quantification of free-living behaviour is the result of the analysis on the patterns of these chosen events. Event-based analysis provides a flexible yet robust method of addressing the research question(s) and provides a deeper insight into free-living behaviour. It is proposed that it is through event-based analysis we can more clearly understand how behaviour is related to health and we can produce more relevant outcome measures to understand the effectiveness of interventions.

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0815 – 0915	Workshop	Sports medicine for elite sporting teams – Olympics and Paralympics		Terrace	453
0815 – 0915	Tutorial Lecture	Systematic reviews: Why, how and for whom?	Jannique van Uffelen Bill Bellew	102	454
0815 – 0915	Workshop	Breast and bra fit: Optimising breast support during physical activity	Deirdre McGhee	103	455
0815 – 0915	Workshop	Imaging – Knee	David Connell	104	456
0815 – 0915	Workshop	CPR Certification (HLTCPR211A)	Sports Medicine Australia	105	457
0815 – 0915	Workshop	Imaging – Ankle	James Linklater	106	458
0815 – 0915	Tutorial Lecture	Everything you wanted to know about (the evidence for) physical activity mass-media led campaigns and should have been afraid to ask	Adrian Bauman Kelly Murumets Trevor Shilton	201	459
0815 – 0915	Workshop	Handling the groin: Practical application of the treatment model	Andrew Wallis	203	460
0815 – 0915	Tutorial Lecture	Physical activity and cancer: What have we learned and what do we still need to determine?	Christine Friedenreich Chair: Ron Plotnikof	204A	461
0815 – 0915	Tutorial Lecture	Physical activity policy research: Are we making legislation or sausage?	Ross Brownson Chair: Nick Cavill	204B	462
0930 – 1030	Keynote	It's hard to persuade some people to walk – or is it?	Nanette Mutrie Chair: Ron Plotnikof	Auditorium A	463
0930 – 1030	Symposium	Joint aspiration and injection	Sports Doctors Australia	Terrace	464
0930 – 1030	Invited	Clinical gait analysis	Chris Carty	104	465
0930 – 1030	Symposium	Injury prevention – Why do we do it?	Dara Twomey	106	466
		Embedding your injury prevention program within the target community: Why bother?	Dale Hanson		467
		Physical (in)activity and injury risk	Evert Verhagen		468
		Injury prevention strategies: An ideal opportunity to translate scientific evidence	Dara Twomey		469
		Developing evidence-based, context specific sports policy – an AFL experience	Lawrie Woodman		470

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1100 – 1230	Keynote	Biological mechanisms underlying musculoskeletal soft tissue injuries: Why it is clinically relevant?	Malcolm Collins	Terrace	471
1100 – 1230	Workplace sitting: Patterns and interventions Chair: Hidde van der Ploeg Distinguished Discussant: Neville Owen			102	
		Are we chained to our desks? Assessing desk based sitting using a new objective measure of occupational sitting time	Gemma Ryde		472
		Sit-stand desks and sedentary behavior in Swedish call centre workers	Leon Straker		473
		Evidence of worksite physical exercise training to promote health in jobs ranging from low to high occupational physical demands	Gisela Sjøgaard		474
		Individual, psychological and environmental correlates of office based occupational sitting in the 10,000 Steps cohort	Mitch Duncan		475
		"Thinking on your feet": A qualitative evaluation of an installation of sit-stand desks in a medium-sized workplace	Anne Grunseit		476
		Reducing sitting time in office workers: Efficacy and acceptability of sit-stand workstations	Genevieve Healy		477
		Does work contribute to the sedentary risk of office workers?	Sharon Parry		478
		Efficacy of an integrated approach to reduce sitting time in office workers	Maike Neuhaus		479
		A 5-months workplace pedometer-based intervention: Did it change employees´ sedentary behaviour 2 months after removal?	Judit Bort Roig		480
		Workers and Metronomes: The periodicity of physical activity in relation to work pattern	Alex Rowlands		481
1100 – 1230	Physical activity, sedentary behaviour and diabetes Chair: Mireille van Poppel Distinguished Discussant: David Dunstan			103	
		How does exercise training improve fasting glucose regulation?	Lynda Norton		482
		Accuracy of continuous glucose monitoring system during exercise in Type 2 Diabetes	Franciele Figueira		483
		Joint associations of TV viewing time and snacking behaviour and the metabolic syndrome in Australian adults	Alicia Thorp		484
		Interaction of age, sedentary time and breaks on cardio-metabolic markers in a high risk of Type 2 Diabetes UK population	Joseph Henson		485
		The association between physical activity and impaired glucose regulation: Is there a difference between ethnic groups?	Thomas Yates		486
		Seasonal variations in physical activity, fitness, and health are lacking in sedentary patients with the metabolic syndrome	Catherine Mikus		487
		Sedentary behaviour, moderate-to-vigorous physical activity and insulin resistance: A seven-year prospective study (ProActive)	Katrien Wijndaele		488
		Living well with Diabetes: Six-month randomised trial outcomes of a telephone-delivered weight loss intervention	Elizabeth Eakin		489
		The effectiveness of self-guided web-based physical activity interventions among patients with a chronic disease: A systematic review	Cindy Veenhof		490

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		Making sport safer in the real world – the voice of the Australian Rugby Union	Matthew Carroll		492
		Acceptance and rejection of rule changes to reduce injury in professional sport	John Orchard		493
		Implementation of safer sport at community level – Triathlon and field hockey case studies	Peter Tate		494
		FFA – Making sport safer in the real world	Matthew Bulkeley		495
		The challenges of using research to make community rugby league safer	Martin Meredith		496
1100 – 1230	Mass media and social marketing Chair: Kerry Mummery Distinguished Discussant:: Adrian Bauman			201	
		Think again: Social marketing campaign	Kelly Murumets		497
		Who do we reach? Campaign evaluation of Find Thirty every day® using awareness profiles in a Western Australian cohort	Justine Leavy		498
		Turning health policy into health promotion: A critical analysis of causality in a United Kingdom health campaign	Joe Piggin		499
		Community-wide campaign using social marketing to promote physical activity in middle and old-aged people: A cluster randomized controlled trial	Masamitsu Karnada		500
		Unplug and Play: Helping families to switch off the screen	Clover Maitland		501
		Motivated to walk but nowhere to walk to: Moderation of a mass media campaign by mix of local destinations	Rosanne Barnes		502
		Physical activity mass media campaigns: Impacts on different socio-economic groups	Margaret Thomas		503
		"I like to watch" – audience experiences of media coverage of physical activity and sedentary behaviour	Catriona Bonfiglioli		504
1100 – 1230	Active transport: Children and young people Chair: Tim Olds Distinguished Discussant: Niamh Murphy			202	
		Adolescent walking and biking to school in the Danish SPACE Study: The influence of individual, social and school site factors	Lars Breum Christiansen		505
		Is the bus an overlooked source of active transport to school in Canadian youth?	Christine Voss		506
		Parents' neighbourhood self-selection and children's active transport to school	Lisa Mackay		507
		Young and free? A study of children's independent mobility in urban and rural Australia	Alison Carver		508
		The influence of ethnicity on children's independent mobility	Nicola Tava'e		509
		Using travel diaries for measuring children's independent mobility and active travel – Examples and experiences	Stephanie Schoeppe		510
		The cycling 'dilemma' in youth: Was recreational- or commuter cycling first?	Christine Voss		511
		Children's cycling skills: Development of a test and determination of individual and environmental correlates	Greet Cardon		512
		Effects of school distance and travel mode on sedentary time in children	Erica Hinckson		513
		Physical activity and school active transport behaviours of Queensland school children	Peter Abernethy		514

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1100 – 1230	Critical incidents in sport		Jacqui Louder	203	515
			Lisa Stevens		
1100 – 1230	Intervention evaluation: Issues and challenges			204A	
	Chair: Lise Gauvin				
	Distinguished Discussant: Mike Pratt				
		Evaluation of physical activity interventions: A standardised approach	Nick Cavill		516
		10,000 Steps Flanders': Evaluating the state-wide dissemination of a physical activity intervention in Belgium	Katrien De Cocker		517
		Methodological challenges in conducting a systematic review of community wide interventions to increase physical activity	Daniel Francis		518
		Developing human dynamics models of physical activity and sedentary behavior to inform interventions	Sebastien Chastin		519
		Reporting of external validity elements among studies of physical activity interventions in Latin America	Christine Hoehner		520
		The impact of the 'Healthy Dads, Healthy Kids' community RCT on fathers' physical activity-related parenting practices and children's physical activity	Adam Lloyd		521
		Results from the dissemination of a telephone-delivered intervention for healthy lifestyle and weight loss: The Optimal Health Program	Ana Goode		522
		'Physical Activity at Home (PAAH)', evaluation of a group versus home-based physical activity program in middle-aged adults	Nicole Freene		523
1100 – 1230	Environments and physical activity: Adults			204B	
	Chair: Rodrigo Reis				
	Distinguished Discussant: Lawrence Frank				
		Perceived environmental factors related to adults' leisure-time physical activity: Findings from Europe, Australia and the USA	Delfien Van Dyck		524
		Relationship between the physical environment and different domains of physical activity in European adults: A systematic review	Veerle Van Holle		525
		Walking for recreation and perceptions of the neighborhood environment in older Chinese urban dwellers	Ester Cerin		526
		Association of perceived environment with changes on walking in adults of low socioeconomic level: Preliminary results of 'Ambiente Ativo' Project	Leandro Garcia		527
		Physical activity of adult Czech population in perceived neighbourhood environments – National cross-sectional study	Josef Mitas		528
		To what extent may local crime rates, perceptions of crime and personal safety limit walking in deprived neighbourhoods?	Phil Mason		529
		Neighborhood walkability, income and physical activity: Moderating effects of gender	Klaus Gebel		530
		Are physical environments and physical activity differentially associated by urban-rural status among mid-older aged adults? The WELL study	Kylie Ball		531
		Neighbourhood environment and physical activity among older adults: Does the relationship differ by driving status?	Ding Ding		532
		Adult physical activity within park activity areas: Differences by gender and race/ethnicity	Andrew Kaczynski		533

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1330 – 1500	Invited	MSK imaging – Best practice and the future	David Connell James Linklater	Terrace	535
1330 – 1500	Sports science 2			104	
		Resistance training to improve power and sports performance in adolescent athletes: A systematic review and meta-analysis	Simon Harries		536
		Effects of synchronous music on elite athletes during training activities	Peter Terry		537
		Effect of intermittent hypoxic training on cardiovascular responses to altitude (2800m)	Lisa Board		538
		Using a body-worm accelerometer to identify the start and end points of a stride during walking	David Maclean		539
		Body loads and physical impacts in National Rugby League players	Cloe Cummins		540
		Reliability and validity of a talent identification test battery for seated and standing Paralympic throwing	Jemima Spathis		541
1330 – 1500	Exercise Science 2			105	
		Actiheart based estimates of body expenditure are accurate during treadmill walking, arm ergometry and bicycle ergometry	Amged Mehdi		542
		Physiological responses during incremental exercise test in a stationary bicycle underwater	Vitor Costa		543
		Sex-based differences in salivary α-amylase activity following maximal cycling exercise	Kohei Yamamoto		544
		Respiratory muscle training enhances maximal minute ventilation and forced vital capacity in adolescent athletes	Boris Gojanovic		555
		A new submaximal cycle ergometer test for prediction of VO_2max	Elin Ekblom-Bak		546
		The design and implementation of a novel method for quantifying training loads in elite rowing: The T2minute method	Jacqueline Tran		547
		Cortical bone distribution at the tibial shaft in adolescent female athletes	David Greene		548
1330 – 1500	Risk factors and injury surveillance			106	
		Injury surveillance data captured by Sports Trainers at the 2007, 2009 and 2011 Australian University Games	Mark Brown		549
		The association between ground conditions and injury: An evaluation of current practices	Lauren Petrass		550
		Subjective assessments of playing surface conditions: Are they accurate?	Dara Twomey		551
		Investigating risk factors in paediatric snowsport injuries: Characterisation of head impacts	Tracey Dickson		552
		An investigation of in-game landings in elite netball: Implications for injury risk	Aaron Fox		553
		Injury incidence in a group of U17 and U19 Rugby League players	Shona Papalia		554

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1330 – 1500	Games and mental skills: Enhancing life satisfaction, self-worth, and happiness of former gang members		Stephanie Hanrahan	203	555
1530 – 1700	Keynote	Minimising risk in high risk settings: Do the 3 E's of injury prevention (education, enforcement or engineering) work?	Claude Goulet	Auditorium A	556
1530 – 1700	Physical activity and cardiovascular disease in adults Chair: Katrien Wijndaele Distinguished Discussant: Bill Kohl			Terrace	
		Relationship between physical activity related energy expenditure and cardiovascular disease factors among adults	Tiago Barreira		557
		Associations of leisure time, commuting and occupational physical activity with fitness and clustered cardiovascular risk factor	Jani Vaara		558
		The impact of body mass index and physical activity on endothelial function and inflammation	Amanda Rossi		559
		Total sitting time, leisure screen time and cardiometabolic risk in adults. Cross-sectional analysis of the HUNT3 cohort, Norway	Josephine Chau		560
		Sedentary time decrease in patients with cardiovascular risk factors participating in a structured lifestyle intervention program	Matthias Lidin		561
		The acute effect of 'breaking-up' prolonged sitting on cardiovascular risk factors in overweight/obese adults	Robyn Larsen		562
		Is incidence of a health condition associated with physical activity change in adults over two years?	Asad Khan		563
		Lifestyle intervention improves cardiovascular disease risk factors in young overweight women	Bianca Share		564
		Sport participation and metablic health in adolescents: Is more always better?	Silvia Brouwer		565
1530 – 1700	Workplace health and physical activity Chair: Leon Straker Distinguished Discussant: Estelle Lambert			102	
		Physical activity interventions to promote employee health and wellbeing: A Stage of Change approach	Aadil Kazi		566
		The interpersonal and ecological factors influencing employee health status in South African worksites	Tracy Kolbe-Alexander		567
		Working Late: Strategies to enhance productive and healthy environments for the older workforce	A. Ricardo Twumasi		568
		An international study of an automated web-based walking program (Walk@Work) to increase workday step counts in lower active office workers	Nicholas Gilson		569
		Walking Works! Evaluation of a workplace walking project in England	Emma Adams		570
		Effects of 1-year worksite structured exercise intervention at different volumes and intensities on physiological markers of health status	Alfonso Jimenez		571
		Physical activity in shift workers of a poultry processing plant in southern Brazil	Daniela Cardoso Tietzmann		572
		Does modest weight loss translate into improvements in workplace productivity?	Caryn Zinn		573
		Changes in leisure-time physical activity and subsequent sickness absence	Jouni Lahti		574
		Economic evaluation of an occupational health guideline for prevention of weight gain among employees	Willem Van Mechelen		575

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		How credible are older adults' responses to the Active Australia Survey? Findings from cognitive interviewing	Kristiann Heesch		576
		Taking fewer than 5000 steps/day is associated with poorer balance in elderly women with osteoporosis	Ing-Mari Dohrn		577
		How many steps are enough? Dose response curves for objectively measured physical activity in an Australian community based sample	Ben Ewald		578
		Quantifying the accumulation of sedentary time in older adult populations	Malcolm Granat		579
		Determining accelerometer non-wear and sedentary time in midlife and older adults	Steven Hooker		580
		The correlates of three-year change in accelerometer-assessed physical activity for a diverse sample of older urban UK adults'	David Barnett		581
		ActiGraph GT3X+ threshold for classifying sitting/lying activity in older adults in free-living environments	Nicolas Aguilar Farias		582
		Tri-axial accelerometer-derived sedentary time and its correlates among community-dwelling older adults in Japan	Takanori Honda		583
1530 – 1700	Patellofemoral joint/osteoarthritis			104	
		People with early-onset hip osteoarthritis who demonstrate greater physical function also have improved outcomes of function, pain and quality of life	Joanne Kemp		584
		Individuals with PFJ osteoarthritis demonstrate different kinematics but not muscles forces during more demanding ambulation tasks	Natalie Collins		585
		Femoroacetabular impingement in former high performance male Water Polo players	Phillip Melville		586
		Prevalence of patellofemoral and tibiofemoral radiographic osteoarthritis in people with chronic anterior knee pain: Data from a RCT	Kay Crossley		587
		The association between objectively measured physical activity and knee structural change using magnetic resonance imaging (MRI)	Dawn Doré		588
		10 year outcome of high tibial osteotomy for medial compartment osteoarthritis of the knee	John Scanelli		589
		Conservative management of patellofemoral pain syndrome: Integrating the evidence base with physiotherapists' clinical reasoning	Christian Barton		590
		A randomised clinical trial of targeted physiotherapy for patellofemoral osteoarthritis	Kay Crossley		591
1530 – 1700	Exercise Science 3			105	
		Effects of menstrual cycle phase on salivary α-amylase activity following 2 hours of cycling exercise in recreationally active eumenorrheic women	Nobuo Yasuda		592
		Modelling heat stress and strain in singles tennis	John Brotherhood		593
		Assessment of training intensity in response to salivary α-amylase activity in female handball players	Yukako Tanaka		594
		Effects of marching band training program on salivary IgA responses following 30 min of performance	Riku Teraoka		595
		Catecholamine responses to 6 h extended daily practice of marching band activities as a performing art	Tomoko Shimizu		596

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		Isokinetic strength and blood lipids responses to high- and medium-intensity resistance training in postmenopausal women	Yueh-Chang Tsai		597
		The effect of physiological and metabolic strain on females whilst wearing shorts with uncompensable heat stress	Gary Brickley		598
		The comparison of two types training on HSP 70 in active female	Farah Nameni		599
1530 – 1700	Invited	Nutrition: An untapped resource in rehabilitation and injury prevention	Bronwen Lundy	106	600
1530 – 1700		Patterns of physical activity and sedentary behaviour in children Chair: Nicola Ridgers Distinguished Discussant: Stewart Trost		201	
		Physical activity levels and patterns of 19 month old children	Jill Hnatiuk		601
		How do infants spend their time? Physical activity and restraint in 3, 9 and 19 month old children	Kylie Hesketh		602
		Physical activity during full-day and half-day kindergarten	Jeff Crane		603
		Active couch-potatoes? Combined physical activity-sedentary behaviour associations with weight status in 8–10 year old children	Katya Herman		604
		Two-year longitudinal changes in screen-time and different elements of physical activity in British youth from 11 to 13 years	Gavin Sandercock		605
		How similar are Australian and New Zealand youth? Trans-Tasman youth time use clusters and correlate profiles	Katia Ferrar		606
		Physical activity patterns and determinants in rural South African adolescents	Lisa Micklesfield		607
		A comparative study of step-determined physical activity among Korean children in Korea and Canada	John Spence		608
		Change in objectively measured physical activity during the transition to adolescence: Targets for intervention	Kirsten Corder		609
		Maintaining participation in physical activity from childhood to young adulthood: Is fluctuating participation the norm?	Kim Jose		610
1530 – 1700		Environments and physical activity: Children and young people Chair: Erica Hinckson Distinguished Discussant: Illse de Bourdeaudhuij		202	
		Safety perceptions and physical activity in US adolescents	James Sallis		611
		A systematic review of the relationship between the built environment and different domains of physical activity in children	Sara D'Haese		612
		Effects of urban renewal on children's movement patterns and physical activity: Study design and baseline data from the When Cities Move Children study	Charlotte Klinker Demant		613
		Physical activity, urban-rural status and geographic mobility from childhood into adulthood: Is it who we are or where we live?	Kira Patterson		614
		The built environment and children's physical activity – what is 'child friendly'?	Hayley Christian		615
		Locating schoolyard physical activity – Using GPS, accelerometerty and GIS	Jasper Schipperijn		616
		Promoting physical activity at the preschool playground: The influence of lowering playground density	Greet Cardon		617
		Features of public open spaces: Are there differences between urban and rural areas?	Jenny Veitch		618

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		Psychological components of the beep test	Michael Noetel		619
		Body image, eating behaviours and weight management in DanceSport competitors	Natalie Kyan		620
1530 – 1700	Interventions in diverse populations Chair: Nanette Mutrie Distinguished Discussant: Sigmund Anderssen			204A	
		Social disadvantage and physical activity promotion: A European perspective	Niamh Murphy		621
		The impact of a sport-for-development programme on the physical activity levels of young adolescent boys in Gulu, Northern Uganda	Justin Richards		622
		The healthy lifestyle capacity building project for the remote physical activity workforce in Aborginal communties across the Northern Territory, Australia	Martha Kelehan		623
		The provision of 'fly-in-fly-out' physical activity programs to Indigenous Cape York communities	Kathryn Meldrum		624
		Correlates of physical activity among Indigenous and non-indigenous adolescents	Rona Mcniven		625
		Physical activity intervention research in the Pacific – What works?	Katja Siefken		626
		Results from a community-led intervention aimed at reducing health inequalities in Stoke-on-Trent, UK	Gemma Hurst		627
		Physical activity promotion in adults of low socioeconomic level: Preliminary results of environment active project	Alex Florindo		628
		Physical activity and mental wellbeing in deprived neighbourhoods: A potential outcome of urban regeneration	Phil Mason		629
1530 – 1700	Policy issues Chair: Bill Bellew Distinguished Discussant: Trevor Shilton			204B	
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Friday 2 November

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15-18 OCTOBER 2014, CANBERRA

See you in a couple of years!

453 Sports medicine for elite sporting teams – Olympics and Paralympics

WORKSHOP

Being a sports medicine practitioner for an elite sporting team is a role which is aspired to by many sports medicine practitioners. Many Sports Medicine Australia members from a varied range of disciplines have experienced the fulfillment which comes with providing the support to a touring athlete or team to enable them to play at their best. The role of a sports medicine practitioner for an elite sporting team is often much more complex than applying discipline specific skills to bring out an athlete's best and in many instances sports medicine practitioners are required to provide support that extends beyond those of their specific discipline.

As a new Olympic and Paralympic cycle begins it is important to understand the pathways and possibilities for sports medicine practitioners. This forum will bring together some of Australia's leading elite Olympic and Paralympic practitioners to discuss the pathways and pre-requisites for practitioners aspiring to be part of these amazing elite sporting events.

454 Systematic reviews: Why, how and for whom?

TUTORIAL LECTURE

J. Van Uffelen[1]* ▪ [1]Victoria University

A systematic review is a useful research method to answer research questions related to public health, making use of all relevant evidence. This evidence can for example include findings of observational studies, intervention studies, economic evaluations or qualitative studies. Important steps in a systematic review include collecting appropriate evidence to answer the question, appraising the quality of the evidence, and synthesizing the evidence. The results of good quality systematic reviews are useful for researchers, practitioners and policy makers. This tutorial will address why systematic reviews are important, how to do a systematic review and what kinds of systematic reviews are needed to inform decision and policy making.

455 Breast and bra fit: Optimising breast support during physical activity

WORKSHOP

D. McGhee[1]* ▪ [1]University of Wollongong

Introduction: Insufficient breast support during physical activity leads to excessive breast movement. This has been found to be a barrier to females participating in physical activity due to both breast discomfort and embarrassment. Excessive breast movement and discomfort can also negatively affect sporting performance through changes in both the posture and movement of the upper limbs and trunk. Consequently, correct breast support is an important factor for all females to consider, and is an important educational issue to promote physical activity in females and optimise sporting performance in female athletes.

Methods: Sufficient breast support requires both a supportive bra design and correct bra fit. The level of breast support required varies with the age, bra size and the type of physical activity. This practical evidence-based workshop shows how to optimise breast support by providing simple guidelines of how to choose a supportive bra to wear during physical activity and ensure that it fits correctly. Educational strategies on how to inform specific sub-groups such as female sporting teams, patient populations and adolescents with mother/daughter sessions, will also be covered. Free educational resources that can act as an ice-breaker to bring up this important but sensitive topic will also be available.

Results: Participants will leave the workshop with both the skills and resources to optimise breast support in active women across a wide range of ages, bra sizes and activity levels.

456 Imaging – Knee

WORKSHOP

An interactive workshop on imaging for knee injuries. This workshop will be led by sports physicians and a radiologist detailing the gold standard imaging for a range of knee injuries and pathology. There will be detailed learning on how to read and interpret these images.

457 CPR Certification (HLTCPR211A)

WORKSHOP

Sports Medicine Australia

This workshop is designed to provide a CPR update with a Sports Medicine flavour. It provides an ideal opportunity for Sports Medicine Clinicians to up skill in a credentialed emergency resuscitation hands on session. It is primarily provided for Doctors, Physiotherapists, Podiatrists or any other health professionals who require an annual update for their daily work and to fulfill the requirements for their professional education or registration. The workshop will fulfill the updated 2011 guidelines of the Australian Resuscitation Council and all participants will receive a Statement of Attainment as Nationally Recognised Training for HLTCPR211A-Perform CPR.

458   Imaging – Ankle

WORKSHOP

An interactive workshop on imaging for ankle injuries. This workshop will be led by sports physicians and a radiologist detailing the gold standard imaging for a range of ankle injuries and pathology. There will be detailed learning on how to read and interpret these images.

459   Everything you wanted to know about (the evidence for) physical activity mass-media led campaigns and should have been afraid to ask

TUTORIAL LECTURE

A. Bauman[1]* ▪ K. Murumets[2]* ▪ T. Shilton[3]* ▪ [1]School of Public Health, Sydney University ▪ [2]ParticipACTION ▪ [3]Heart Foundation

Mass-media led campaigns (MMCs) to promote physical activity are in their third decade in Australia. Despite early innovation, are we making progress against best –practice in this area? A recent systematic review of MMCs in Australia identified features of good campaign design and implementation, but less good linkage to other aspects of social marketing, with especially limited linkage to counter-marketing, audience segmentation, the voluntary exchange' part of marketing, and the environmental and regulatory reinforcement of campaign themes. By way of illustration, highly experienced MMC proponents and leaders will describe current campaign practice in Oceania and through a long history of ParticipACTION in Canada, and discuss the future of this kind of physical activity promotion. This will be followed by a state-of-the-art discussion on whether these campaigns are complementary to large scale efforts to encourage activity, or are they destined for devolution and disinvestment. This will provide an evidence based understanding of the roles of mass media campaigns in physical activity and public health.

460   Handling the groin: Practical application of the treatment model

WORKSHOP

A. Wallis[1,2]* ▪ [1]St. Kilda Football Club ▪ [2]Malvern Sports Medicine Centre

This workshop is directly related to the model presented in the Groin Symposium – "Demystifying the Groin". The focus of the workshop is for registrants to understand the eight subgroup classifications and tailor treatment appropriately. It will allow registrants to utilize clinical reasoning in the application of this model to objective assessment and treatment of groin pathology. In this workshop, the presenter will demonstrate appropriate objective examination related to groin pathology. Manual application of treatment will also be displayed as will subgroup appropriate exercise prescription for rehabilitation. Practically there will be demonstration of myofascial release techniques, targeted mobilization, the do's and do not's related to stretching etc. Registrants can expect to gain an understanding of how treatment and return to sport guidelines will alter dependent on subgroup categorization.

461   Physical activity and cancer: What have we learned and what do we still need to determine?

TUTORIAL LECTURE

C. Friedenreich[1]* ▪ [1]Alberta Health Services-Cancer Care

Since 1985 observational epidemiologic evidence has been accumulating that physical activity reduces the risk of developing cancer and since 2005 there is also evidence that increased activity levels can improve survival after cancer. Indeed, there is now strong and consistent evidence for a reduction in the risk of breast, colon and endometrial cancers with physical activity and possible evidence for an effect on prostate, lung and ovarian cancers. Physical activity can also improve quality of life, coping and rehabilitation during cancer treatment and several randomized controlled trials have examined various physical and health indicators in cancer patients given exercise regimens during treatment. Enhanced patient reported outcomes have also been observed in these studies amongst patients who exercise during or after their cancer treatments. Research has now shifted to examine the underlying biologic mechanisms involved in the association between physical activity and cancer risk as well as survival. These mechanisms include an effect of activity on levels of body fat, insulin resistance, inflammation, metabolic and growth hormones, endogenous sex steroid hormones, immune function and oxidative stress. On-going intervention trials and cohort studies are investigating if physical activity and health-related fitness will improve survival after cancer. Several aspects of the association between physical activity and cancer control still require more investigation including the exact type, timing, dose of activity needed for optimal cancer risk reduction and improved coping, rehabilitation, quality of life and survival after cancer. Much progress has been made and physical activity guidelines for cancer prevention and survival are being developed by national and international agencies.

462   Physical activity policy research: Are we making legislation or sausage?

TUTORIAL LECTURE

R. Brownson[1]* ▪ [1]Washington University

This presentation will cover the intricacies of the policy making process and its application to the promotion of physical activity. It will review the importance of an evidence-based approach for promoting physical activity (including the state of the evidence). The discussion will also cover emerging issues and questions in policy dissemination research related to physical activity.

463 | It's hard to persuade some people to walk – or is it?

KEYNOTE

N. Mutrie[1]* ▪ [1]University of Edinburgh, Scotland

Introduction: Rates of walking are declining in most developed countries and yet walking is an ideal mode of physical activity to promote for inactive adults with many health benefits demonstrated. Evidence suggests that individually tailored interventions delivered on a one-to-one, household or group basis are the most successful at increasing walking. However, we know less about how best to promote walking than we do about its benefits. The focus of this presentation is on two limitations to the existing literature. The first is an assumption that men do not want to take part in walking programmes and the second is how best to support older people. Two studies will be presented that address these limitations.
Methods: Football Fans in Training [FFIT] is a lifestyle education programme for weight loss aimed at the male fans of the top football league clubs in Scotland. The programme has 12, weekly, 90-minute sessions of 'classroom-based' discussion and 'pitch-side' training that aims to encourage weight loss. A key element is a pedometer-based walking programme which provides graduated walking goals based on baseline step counts for each man. Semi-structured telephone interviews provided data on how the men viewed the walking element of the programme. In the West End Walkers 65+ study [WEW 65+] we aimed to assess the feasibility of a pedometer-based walking programme, delivered by a trained practice nurse, with patients aged over 65 years from primary care. Using a two arm randomised controlled trial, step counts, activity patterns and psychosocial variables were assessed at three time points; baseline, 12 weeks and 24 weeks.
Results: Men taking part in FFIT were very positive about the walking programme. The data suggested three inter-related factors: the utility of pedometers as a technology for motivation; the speed with which fitness was regained and weight reduced; and bolstering of their masculine identities through the receipt of the programme in a valued, masculinised, context. The WeW 65+ intervention was successful in increasing walking [by around 2,000 steps/day] which was sustained up to the 24 week time point and was associated with improved quality of life and reduced sedentary time.
Discussion: These studies have shown that it is possible to persuade men and older adults to increase walking levels and that the pedometer is a valued motivational tool. Further research is needed on how to persuade other segments of society that walking is a good physical activity option.

464 | Joint aspiration and injection

SYMPOSIUM

Sports Doctors Australia

This symposium is an interesting and informative look at the controversies that surround the use of joint aspiration and joint injection with corticosteroids. The symposium will be run with an expert panel of clinicians, who are directly involved in the decision making about injections, the use of injections as well as the identification and treatment of the complications of these injections. There is a general nervousness in the community about the use of steroid joint injections, but the fears are often about issues that relate to the long term systemic use rather than the issues related to injection.
We, as clinicians, have other fears about the use of these injections. This symposium is relevant to every primary care clinician who may use injections or refer for injections and includes GPs, Sports Physicians, Rheumatologists, Orthopaedic surgeons, Physiotherapists, Podiatrists and anyone involved in the care of people with joints.
This symposium will give the audience an interesting insight into the thoughts of different clinicians, allow the audience to partake with questioning the panel as well as arriving at a consensus at the end. Presentation by Dr Maddy Martin and Associate Professor Gavan White.

465 | Clinical gait analysis

WORKSHOP

Australian and New Zealand Society of Biomechanics Supported Speaker

C. Carty[1,2]* ▪ [1]Queensland Health, Royal Children's Hospital ▪ [2]Centre for Musculoskeletal Research, Griffith Health Institute, Griffith University

The gait cycle can be divided into the stance phase and the swing phase. Tasks that need to be accomplished during the stance phase include weight acceptance, single leg support and propulsion. During the swing phase the lower limb needs to be advanced for the subsequent cycle. The above tasks require a coordinated effort from the neuromuscular system to accelerate and decelerate each joint. By comparing the gait patterns of typically developing and pathological gait clinicians can identify periods in the gait cycle and specific joint patterns that differ. This comparison includes assessment of joint angles, joint moments and powers, and muscle activation patterns. The clinicians' goal is to identify which of these patterns are primarily responsible for the abnormal gait pattern and which are compensatory. This requires careful consideration of a musculoskeletal assessment, which will identify areas of pain, muscle weakness, structural abnormalities and reduced range of motion. The purpose of this session on clinical gait analysis will be to 1) provide an overview of a typically developing gait pattern including description of 3D joint angles and angular velocities (kinematics), description of joint moments and powers (kinetics) and description of muscle activation patterns (EMG), 2) participate in an interactive discussion on common gait disorders (e.g. femoral torsion, equinus, equinovarus, pseudo equines, jumped, crouch, stiff-knee) and 3) discuss current innovations in gait analysis (i.e. neuromusculoskeletal modelling).

466   Injury prevention – Why do we do it?

SYMPOSIUM

D. Twomey[1]* ▪ **D. Hanson[2]** ▪ **E. Verhagen[3]** ▪ **L. Woodman[4]** ▪ [1]University of Ballarat ▪ [2]James Cook University ▪ [3]VU University, Amsterdam ▪ [4]Australian Football League

Injury prevention is a complex, multi-faceted process that requires considerable contribution and commitment from many different groups such as, policy makers, scientists, practitioners, and participants. It has been well documented that injuries can have serious consequences not only on the physical, psychological and financial condition of an individual but also long term public health consequences. Therefore, the impact of sound evidence-based and successfully implemented injury prevention strategies has the potential to be extensive.

The aim of this symposium is to showcase some of the primary reasons for injury prevention and provide an opportunity to openly discuss the value, quality of work and need for each component for continued effective injury prevention. Firstly it will highlight the current knowledge and approaches used to advance various aspects of injury prevention and secondly stimulate discussion on the gaps and future directions of injury prevention strategies and research. Paper 1 will describe the public health impact of injury prevention strategies; paper 2 will explore the injury risk and associated cost burden those choosing to become more active; paper 3 will discuss the role of scientific evidence in injury prevention; and paper 4 will explore the development and implementation of an injury prevention strategy in the real world context. Following the four papers, a discussion about the future of injury prevention strategies and research needs will be led by the chair.

Paper 1:   Embedding your injury prevention program within the target community: Why bother?
Paper 2:   Physical (in)activity and injury risk
Paper 3:   Injury prevention strategies: An ideal opportunity to translate scientific evidence
Paper 4:   Developing evidence-based, context specific sports policy – an AFL experience

467   Embedding your injury prevention program within the target community: Why bother?

NSW Sporting Injuries Sponsored Speaker

D. Hanson[1]* ▪ **C. Finch[2]** ▪ **J. Allegrante[3]** ▪ **D. Sleet[4]** ▪ [1]Mackay Health Service District
[2]Monash Injury Research Institute ▪ [3]Columbia University ▪ [4]Centres for Disease Control and Prevention

Introduction: William Haddon, the father of modern injury prevention, prophetically introduced the concept of ecological injury prevention with his foundation paper, "On the Escape of Tigers: an Ecological Note".1 Haddon was seeking to emphasise a comprehensive approach to injury causation in response to the prevailing paradigm of accident prevention.

This paper aims to present a systematic ecological framework in which to design sustainable, community based, safety promotion interventions.

Method: A literature review was undertaken of English-language articles addressing the topics of "ecological injury prevention or safety promotion", "ecological health promotion", "sustainable economic, health or ecological systems" and "steady state", with 143 articles retrieved and reviewed.

Results: Injury prevention is a biomedical construct, in which injury is perceived to be a physical event resulting from the sudden release of environmental energy producing tissue damage in an individual. This reductionist perspective overlooks the importance of psychological and sociological determinants of injury. A number of recent studies have emphasised the importance of the social determinants of injury. Safety has physical, psychological and sociological dimensions. It is inherently an ecological concept. Interventions aiming to achieve long-term improvements in community safety must seek to develop sustainable safety promoting characteristics within the target community. We propose a visual metaphor "the injury iceberg" as an ecological metaphor of injury causation. In this system the individual is only the "tip of the iceberg". The most enduring way to reduce an individual's risk of injury is to systematically address the environmental and sociological issues "hidden beneath the water line".

Discussion: Haddon rightly observed that injury prevention and safety promotion is an ecological concept. Safety, in particular, has physical, psychological and sociological dimensions. We must capitalise on what has been achieved through re-engineering the physical environment by simultaneously re-engineering the social environment. To reduce a community's risk of injury and sustain this lowered risk, it is necessary to take a whole of system view of injury causation and safety promotion.

468   Physical (in)activity and injury risk

E. Verhagen[1]* ▪ [1]Department of Public and Occupational Health / EMGO Institute for Health and Care Research

Introduction: Regular participation in physical activity and sports is beneficial for health. Thereby, safety in sports and physical activity is an important prerequisite for continuing participation in sports, as well as maintenance of a healthy physically active lifestyle. However, injuries are side effects of otherwise healthy activities and should not be neglected. This holds especially true for that part of the population that transfers from (relative) inactivity to a more active lifestyle for health gain.

Methods: A series of (randomized) controlled trials in youth and novice runners will be discussed.

Results: For youth there is an increasing amount of evidence pointing towards physical inactivity being a risk factor for physical activity and sports related injury. In absolute sense the number of injuries might be low in the participants with lowest exposure to sports and physical activity. However, when injury risk is expressed against actual exposure (i.e. n per 1,000 hours of participation) risk for injury is over 10-fold higher in the least active part of the population. The reason for this finding remains elusive, as this relationship seems to exist without influence of BMI and motor fitness, albeit both are also affected by relative physical inactivity. Similar relationships are also reported for adult populations in which, for instance, it has been found that novice runners have higher risks of injury than experienced runners.

Discussion: The consistent findings that relative inactive individuals are at increased risk for injury pose an important issue in regards to public health. It is this part of the entire population that is encouraged through various channels and millions of dollars to become more active for health reasons. However, injury risks are neglected in these health messages. This warrants a new approach towards injury prevention for a public health perspective. There is great potential health gain and health protection if injury prevention becomes an integral part of physical activity promotion. Injuries and associated costs are prevented in a large population, and drop-out from otherwise healthy activities due to injury is prevented. One should be aware though that most of the available evidence on prevention stems from active sports populations and is not necessarily transferrable to this large population of interest.

469 Injury prevention strategies: An ideal opportunity to translate scientific evidence

D. Twomey[1]* ▪ [1]University of Ballarat

Introduction: Injury prevention is commonly defined as the ability to reduce the likelihood, incidence and severity of injury and to be successful requires a multi-faceted approach. It has been argued that successful injury prevention strategies need a foundation of solid scientific evidence, but it could also be contested that the development of injury prevention interventions provide an excellent conduit for applying the knowledge acquired in a laboratory or controlled setting. The aim of this paper is to present examples of injury prevention intervention/strategies that have been underpinned by sound scientific evidence. In doing so, it will explore how the evidence was accrued, the implementation/delivery of the intervention, and any available evaluations.
Methods and results: The examples will be drawn from neuromuscular based interventions, for example the Preventing Australian Football Injuries through eXercise (PAFIX); equipment based strategies, for example headgear or helmet wearing in sports such as cricket, rugby and snow sports; and rule modifications, for example body checking in ice hockey. The examples will demonstrate the importance of scientific evidence within injury prevention research and more importantly highlight the role it plays as only one facet of injury prevention research. Furthermore, the importance of evaluation to inform future scientific research will be illustrated through the examples presented.
Discussion and Implications: As scientific knowledge is constantly evolving, new and often exciting opportunities for innovative injury prevention strategies emerge. Not only are advancements in equipment and technology occurring but knowledge regarding optimal implementation and translation of scientific evidence is also being regarded as playing a critical role in successful injury prevention strategies into the future.
A limitation of many evidence-based prevention strategies is the lack of high quality evaluations that would inform and direct additional advanced scientific work. There is little doubt that if there are continued efforts to improve the mechanistic understanding of injuries combined with sound evaluations of evidence-based interventions, the value and role of scientific evidence in the realm of injury prevention will remain requisite.

470 Developing evidence-based, context specific sports policy – an AFL experience

L. Woodman[1]* ▪ **A. Donaldson[2]** ▪ **N. Ames[1]** ▪ **C. Finch[2]**
[1]Australian Football League (AFL) ▪ [2]Australian Centre for Research into Injury in Sport and its Prevention (ACRISP), Monash Injury Research Institute, Monash University

Introduction: Sports trainers (i.e. first aid providers) play an integral role in the provision of both immediate care and preparation of participants in many sporting contexts and hence their level of competency is critical to enable the fulfillment of this responsibility and to make participation safer. The aim of this paper is to present an example of how a national governing body of a sporting organisation recognised the need to clarify the competencies required of sports trainers, engaged in a research process to establish these competencies, and is in the process of implementing a new evidence-based and context-specific policy within the sport.
Methods: Firstly, a literature review was conducted to identify the injury profile that sports trainers within the sport were required to be competent to manage. This was followed by a three stage Delphi consultation process to collate the opinions of sixteen experts on a set of draft sports trainer competencies and to develop consensus regarding their inclusion in the final policy and training structure documents. Subsequently, a Sports Trainer Policy and Training Structure were proposed and an on-line community consultation process was undertaken to seek the views of the broader Australian Football community. Finally, implementation of the policy was planned and initiated (a long term process).
Results: During the Delphi process consensus was achieved on the expected and desirable competencies required by a sports trainer to successfully manage the range of injuries expected to be sustained by participants in non-elite Australian football. Key themes that emerged from the community consultation phase were: the need to acknowledge the volunteer intensive nature of community sport and the transient nature of sports trainers in community Australian football for successful implementation of the new policy; and the challenges associated with developing and implementing a 'one-size-fits-all' sports trainer policy in an environment in which resources and need vary enormously and are constantly changing.
Discussion: Successful community club implementation of this type of centrally developed micro-level sport policy requires that policy-makers identify, understand and address the context-specific issues that will impact successful policy implementation.

471 Biological mechanisms underlying musculoskeletal soft tissue injuries: Why it is clinically relevant?

KEYNOTE

Club Warehouse and Australian Institute of Sport Supported Speaker

M. Collins[1,2]* ▪ [1]MRC/UCT Research Unit for Exercise Science and Sports Medicine of the South African Medical Research Council (MRC) [2]Department of Human Biology, University of Cape Town (UCT), South Africa

Musculoskeletal soft tissue injuries such as Achilles tendinopathy and anterior cruciate ligament ruptures are common among elite athletes, recreational athletes and physically active individuals. The consequences of injury may be devastating and prevent the recreational or competitive athlete from reaching their potential or lead to a premature end to their careers. Although these injuries have been well described at a clinical level, the biological mechanisms causing these injuries are poorly understood. A further understanding of the biological mechanisms underlying the injury will assist the treatment and management of these injuries. In addition, understanding the biology is an important prerequisite in developing models that can be used to effectively identify risk, as well as, implement personalized prevention, treatment and rehabilitation programmes. Both intrinsic, including genetic variants, and extrinsic risk factors have nevertheless been implicated in the aetiology of these injuries. The genes implicated in musculoskeletal soft tissue injuries encode: i) structural components of connective tissue (collagens and glycoproteins); ii) extracellular matrix (ECM) proteinases (MMPs); and iii) cytokines and growth factors. Some of these genes are also associated with performance and flexibility. Although seemingly unrelated, these injury and performance phenotypes are associated directly or indirectly with the mechanical properties of musculoskeletal soft tissue. We therefore hypothesize that variants in several of the genes implicated with these phenotypes alter fibril architecture and structure and, thereby, mechanical properties. We also proposed that genetic risk factors would in the future be included in multifactorial models developed to understand the molecular mechanisms that cause musculoskeletal soft tissue injuries or related pathology. Clinicians could eventually use these models to develop personalized training programmes to reduce the risk of injury as well as to develop treatment and rehabilitation regimens for the injured individual. The objective of this lecture will be to review the evidence for the genetic predisposition to musculoskeletal soft tissue injuries and the implicated biological mechanisms, as well as the application of this data in the prevention, treatment and management of musculoskeletal soft tissue injuries.

472 Are we chained to our desks? Assessing desk based sitting using a new objective measure of occupational sitting time

G. Ryde[1]* ▪ **H. Brown**[1] ▪ **N. Gilson**[1] ▪ **W. Brown**[1] ▪ [1]The University of Queensland

Introduction: Detailed data on sitting time at desks is required to understand and effectively influence occupational sitting habits. The aim of this study was to assess desk based sitting time in office employees using a new objective measure of occupational sitting.
Methods: Participants were full time employees (n=80; mean age 40.8±11.7 years; BMI 25.82±3.92; 64% women) recruited from urban workplaces in South-East Australia. Desk based sitting was objectively measured using a validated pressure sensor (sitting pad) fitted to work chairs for a full working week. Employees used a diary to record work/waking hours and desk based activity across this period. A minimum recording period of 6hrs on three or more working days was required for analyses. Average daily time spent awake, at work and sitting at the desk; longest continuous sitting period, number of continuous sitting periods of >60 minutes; and sit to stand transitions (STS) at the desk were calculated. The ranges for each day included in the analysis were calculated for time spent sitting at the desk, longest continuous sitting period and STS.
Results are presented as group means and daily ranges. Results: Average time awake was 16.2±0.8 hours/day with 8.7±0.8 hours/day spent at work. Of work time, 66% was spent sitting at the desk (mean 5.8±1.2 hours/day, range 1.0 to 11.3 hours). The mean longest, continuous sitting period was 1.0±0.4 hours (range of 0.2 to 4.1 hours). Sitting for more than 60 consecutive minutes occurred less than once per day (mean 0.69±0.62 times). On average, employees got up from their desks three times per hour of work (mean 29±14 STS/day, range 7 to 181 STS).
Discussion: This sample of office employees spent a large proportion of their working hours sitting at their desk but there were frequent transitions between sitting and standing. Prolonged daily sitting for more than an hour was relatively rare. Without intervention, employees on average interrupted their desk based sitting every 20 minutes of the working day although variation between days was large. These findings highlight the potential for reducing time spent sitting at the work desk, while recognising the relatively high frequency and variation in sitting breaks.

473 Sit-stand desks and sedentary behavior in Swedish call centre workers

L. Straker[1]* ▪ **R. Abbott**[2,3] ▪ **M. Heiden**[3] ▪ **S. Mathiassen**[3] ▪ **A. Toomingas**[4] [1]School of Physiotherapy, Curtin University ▪ [2]Centre for Musculoskeletal Research, University of Gavle, Sweden [3]School of Human Movement Studies, The University of Queensland ▪ [4]Institute of Environmental Medicine, Karolinska Institutet, Sweden

Introduction: Adults spend approximately 8 to 9 hours of the day in sedentary behavior and much of this is gathered at work. The rising level of occupational sedentary behavior is both a public health and occupational health concern due to the emerging evidence regarding the deleterious effect that sedentary behavior has on health, independent of physical activity. In the occupational setting, sit-stand desks have been purported to offer a means of reducing sedentariness. This study aimed to investigate whether or not use of sit-stand desks and awareness of the importance of postural variation and breaks are associated with the pattern of sedentary behavior in call centre workers.
Method: The data came from a cross-sectional observation study of fifteen Swedish call centres, carried out in 2002–2003. Ten operators were randomly selected from each of the call centres and invited to participate. Inclinometers recorded 'seated' or 'standing/walking' episodes of the operators over a full work shift. Differences in sedentary behavior based on desk type (categorized as 'sit-stand' or 'sit') and awareness of the importance of posture variation and breaking up seated computer work within those using a sit-stand desk were assessed by non-parametric analyses.

Results: Four operators declined to participate and 15 operators had inclinometer recordings that were not of sufficient quality. Of the remaining 131 operators, 90 (68.7%) worked at a sit-stand desk. Working at a sit-stand desk, as opposed to a sit desk, was associated with a modest reduction in the time seated (78.5 vs 83.8%, p=0.010), and less time taken to accumulate 5 minutes of standing/walking (36.2 vs 46.3 minutes, p=0.022), but no significant difference to sitting episode length or the number of switches between sitting and standing/walking per hour. Ergonomics awareness had no significant association with any sedentary behavior pattern variable among those using a sit-stand desk.

Conclusion: Use of sit-stand desks was associated with better sedentary behavior in call centre workers, however ergonomics awareness did not enhance the effect. The growing number of people in occupations dominated by sedentary work and the clear evidence of the importance of sedentary behavior as a key lifestyle risk factor support the need to develop effective interventions. Sit-stand desks may be an important remedy in this endeavor, particularly in office settings, while ergonomics awareness may be able to contribute to further changes in sedentary behavior if improved and supported by the work organization.

474 Evidence of worksite physical exercise training to promote health in jobs ranging from low to high occupational physical demands

G. Sjøgaard[1]* ▪ [1]University of Southern Denmark

Introduction: Conflicting results have been presented regarding the effectiveness of worksite physical exercise training on health promotion which is true within jobs with low as well as high occupational physical demands, and where evidence is in particular lacking for the latter.

Methods: In Denmark several research groups combined forces and conducted 9 studies with RCT design and using the same basic intervention of offering 1 hr per week supervised physical exercise training at the worksite during working hours according to the concept "Intelligent Physical Exercise Training" that is based on evidenced sports sciences training principles and tailored to work exposure, employee health status and physical capacity. The interventions enrolled ~2500 workers and lasted from 12–52 weeks. Questionnaire surveys and health checks were performed at baseline and follow-up. The job groups included were: Office workers, computer workers, industrial laboratory technicians, cleaning personnel, health care workers, construction workers, and fighter pilots.

Results: In all job groups significant improvements were documented regarding health outcomes and/or health risk indicators. These outcomes were job group specific: Neck pain was reduced among office and computer workers, industrial laboratory technicians, health care workers as well as fighter pilots and forearm pain was reduced among laboratory technicians. Relative aerobic capacity – a health risk indicator for cardio-vascular diseases – was improved among office and computer workers, health care workers, and construction workers. Additionally, a number of other improvements in physical capacities were evidenced such as increased muscle strength and balance control.

Discussion: It is remarkable that in every study group outcomes of improved health were documented and the effect sizes were of clinical relevance. Three essential factors characterized these interventions which made them distinct from a number of unsuccessful interventions: 1) Physical exercise training was performed during working hours 1 hr per week, usually divided into 2–3 training sessions, which requested involvement of the employer to allow for such activities and thus signaling support of health enhancement for employees, 2) sports exercise training specialists were involved in designing the specific exercise training programs that were evidence based and of general high intensity, 3) training sessions were regularly supervised by expert trainees in the field and adherence was monitored. It is concluded that worksite exercise training does enhance health if a program with evidenced efficacy is implemented by expert trainees with support of the employer. Preliminary cost effectiveness estimates indicate acceptable cost relative to societal savings on health expenses.

475 Individual, psychological and environmental correlates of office based occupational sitting in the 10,000 Steps cohort

M. Duncan[1]* ▪ C. Vandelanotte[1] ▪ M. Rashid[2] ▪ N. Cutumisu[3] ▪ R. Plotnikoff[4]

[1]CQUniversity Australia, Institute for Health and Social Science Research, Centre for Physical Activity Studies

[2]University of Kansas, School of Architecture, Design, and Planning, Department of Architecture

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Introduction: Long periods of occupational sitting are associated with increased risk of overweight or obesity, and prolonged sitting in transport and leisure domains is linked to increased risk of poor health. Information on the factors that are associated with sitting time is required for the development of interventions that aim to reduce occupational sitting time. This study examines potential individual, psychological and environmental level correlates of occupational sitting among office employees.

Methods: 10,000 Steps is an online physical activity promotion project based in Australia. Adult members of 10,000 Steps (n=159,699) were emailed an invitation to take part in an online survey in November–December 2011. The survey included measures of general health and well-being, risk factors for chronic disease, job autonomy, physical activity (IPAQ-LF) and sitting time (duration and number of breaks in sitting per hour).

Environmental characteristics of the office environment were assessed using a reliable and valid instrument that focused on the spatial configuration of the office, the size (small, medium, large) and dominant type of office (open plan, shared, private). Generalized Linear Models were used to examine associations between the two occupational sitting outcomes and individual, psychological and environmental variables.

Results: A total of 11,089 individuals provided complete data, a subset (n=5,673) who worked in office based forms of employment and provided complete data on variables relevant to this particular study. Variables significantly associated (p<0.05) with increased duration of sitting were increased age (β=-0.01), being female (β=-0.11), being a non-smoker (β=0.19), increased total MET-minutes of physical activity (β=<0.001), increased duration of non-occupational sitting (β=0.05), greater proximity of co-workers (β=0.11) and working in a large office compared to a small office (β=-1.18). Variables significantly associated (p<0.05) with greater number of breaks in occupational sitting were increased age (β=0.01), higher BMI (β=-0.01), fair or poor self-rated health (β=-0.10), increased duration of occupational sitting (β=-0.07), greater job autonomy (β=0.01), greater local connectivity (β=-0.04), greater proximity (β=-0.01) and greater visibility of co-workers (β=0.18).

Discussion: The study is among the first to examine correlates of occupational sitting at multiple levels. Results indicate that variables are uniquely associated with the different sitting behaviours examined and also suggest that the spatial configuration of the office environment is an important component to consider in future interventions.

476   "Thinking on your feet": A qualitative evaluation of an installation of sit-stand desks in a medium-sized workplace

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Introduction: Sitting is a risk factor for developing chronic illnesses and mortality, independent of physical activity. Occupational sitting is a major contributor to sedentary time. Sit-stand desks are one strategy to reduce sitting time at work. Previous evaluations of sit-stand desks have focused on musculoskeletal effects, physical discomfort/complaints, and productivity with little qualitative data published regarding user acceptance.
A medium-sized government organisation specializing in management/leadership training installed a mix of manually and electrically operated sit-stand desks for all employees as part of office refurbishments in late 2011. This study evaluated the acceptability and usability of the two different types of desks, and whether they reduced sitting time for staff during their workday.
Method: Participants completed short questionnaires about their sitting time pre and three months post installation of the sit-stand desks. Staff also participated in focus groups at follow-up and discussed their perceptions about ease of, and barriers to, use and acceptability of the sit-stand desks. One key-informant interview was conducted with the staff member responsible for arranging and choosing the desks. All interviews were recorded and transcribed and analysed for themes regarding usability and acceptability.
Results: Of 30 staff, 21 agreed to take part, of whom 13 completed follow-up questionnaires, and were interviewed. The median proportion of sitting time for work was 85% (range 50%–95%) at baseline and 60% (range 10%–95%) at follow-up. From the focus groups, most participants were regular users of the desks, one had never tried his, and one had also used sit-stand desks with former employers. The desks were variously described as "interesting, "innovative" and "a luxury". Most found the desks easy to operate, although there was a strong preference for the electrically operated desks from both manual and electric desk users. Motivation for initial use classified participants into two groups: those who were very interested because of short term and/or long term health benefits, and those who were willing to experiment. Factors shaping continued use included: Concern for, and experience of, short and long term health consequences; general lifestyle habits; fit of the standing position to the rest of the office set-up; past and/or usual modes of working; and the position the person felt that they did their best thinking.
Conclusion: Sit-stand desks had high usability and acceptability and reduced sitting time at work. Use could be promoted by emphasizing the health benefits, providing guidance on appropriate set-up and normalizing standing for work-related tasks.

477   Reducing sitting time in office workers: Efficacy and acceptability of sit-stand workstations

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Introduction: Prolonged sitting is detrimentally associated with several health outcomes, including premature mortality. For office workers, a large proportion of sitting time occurs at work. Office-based employees, and the office workplace, are thus an important candidate group and setting for preventive approaches. This pilot examined the efficacy of a sit-stand workstation to reduce office workers' sitting time, plus workstation acceptability, health- and work-related outcomes.
Methods: Office workers aged 20–65 years who were ambulatory and worked at least 0.5 full-time equivalent were eligible for this quasi-experimental study. Intervention participants (n=18) were recruited from a single workplace (a public-health research centre) that was physically separate from the workplaces (also public health research centres) of comparison participants (n=14). The intervention group received a sit-stand workstation (Ergotron WorkFit-S), while comparison participants continued to use their non-height adjustable workstation. The primary outcomes (one-week and three-month follow-up) were changes from baseline in minutes/day spent sitting, standing, and stepping at the workplace and during all waking hours (activPAL3™ activity monitor, 7-day observation). Health outcomes (fasting total cholesterol, HDL cholesterol, triglycerides, glucose: *Cholestech LDX Analyzer*), self-reported work performance, and workstation acceptability were assessed at three-months. Analyses were by linear regression (or linear mixed models for primary outcomes) and adjusted for baseline values; significance level=0.05, two-tailed.
Results: Relative to the comparison group, the intervention group significantly reduced sitting time at both the one-week follow-up (mean change [95% CI]: -143 [-184, -102] minutes/day at the workplace; -97 [-144, -50] minutes/day during all waking hours) and the three-month follow-up (-137 [-179, -95] and -78 [-125, -30] minutes/day, respectively). Sitting was almost exclusively replaced by standing, with minimal changes to stepping time. There were no statistically significant intervention effects on biomarkers, except for HDL cholesterol (+0.26 [+0.10, +0.42] mmol/L), or on work performance. The majority agreed or strongly agreed that the workstation was easy to use (94%), enjoyable (94%) and comfortable (83%). Problems were reported regarding wrist support, mouse maneuverability and footwear choice; however, no-one wanted the workstation removed.
Discussion: This trial is the first with objective measurement and an appropriate comparison group to demonstrate that the introduction of a sit-stand workstation can substantially reduce office workers' sitting time both at the workplace and overall throughout the week. Cluster-randomized trials with larger, more representative samples and longer-term follow-ups are needed to determine the health benefits of reduced workplace sitting. The potential benefit of additional behavioral and organizational intervention strategies should be investigated.

478 Does work contribute to the sedentary risk of office workers?

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Introduction: Sedentary behavior (accelerometer counts below 100 counts/min) has been found to be independently associated with poor health and mortality. Further, in modern times, with the evolution of the "technological age", it has been reported that sedentary time is increasing. This may also be due to the shift towards reduced occupational physical activity and the rise in percentage of workers employed in low activity occupations such as office work. Therefore, the purpose of this study was to examine the contribution of occupational physical activity of office workers to sedentary risk. Specifically, to determine the exposure and pattern of sedentary time, light activity and moderate/vigorous physical activity (MVPA) of office workers during work hours and non-work hours.

Methods: 51 office workers from a large resource company in Perth, Australia took part in this cross sectional observational study. Participants wore an Actical accelerometer during waking hours for 7 days and recorded wear time, work hours and daily activities in activity diary and completed the International Physical Activity Questionnaire. Raw accelerometer count data was processed using a custom LabVIEW program to enable simultaneous analysis of the pattern of activity intensity and duration using Exposure Variance Analysis.

Results: Office workers reported significantly more sedentary time (sitting) and accelerometer determined sedentary time were significantly greater on work days compared to non-work days (p<0.001). Office workers were sedentary for the majority of their working hours with sedentary time during work hours accounting for 81.7% of work hours (light 27.3% and MVPA 6.9%), which was significantly greater than the sedentary time during non-work time (68.5%, p<0.001). Office workers experienced significantly more sustained sedentary time (bouts>30 minutes) and significantly less light intensity activity during work hours compared to non-work time (p<0.001). Further, office workers had significantly fewer breaks in sedentary time during work hours compared to non-work time (p<0.001).

Discussion: Modern *office work* is characterised by sustained sedentary time and does contribute significantly to overall sedentary exposure of office workers. Office work, which has traditionally be considered a 'low risk' occupation in terms of chronic health outcomes, may in fact increase risk of mortality and cardiometabolic disorders due to excessive and sustained occupational sedentary time. Therefore, in order to reduce overall sedentary risk, work based physical activity interventions should not only address reducing sedentary time of office workers but also interrupting prolonged sedentary time and promoting light physical activity during work hours.

479 Efficacy of an integrated approach to reduce sitting time in office workers

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Introduction: There is now substantial evidence linking prolonged sitting time with adverse health outcomes. Desk-based office workers accumulate high amounts of sitting time, often in prolonged bouts, making them an important target for workplace strategies to reduce prolonged sitting. Recent frameworks recommend an integrated approach to workplace health promotion that includes both individual behavior and organizational-level change elements. The advent of sit-stand workstations provides an opportunity to add environmental change to such an integrated approach. To date, no workplace intervention studies have addressed all these elements to target reductions in workplace sitting time. In a controlled workplace trial, we evaluated such an intervention to reduce sitting time.

Methods: Participants were between 26–62 years of age (mean age: 44±11years; 50% female) and were recruited from a single workplace, with intervention participants (n=18) working on a separate floor from comparison participants (n=18). The four-week intervention communicated three key messages: "stand up, sit less, move more," and comprised organizational (management consultation; worker information session; management support emails), environmental (sit-stand workstation: *Ergotron WorkFit-S*), and, individual (30 minute face-to-face consultation; weekly telephone calls; email summaries after each contact) elements. Sitting time was measured using *activPAL3™* activity monitors over seven days. Primary outcomes were changes in minutes/day spent sitting (including time accumulated in prolonged sitting bouts ≥30 minutes), standing, and stepping at the workplace and during all waking hours from baseline to four weeks. Analyses were by linear regression adjusted for baseline values (ANCOVA); significance level=0.05, two-tailed.

Results: At baseline, the overall mean for workplace sitting was 317 [SD 61] minutes/day, with much of this sitting time (110 [69] minutes/day) accrued in prolonged bouts. The intervention group (relative to the comparison group) significantly reduced sitting time at both the workplace (mean change [95% CI]: -128 [-162, -94] minutes/day) and across all waking hours (-78 [-120, -36] minutes/day). Reductions in workplace sitting were primarily driven by a reduction in sitting time accrued in prolonged bouts (-70 [-103, -37] minutes/day). Workplace sitting was almost exclusively replaced by standing (+129 [+96, +162] minutes/day) with minimal changes to stepping time (-1 [-7, +5] minutes/day).

Discussion: This integrated intervention, combining organizational, environmental, and individual elements, contributed to a significant reduction in objectively-measured sitting time in office workers. Cluster-randomized trials with larger, more representative samples and longer-term follow-ups are needed to determine the health and work-related benefits of reduced workplace sitting.

480   A 5-months workplace pedometer-based intervention: Did it change employees´ sedentary behaviour 2 months after removal?

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Introduction: Higher levels of daily sitting time are associated with an elevated risk for type 2 diabetes, all-cause and cardiovascular disease mortality. As a typical work day represents one-half of waking hours and because people spent an average of 10 hours sitting a day, workplace interventions aimed at reducing sitting time are needed. Currently, evidence on the effectiveness of workplace interventions for reducing sedentary behaviour is scarce. We evaluated the impact of a pedometer-based programme – based on Web technology – on employees´ sitting time two months after removing the intervention.

Methods: Inactive white-collar employees (n=264; age 42±10 years; 171 women) undertook a 20-week programme at four Spanish Universities. A quasi-experimental design was used, with an additional Campus in each University acting as a control. Employees at these additional sites undertook key measures for comparative analyses (n=135; control group; maintain normal behaviour) with the intervention group (n=129). The intervention consisted of: a) a ramping phase (8 weeks) to progressively increase baseline step counts to 10.000 steps/workday by integrating active working tasks, *short* (10') and long (20') campus walking routes at low and moderate intensities, b) a maintenance phase (12 weeks) of the increased *volume* of step counts, with intensive researcher guidance (weekly emails). Adherence to behaviour change was assessed two months after completing the intervention. Employees used a pedometer and a Website that provided strategies, motivational materials and interactive features. Employees completed baseline and intervention measures at three points (after ramping, maintenance and adherence phase) of sitting time (domain and day-specific sitting time questionnaire). T Student tests analysed significant differences between groups.

Results: Significant differences between groups (p<0.05) were identified for a) TV sitting time at weekend with mean differences indicating a decrease of 27 and 25 minutes on the maintenance and adherence phase respectively, b) transport sitting time during work days with mean differences indicating a 10 minutes decrease on the adherence phase, (c) total sitting time during work days with mean differences indicating a 38 minutes decrease on the ramping phase. Small, non-significant changes were found for occupational sitting time.

Conclusion: Our workplace pedometer-based programme decreased employee sitting times but not at work, which was our main purpose. This data suggests that employees could not integrate the strategies into their working routines but integrated them outside work instead, facilitating meaningful behaviour change in some specific sitting domains.

481   Workers and Metronomes: The periodicity of physical activity in relation to work pattern

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Introduction: It has been proposed that an inbuilt 'activitystat' may hamper efforts to change activity in a sustainable way. To design studies that can determine whether activity level can be manipulated it is necessary to know how habitual activity fluctuates over time. Tudor-Locke and colleagues assessed steps per day in individuals over one year. The aim of this study was to use this unique data set to investigate whether individuals' habitual activity exhibits periodicity.

Methods: Twenty-three participants from South Carolina or Tennessee (7 men, 16 women, age=38±9 y (mean±SD), body mass index=27.7±6.2 kg.m^{-2}) wore a Yamax SW200 pedometer and recorded their steps per day for 365 consecutive days, whether or not the day was a work day and whether or not they participated in sport/exercise. Fourier transforms of the steps per day data and the work/no work pattern were carried out for each participant.

Results: Three groups were evident: Group 1 (N=8) – Periodicity of steps matched periodicity of work pattern (dominant period of 7 days); Group 2 (N=9) – Periodicity of steps <7 days, not matching work periodicity; Group 3 (N=6) – Periodicity of steps >7 days, not matching work periodicity. Group 1 had the lowest daily step count (1=7860±3167, 2=11123±3144, 3=11512±2877 steps/day *P*=0.06); this pattern was apparent across each type of day. Groups 1 and 2 decreased steps on non-work days by approximately 2500 steps, whereas group 3 recorded similar steps, irrespective of whether they reported working. All groups increased by approximately 4000 steps on a day with sport/exercise reported.

Discussion: We identified three groups: Inactive workers – Low steps, work dictates 7-day step periodicity; Active workers – Higher steps with a drop off in steps on non-work days, periodicity <7-days inconsistent with work periodicity; Metronomes – Similar steps on work days to group 2 but no drop off in steps on non-work days, periodicity >7-days inconsistent with work periodicity. Individuals whose daily step pattern was dictated by work were the least active even when they incorporated sport or exercise into their day. Identification of the periodicity and variability of a person's usual activity will inform the measurement period and size of activity stimuli necessary to test the existence and tolerance of an 'activitystat'. Further, if an 'activitystat' is indicated its tolerance will inform development of activity stimuli that might be incorporated into an individual's activity pattern without triggering a compensatory response.

482   How does exercise training improve fasting glucose regulation?

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Introduction: Numerous studies have measured changes in fasting blood glucose [FBG] levels in response to physical activity [PA] interventions. While studies using clinical populations such as type 2 diabetics have reported significant reductions most others report no change in FBG. This study investigated changes in FBG in apparently healthy adults following a PA intervention. In light of our findings and those of others we suggest possible reasons for changes observed in FBG following PA interventions.

Methods: We measured FBG pre and post a 40-day PA program in 583 insufficiently active adults. The PA goal was at least 30 minutes of moderate exercise daily and there was 73% compliance. Fingertip samples were taken and FBG was determined using a Reflotron analyser.

Results: A PA questionnaire showed the average level of activity was 70 min/wk pre-intervention and this increased to 452 min/wk post-intervention. When the change in FBG was regressed against baseline FBG levels there was a significant negative relationship [r=0.483 ; p<0.0001]. The regression line showed subjects with low pre-study glucose levels increased FBG while those with high levels had reductions in FBG.

Discussion: It appears that the body's response to PA training is to up-regulate glucose control which is reflected in tighter FBG levels around a physiological set-point [5.6 mmol/L in the present study]. At least two other large studies have also reported an elevation in FBG in subjects at the low end of FBG pre-PA interventions, as well as the typical reduction in glucose for those with high pre-PA FBG. Since blood glucose regulation involves the counteracting effects of both insulin and glucagon it is likely that exercise-induced changes involve modulation of both of these hormonal pathways. In support, while numerous studies have confirmed the important insulin adaptations with exercise [increased sensitivity and/or receptor density in several organs] other studies [mainly animal] have shown increased glucagon receptor density in hepatocytes as well as increased glucose secretion with a standardised glucagon load after exercise training [in humans]. The role of glucagon in exercise-induced metabolic adaptations has been overshadowed by well-established changes in insulin. However, there is strong evidence of the important role that glucagon plays in glucose regulation and how exercise improves this function.

483 Accuracy of continuous glucose monitoring system during exercise in Type 2 Diabetes

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Continuous glucose monitoring system (CGMS) provides information on interstitial glucose throughout the day, but its performance during different types of physical exercise has not been studied.
Aim: To evaluate the concordance of a CGMS (Medtronic Mini-Med) and finger-stick blood glucose (FSBG, Accu-Check, Roche) in patients with type 2 diabetes mellitus (DM) during daily activities (DA) and sessions of aerobic exercise (AE) or aerobic plus resistance exercise (AE+RE).
Methods: Fourteen DM underwent DA, AE and AE+RE wearing a CGMS. Reference FSBG was determined using a glucose monitor. Exercise sessions had similar durations, and were randomly performed, in a crossover design. Intraclass correlation coefficient and Bland-Altman analyses were used to assess the association and concordance of CGMS and FSBG methods.
Results: Baseline fasting glycemia was 139±19 mg/dL, HbA1c was 7.9±0.7%. Correlations between FSBG and CGMS glucose during DA (0.94, P<0.001) were significantly stronger than those in the AE+RE (0.81, P<0.001), but were not different when compared with AE (0.85, P<0.001). The mean relative difference (bias, in percentage) of measurements between FSBG and CGMS methods was 1.5±12.5% (P=0.39) during DA, -11.3±16.5% (P=0.007) for the AE, and -1.3±17.5% (P=0.97) for the AE+RE. CGMS readings were within the tolerance (International Organization for Standardization, ISO) in 100% of measures during DA and AE+RE, while 90% of measures were within recommended limits during AE.
Discussion: The present data show that both aerobic and combined exercise sessions reduced the CGMS accuracy, as evaluated by intraclass correlation coefficients and Bland-Altman plots. Notwithstanding these observations, the percentage of CGMS values in accordance with the reference glycemia was within the proposed ISO criteria. Because we evaluated well-controlled type 2 diabetic patients who were not using insulin or sulphonylureas, neither hypoglycemic events nor high glucose variability were expected factors to potentially interfere with the accuracy of the CGMS. We assigned the lower accuracy during exercise sessions to the glycemic state, the possible biological time delay between blood and interstitial glucose concentrations, and also to the technical conditions when measurements are obtained.
Conclusions: In patients with DM, agreement between FSBG and CGMS glucose is weaker during exercise, but more than 90% of all the CGMS readings are within the proposed ISO criteria.

484 Joint associations of TV viewing time and snacking behaviour and the metabolic syndrome in Australian adults

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Introduction: Television (TV) viewing time is positively associated with the metabolic syndrome (MetS) in adults. However, the mechanisms through which TV viewing time increases MetS risk is unclear. Snack food consumption has been shown to be positively correlated with adult TV viewing time, suggesting that snacking and TV viewing may jointly contribute towards MetS risk. While we have previously showed the association between TV viewing time and the MetS is independent of adult's overall dietary intake, the influence of snacking behavior on this relationship remains unclear. The purpose of this study was to examine the joint association of daily TV viewing time and snacking behaviour on the prevalence of the MetS in a sample of Australian adults.
Methods: This population-based cross-sectional study included 3,816 females and 3,104 males aged ≥25 years who were free from diagnosed diabetes mellitus, no previous history of cardiovascular disease and were not taking lipid-lowering or antihypertensive drugs. MetS was defined according to the 1999 World Health Organization criteria. For comparative purposes, were also examined MetS based on IDF and NCEP criteria. Participants self-reported TV time for the previous week. Snacking behaviour was determined from a self-administered food frequency questionnaire; daily intake of common "non-core" snack foods was quantified according to Australian guidelines. Participants were categorised into four groups according to their daily TV viewing time (low: ≤2 hrs/d; high: >2 hrs/d) and snacking behaviour (low: ≤3 serves/d; high: >3 serves/d). Odds ratios (with 95% confidence intervals[CI]) for MetS according to groups (TV viewing time and snacking behaviour) were estimated using sex-specific, forced entry logistic regression models adjusted for potential covariates (age, education, smoking, physical activity and dietary factors).
Results: The odds of having the MetS was 1.82 (95% CI: 1.10,3.03) in males and 2.33 (95% CI: 1.24,4.37) in females when reporting high TV viewing time and high snacking, relative to the reference group (low TV time and low snacking). In females only, adjustment for waist circumference strengthened the association with MetS by a further 43%; OR: 2.76 (95%:1.29, 5.87). Analyses using the IDF and NCEP (females only) definitions of the MetS showed similar results.
Discussion: In adults, patterns of daily TV viewing time and snacking behaviour are jointly associated with the prevalence of MetS. In addition to the promotion of regular physical activity, population strategies addressing the MetS should give consideration to reducing time spent watching TV, as well as discouraging excessive snacking, particularly in females.

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Introduction: Sedentary time (ST) may be a distinctive health behaviour paradigm with deleterious effects on health. The number of breaks in ST (BST) may also be important. However, it is unclear whether these associations vary by age and data in high risk populations is limited.

Methods: Cross-sectional analysis using 879 participants from diabetes prevention programmes conducted in Leicestershire, United Kingdom (UK). Participants were recruited through primary care using common risk factors (body mass index (BMI), family history of type 2 Diabetes (T2DM)). ST (<100counts/min) and moderate-to-vigorous physical activity (MVPA) (>1952counts/min) were measured using Actigraph GT3X accelerometers (15s epochs), worn for a minimum of 4 days. A break was considered as any interruption in ST (>100counts/min). Results were stratified into <40 and >40 age groups to conform to UK policy. Linear regression analysis (standardized β coefficients), adjusted for known confounders (including MVPA and waist circumference (WC)) examined the association of ST and BST with markers of metabolic (fasting glucose (FPG), 2-hour glucose, HbA1c) and cardiovascular health (triglycerides, high density lipoprotein (HDL) cholesterol).

Results: 148 participants aged <40 (age=32.5±5.4years; female=71.6%) and 731 participants aged >40 (age=63.6±7.9years; female=35.3%) were included. Accelerometer wear time (14.5±1.4hours vs 14.4±1.4hours per day, p>0.05) and ST (10.3±1.5hours vs 10.3±1.6hours, p>0.05) were similar between groups. The <40 cohort spent a longer time engaged in MVPA (interquartile range; 0.7hours (0.4-0.9) vs 0.5hours (0.3-0.8), p<0.05) and took more breaks per day (300±64 vs 272±61, p<0.05). In the >40 cohort, there were significant detrimental linear associations of ST with 2-hour glucose (β=0.25, p=<0.001), HDL cholesterol (β=-0.15, p=<0.05) and triglycerides (β=0.18, p=<0.05), independent of MVPA and WC. Conversely, only triglycerides showed a detrimental association with ST in the <40 cohort (β=0.51, p=<0.05). Independent of known confounders (including ST, MVPA and WC), BST were significantly inversely associated with 2-hour glucose (β=-0.12, p=<0.05) in the >40 cohort. No associations were found in the <40 cohort. Significant age interactions were observed, with the older cohort demonstrating greater adverse associations with ST and 2-hour glucose. The direction was reversed for triglycerides with the younger cohort exhibiting the greatest detrimental association. For BST, the older cohort achieved the greatest benefit for 2-hour glucose.

Discussion: This analysis of individuals at high risk of T2DM demonstrates clear age differences in ST and BST with cardio-metabolic markers, independent of MVPA and WC. The pattern of findings may highlight differential strengths in underlying mechanistic pathways driving the deleterious effects of ST.

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Introduction: Physical inactivity is one of the leading causes of metabolic dysfunction. Evidence quantifying this link predominately comes from European peoples (white Europeans). However, there is emerging evidence that some ethnic groups known to have an elevated risk of impaired glucose regulation (IGR), such as South Asians (peoples from the Indian subcontinent), may be more susceptible to the deleterious effect of physical inactivity. We test this hypothesis.

Methods: Data is presented from a screening study for IGR (impaired glucose tolerance, impaired fasting glucose, or type 2 diabetes) conducted in Leicestershire, UK. Screened individuals were pre-selected as high risk through a validated risk score (based on BMI, sex, age, family history and medication status). Physical activity was measured by pedometer and the short-last-7-day International Physical Activity Questionnaire. Pedometer counts were classified as; sedentary (<5000 steps/day), low (5000–7499 steps/day), moderate (7500–9999 steps/day), and high (≥10000 steps per day). A standardized oral glucose tolerance test measured glucose regulation. Linear (standardized coefficients±SE) and logistic (odds ratios) regression models were stratified by ethnicity and controlled for age, sex, smoking, social deprivation, medications and waist circumference.

Results: In total, 2990 white Europeans (mean±SD age=63±7; female=39%; ambulatory activity=6673±3450 steps/day) and 368 South Asians (age=59±9; female=38%; ambulatory activity=6622±3044 steps/day) were screened. Self-reported total physical activity was significantly inversely associated with 2-hour glucose in white Europeans (=-0.09±0.02; p<0.01) and South Asians (=-0.30±0.06; p<0.01); the association was stronger in South Asians (P<0.05 for interaction). Similar results were seen for pedometer counts: White Europeans (=-0.09±0.02; p<0.01); South Asians (=-0.17±0.06; p<0.01). No associations were observed for fasting glucose. Lower activity levels were associated with an increased odds of having IGR in a dose-response manner for White Europeans [OR=1, 1.08, 1.22, 1.39 (displayed for high, moderate, low and sedentary categories respectively); P<0.01 for model] and South Asians [OR=1, 1.77, 2.25, 2.41; P<0.01 for model].

Discussion: Physical inactivity, independently of adiposity, is an important determinant of metabolic dysfunction; however in industrialized countries the size of the effect could be greater in some high risk minority groups. This emphasizes the importance of adequately engaging with minority ethnic groups in the promotion of physical activity and the prevention of diabetes.

487 Seasonal variations in physical activity, fitness, and health are lacking in sedentary patients with the metabolic syndrome

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Seasonal variations in physical activity (PA) have been widely reported and are associated with seasonal changes in biomarkers of health, including serum cholesterol. The prevailing dogma is that environmental triggers, such as variations in weather and hours of daylight, elicit changes in PA, which, in turn, influence clinical endpoints. However, these claims stem from studies of generally healthy individuals encompassing a broad spectrum of PA levels. It is unclear whether similar patterns manifest in individuals who do not engage in regular exercise. The purpose of this study was to determine whether seasonal variations in daily energy expenditure (EE), PA, fitness or biomarkers of health were evident in sedentary (< 2 bouts of exercise/week) patients with the metabolic syndrome participating in the Studies of Targeted Risk Reduction Intervention through Defined Exercise (STRRIDE) between January 1999 and March 2012 (N=761; 56% female; 75% Caucasian, 23% African American). Participant characteristics were as follows: Age 53 ± 0.3 y; BMI 30.0 ± 0.1 kg/m^2; fitness (peak oxygen consumption during treadmill test to exhaustion) 26.4 ± 0.2 ml/kg/min (2.34 ± 0.03 L/min); duration of low, moderate, high and very high intensity PA (determined by tri-axial accelerometer) 140 ± 4, 23 ± 1, 10 ± 1, and 3 ± 1 min/d, respectively; EE 2627 ± 45 kcals/d; total cholesterol (TC) 216 ± 1 mg/dL; low and high density lipoproteins (LDL-C and HDL-C) 137 ± 1 and 51 ± 1 mg/dL; triglycerides (TG) 144 ± 3 mg/dL; fasting glucose 98 ± 1 mg/dL; fasting insulin 11 ± 1 uIU/mL; and homeostatic model assessment of insulin resistance (HOMA-IR) 2.74 ± 0.1. We did not observe significant seasonal variations in any of the variables examined (EE, duration of PA, fitness (relative or absolute), fasting glucose, insulin, TG, TC, HDL-C, LDL-C, or HOMA-IR) before or after adjusting for age, sex, race, and BMI. Fitness, EE, and duration of PA peaked in May (2.48 ± 0.07 L/min, 2753 ± 55 kcals/d, and 182 ± 2 min/d, respectively) and were the lowest in June (2.19 ± 0.08, 2505 ± 59, and 172 ± 2). EE and duration of low-to-moderate and high-to-very high intensity PA were significantly predictive of fitness ($P<0.001$). Furthermore, fitness was a significant predictor of TC ($P<0.05$) and HOMA-IR ($P<0.05$). Thus, although sedentary, at-risk individuals may not exhibit the same seasonal variations in PA commonly reported among the general population, daily PA remains an important determinant of fitness. These data suggest that seasonal variations in fitness, PA, or EE are not likely to contribute to changes in these or other parameters observed in longitudinal exercise intervention trials in this population. Moreover, efforts are warranted to increase PA throughout the year in sedentary populations.

488 Sedentary behaviour, moderate-to-vigorous physical activity and insulin resistance: A seven-year prospective study (ProActive)

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Introduction: Hyperinsulinemia, a marker of insulin resistance (IR) and precursor of type 2 diabetes, is positively associated with sedentary behaviour and inversely with moderate-to-vigorous physical activity (MVPA). However, most evidence is from cross-sectional studies and/or based on self-reported activity and sedentary behaviour. So far, few prospective studies have examined whether objectively measured sedentary time and MVPA predict fasting plasma insulin (FPI) independently of each other, nor has the role of adiposity been explored in detail. It is also largely unknown whether the magnitude of association between objective total sedentary time and IR is comparable to that for self-reported TV viewing time and IR. The aim of this study was to asses whether baseline and 7-year changes in time spent sedentary, in MVPA and in TV viewing were independently associated with 7-year change in FPI, and whether these associations where mediated by central or general adiposity.

Methods: In 154 adults (40.6 ± 6.3 years; 67 men) with a family history of diabetes (ProActive UK Trial), FPI, objectively measured physical activity (Actigraph) and anthropometry, and self-reported TV viewing time were assessed at baseline and 7.25 ± 0.50 years later. Multiple linear regression analysis was used to estimate beta coefficients (95% CI).

Results: Baseline MVPA (hours/day; >1952 counts/min), significantly predicted change in (log10 transformed) FPI, independently of sex, baseline age, education, smoking, follow-up time (Model A: -0.17 (-0.30; -0.04), p=0.012), sedentary time (Model B: -0.19 (-0.32; -0.06), p=0.006) and waist circumference (Model C: -0.19 (-0.32; -0.06), p=0.004). Adjustment for baseline body mass index (BMI) instead of waist circumference in Model C produced similar results. No significant associations were found between sedentary (<100 counts/min) or TV viewing time with FPI. Change in MVPA (hours/day), but not change in sedentary or TV viewing time, was associated with change in FPI, independent of baseline MVPA, sex, age, education, smoking, follow-up time (Model A: -0.16 (-0.27; -0.04), p=0.011), and baseline and change in sedentary time (Model B: -0.16 (-0.28; -0.04), p=0.012). However, further adjustment for baseline and change in waist circumference attenuated the association (Model C: -0.08 (-0.18; 0.02), p=0.102). This result was not replicated when adjusting for baseline and change in BMI in Model C, which only attenuated the MVPA association slightly (-0.13 (-0.25; -0.01), p=0.032).

Discussion: These findings suggest a long-term beneficial influence of MVPA on IR, which might be mediated via central adiposity. Future prospective studies using objective activity monitoring should further evaluate the independent role of sedentary behaviors.

489 Living well with Diabetes: Six-month randomised trial outcomes of a telephone-delivered weight loss intervention

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Introduction: Weight loss and increased physical activity are independently associated with improved blood glucose management in type 2 diabetes. However, both are challenging to achieve and maintain for the 7.5% of Australian adults living with diabetes. Most commonly available programs involve intensive, clinic-based approaches that have limited uptake. Effective approaches with wider population reach are needed.

Methods: Living Well with Diabetes (LWWD) is a randomized trial evaluating an 18-month, telephone-delivered behavioural weight loss intervention (Tel) for adults with type 2 diabetes, compared to usual care (UC). Participants (n=151 Tel; n=152 UC) were recruited (71% uptake) from nine general practices. Intervention participants were allocated 27 calls from a lifestyle coach (Accredited Practising Dietician), a workbook, scale and pedometer. Intervention procedures were adapted from the landmark US Diabetes Prevention Program and Look AHEAD trials; the goal was weight loss of 5–10% of initial body weight, via moderate-intensity physical activity (≥210 min/wk) and reduced dietary energy intake (2,000kj/day). Baseline, 6-month (short-term),18 month (end-of-intervention) and 24-month (maintenance) assessments were by staff blind to condition. Primary outcomes were weight loss (% of initial weight; nurse-assessed), physical activity (moderate-to-vigorous [MVPA]; accelerometer minutes >=1952 counts) and glycaemic control (HbA1c). Six-month outcomes were examined using linear mixed models, adjusting for baseline values, assuming normal (% weight loss, HbA1C%) or gamma (MVPA) distributions.

Results: The sample were 56% male, mean age 58.0 (SD=8.6) years. 6-month retention was 91%; 46% completed >75% of scheduled weekly/fortnightly calls (Tel). Tel (n=133) and UC (n=139) participants with full primary outcome data showed no differences in primary outcomes at baseline, with overall means (±SD) being 94.7±18.9 kg weight, 124.7±115.9 min/wk MVPA, and 7.5 ±1.7 HbA1C%. At 6-months, adjusted means [95% CI] for Tel versus UC were significantly different (p=0.004) for % weight loss (-1.5 [-2.1, -0.9] vs -0.2 [-0.8, 0.4]), significantly different (p=0.003) for MVPA (149.4 [129.5, 172.4] vs 109.8 [95.5, 126.4] mins/week) and not significantly different (p=0.684) for HbA1C% 7.4 [7.3, 7.6] vs 7.5 [7.3, 7.7]). Assuming no change for drop-outs did not affect findings.

Discussion: The LWWD is a telephone-delivery model for broadening the reach of behavioural weight loss services available to the growing number of adults with type 2 diabetes. These short-term outcomes are modest in comparison to those observed in the landmark, precursor trials, but consistent with the attenuation of effects seen in translational investigations.

490 The effectiveness of self-guided web-based physical activity interventions among patients with a chronic disease: A systematic review

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Background: Despite well documented health benefits, adults with a chronic condition do not meet the recommended physical activity (PA) guidelines. Therefore, secondary prevention programs focusing on PA are needed. The internet has become a popular medium for the delivery of PA interventions. In particular, web-based programs have shown promise in PA behaviour change.

Objective: This systematic review summarizes the evidence about the effectiveness of web-based PA interventions in adults with chronic disease.

Methods: A literature search of several electronically databases was performed. Articles that evaluated a web-based PA intervention and used a controlled design were included. Moreover, studies were eligible for inclusion if they used a non- or minimal-treatment control group and if PA outcomes measures were applied. Two reviewers independently assessed methodological quality and extracted data from the included studies. Results were analysed using a best-evidence synthesis based on methodological quality.

Results: Seven articles were included. Five out of seven studies were graded as high methodological quality and two were classified as low quality. The majority of the study population had a sedentary lifestyle and all patients were diagnosed with a chronic disease, such as multiple sclerosis, diabetes mellitus 2 or heart failure. Three out of seven interventions were superior to the non or minimal treatment. Although web-based programs showed better results than non-or minimal treatment, results did not attain statistical significance.

Conclusions: Although a trend toward positive effects was identified in favor of the intervention groups, our best evidence synthesis revealed that there is conflicting evidence on the effectiveness of web-based PA interventions in patients with a chronic disease. The inconsistent results may have been attributable to a lack of power, since the number of patients was small and the percentage dropout was notably high.

491   Making sport safer in the real world – the voice of the implementer

SYMPOSIUM

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For evidence-based sports injury prevention interventions to really make a difference they need to be widely adopted and implemented over a sustained period of time across the target population. To facilitate this, a lot of sports injury research attention is currently being focused on understanding the implementation context for the translation of evidence into practice. However, many sports injury prevention researchers do not have an opportunity to work closely with the ultimate implementers – sports administrators, coaches, participants, sports trainers – of injury prevention and safety promotion interventions.

The purpose of this symposium is to enable sports injury prevention researchers to hear first hand from people who are currently actively involved in the administration of sport and the promotion of safety and injury prevention across a range of sports at various levels in Australia.

Each speaker will provide an insight into:

- why their sport is interested in safety and injury prevention
- how their sport identifies injury prevention priorities
- how they access and use evidence in their efforts to make their sport safer
- the facilitators and barriers to improving safety in their sport
- how sports injury researchers could help them to make their sport safer

The following five papers will be presented followed by a chair-led discussion about the implications of the presentations for sports injury prevention research.

The view from the top:

Paper 1:   Making sport safer in the real world – the voice of the Australia Rugby Union

Paper 2:   Acceptance and rejection of rule changes to reduce injury in professional sport

Making things safer in community sport:

Paper 3:   Implementation of safer sport at community level – Triathlon and field hockey case studies

Paper 4:   FFA – Making sport safer in the real world

Paper 5:   The challenges of using research to make community rugby league safer

492   Making sport safer in the real world – the voice of the Australian Rugby Union

M. Carrol[1]* ▪ [1]Australian Rugby Union

Administrators, coaches, and officials are acutely aware that the welfare and safety of players is paramount in the sport of rugby union, and that each has a Duty of Care to ensure the safety of the participant is a priority at all times. The key safety and injury issues in rugby relate to the contest area (i.e. tackle, scrum, ruck etc) and considerable research has been undertaken by the International Rugby Board and the Australian Rugby Union (ARU) into the scrum, tackle, concussion, and injury surveillance – both in the professional and community context. Current safety areas from community feedback include topical issues such as concussion management, early management of injury, junior/youth grading (age/weight debate) and serious injury management. The ARU has funded, since 2000, independent injury surveillance to monitor injuries in Australian rugby from the grassroots community to the national team. By identifying the nature and cause of injury, injury surveillance helps to identify the risks associated with participation in rugby, and enables the ARU to develop injury prevention strategies such as the SmartRugby program. Whilst it is possible to undertake injury surveillance and, through research, identify the evidence-base on which appropriate safety interventions can be developed, it is somewhat more complex to disseminate and implement injury prevention strategies in community sport settings. Community sport provides some unique challenges to traditional implementation strategies. This is due primarily to the volunteer nature of community sport, where time poor volunteers are under increasing regulatory and administrative burden with volunteer numbers decreasing. Further, community sport involves a diverse set of stakeholders who participate in varying ways, and this often requires specific messaging with respect to implementing injury prevention strategies. These stakeholders include players/parents, clubs/schools/private service providers, administrators/officials, coaches, managers, match officials, medical & support personnel. Researchers need to engage earlier and work collaboratively with National Sport Organisations to ensure:

- Research is RELEVANT to sport so that research outcomes are beneficial to sport;
- The research process INVOLVES implementers from within sport;
- There is an UNDERSTANDING of mechanics of the sport and its structure;
- Interventions are both MEANINGFUL and EASILY IMPLEMENTED via existing sport structures, programs and resources; and
- The process of dissemination and education to stakeholders is ROBUST to ensure messages get through to participants and lead to the desired 'behaviour change'.

493   Acceptance and rejection of rule changes to reduce injury in professional sport

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Introduction: According to the van Mechelen paradigm, once risk factors for injury are proven then intervention studies and lowered injury rates should follow. However, Finch has correctly pointed out that there are barriers to implementation.

Methods: Australia's most prominent professional sports are studied for recent examples of rule changes that have been embraced by the ruling bodies, plus others which are likely to reduce injuries but face resistance to implementation.

Results: In the AFL, the centre-circle ruck rule has successfully reduced PCL injuries. The 3–1 substitute rule, however, has had only slight effect on reducing game speed and perhaps injuries, and more radical restriction of interchanges (game speed) is being resisted by clubs and fans. In rugby league, limited interchange has probably helped reduce game speed and overall injuries and 'spear tackles' and scrum depowering have reduced spinal injuries. However, there is player and fan resistance in the NRL against heavier penalties for head-high tackles which concuss opponents.

In cricket, the boundary rope has reduced the incidence of players being injured sliding into fences. However, traditionalists have rejected allowing substitute players in first class cricket which would allow injured players to leave the game before worsening minor injuries and prevent bowlers from facing abusive workloads.

Discussion and conclusion: The primary goal of professional sport is entertainment, with injury prevention a secondary goal only. Sporting administrators in multiple sports have shown willingness to implement rule changes to reduce injuries, but generally on the condition that the rule change must be accepted by a large body of players and fans. Where there is the potential for significant player or fan backlash against a rule change designed to increase player safety, it may be rejected. Because injury prevention should be a much more prominent goal in amateur sport, perhaps the rules of professional and amateur sport should differ more radically with a slant further towards injury prevention in amateur sport.

494   Implementation of safer sport at community level – Triathlon and field hockey case studies

P. Tate[1]* ▪ [1]Hockey NSW

Safer participant practices and injury prevention is paramount to all sports intending to survive, and indeed prosper, in this highly litigious and competitive world. To ignore potential safety trends is to ignore industry guidance and encouragement from the Australian Sports Commission and state government sport and recreation departments (significant grass roots funding providers) and also disregards the fears and anxieties of parents and partners who expect not only fair and enjoyable sporting activity for their loved ones, but overwhelmingly a safe sporting environment in which to participate. In 2010, Triathlon NSW identified from 400+ post-event technical and safety reports that overtaking manoeuvres during the cycling leg was the sport's most risky component. To educate competitors, actual size vinyl banners were manufactured and prominently displayed at major events throughout NSW to depict the 7m long bicycle draft zone which is the safe and enforced distance to trail behind the leading competitor. Meantime, the International Hockey Federation reviewed the global playing rules in response to numerous injuries within their sport. Research indicated 72% of match injuries occur within the 25m zone of the goal. A rule change was introduced to reduce the risk and consequently all governing bodies adopted the modified rule which states free hits taken within the 25m zone of the opposition goal cannot be hit directly into the goal circle. Other related modifications included the ball having to travel 5m before entering the opposition goal circle. These rules reduce the incidence of injury by reducing player congestion within that area of the field. In the case of both sports there was a willing and enthusiastic indoctrination for participants by development officers, technical officials and coaches right around NSW, motivated by the fact that a safer sport enhances their standing with all stakeholders. For hockey, the rule modifications have seen an 18% reduction in injuries occurring within the 25m zone of the field, calculated from insurance claim data and also from injury reports submitted after tournament matches and State Championships. The triathlon results are just as satisfying with the accident rate reduced by 28% at all NSW triathlon events since the education program was introduced. For second-tier sports such as triathlon and field hockey with restrictive budgets, limited resources and significant time constraints, we depend on both internal and external research data to ensure the sporting environment, especially at grass roots community level, is fair, enjoyable and above all safe.

495   FFA – Making sport safer in the real world

M. Bulkeley* ▪ [1]Football Federation Australia

Football (soccer) in Australia identifies injury prevention priorities through its own injury surveillance of the A-League and National teams.

Through football's international body (FIFA) Australian football has access to Injury Prevention resources such as the FIFA 11+ program. Dissemination and implementation of Injury Prevention Programs has not been possible until recently with the building of Website resources and a National Online Registration. Also a revamp of coaching courses and club accreditation criteria have created other opportunities. The large participation rate (>1 million) across Australia presents special problems of improving football safety relating to club governance and associations. While most participants are registered many more are not (e.g. school, church, corporate competitions).

Presently information (and annual premiums) from insurance companies are our only injury monitoring system. Ongoing chronological surveillance into soccer injuries at the community level would be obviously more beneficial in determining whether injury prevention strategies are effective.

496   The challenges of using research to make community rugby league safer

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Rugby League is an 'invasion' sport involving physical contact that carries with it a risk of injury. Participant safety using the best available injury prevention methods is a priority for all the games' administrators with an emphasis on duty of care for all involved in the game. Administrators are also acutely aware of the challenges involved in managing the public perception and media coverage of safety and injury-related aspects of the sport particularly when looking to recruit and retain junior participants. In recent years the League has conducted research into several areas including injury surveillance, safety policy and practice audits, weight and age-based participation for juniors, and burn out for elite juniors (16–18 years) who participate in school and junior pathway programs. There has also been pressure on the sport to investigate concussion following recent media reports. Some of the challenges facing Rugby League when accessing and using available injury prevention and safety research evidence include the transferring of research findings from: 1) the elite level to the community level of the sport (what is true and appropriate for one is not necessarily true and appropriate for the other) and 2) other sports to rugby league (e.g. head injury research from the US). Rugby League, like all sporting organisations operates in a political context and has historically amended rules or adopted programs based not on research evidence but more by weight of numbers and opinion of certain sectors of the game. One big challenge facing sport, particularly at community level is the working relationship between community clubs and academics. Volunteers at club level are by nature 'doers' and they can often struggle with the ethical and scientific rigor required when participating in research. The Rugby League has recently established a Rugby League Research Board with representation from academic institutions such as Sydney University, University of NSW, and University of Technology, Sydney. The League has identified projects internally that require research and researchers interested in ensuring that their projects are relevant to the needs of the sport should consider contacting the League prior to developing research proposals to ensure research outcomes will lead to improvements in the sport. The introduction of the new ARL Commission in February 2012 provides new opportunities for academic-sport research partnerships because the Commissioners have directed all departments, especially Game Development and Football operations "to submit programs that are well researched and have benefit for the Game with supporting evidence".

497   Think again: Social marketing campaign

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Introduction: Less than 10% of Canadian children are currently meeting Canadian physical activity (PA) guidelines. Though Canadian mothers (Moms) are aware and concerned about the inactivity crisis among children, they often think that other children are at risk, not their own. This is important because Moms play a significant role in encouraging and organizing children's PA.

The Campaign: Think Again ParticipACTION created the "Think Again" campaign that helped Moms realize it is their children (5–12 years) that are not active enough. Further, ParticipACTION wanted to help Moms understand that children need 60 minutes of moderate-to-vigorous-intensity PA every day. Using the "Think Again" concept, ParticipACTION developed an integrated marketing communications plan (e.g. broadcast media, print media, social media, PR) that addressed all pillars of McGuire's Hierarchy of Effects model.

Results: Three English and two French commercials, supported by four print ads (English and French) and one digital banner ad (English and French), were developed. The website was revamped to ensure the creative treatment and information was connected to the campaign and that specific sections educated Moms on how to fit 60 minutes of PA into a child's day. The ParticipACTION blog and social media platforms provided additional, personalized content that addressed typical barriers faced by Moms and children. Through social media, ParticipACTION shared real-life personal stories to increase relevance and saliency and to change attitudes. During the period of the campaign, ParticipACTION realized significant traffic to its digital media platforms (e.g. 395,424 visitors), achieved 201.9 million earned media impressions, and had online PSAs that generated an additional 908 million impressions. Of those who recalled the ad in the general population, 91% of English and 87% of French responders correctly identified the slogan, "Fact is, kids need at least 60 minutes of physical activity per day. Every day." In the target population, 94% of English and 92% of French correctly identified the slogan. Over half of respondents (70% English, 52% French) did something as a result of seeing the campaign. Among the target population, the majority started looking for opportunities to get active as a family (36% English, 36% French); talked to their children about being more active (28% English), and made stricter rules with regard to time spent on sedentary behaviours (26% English, 15% French).

Discussion: Targeted ads, as part of an integrated marketing approach, can be successful in providing information and encouraging mothers to support their children's PA.

498 Who do we reach? Campaign evaluation of Find Thirty every day® using awareness profiles in a Western Australian cohort

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Background: Population based mass media campaigns are part of a comprehensive approach to communicate and influence physical activity behaviour change. Campaign awareness (prompted and unprompted) is the most frequently reported, short term measure of campaign effectiveness. Most studies compare behaviour change over time between those who are aware and those unaware of the mass media campaign. Very few studies have tracked levels of awareness in the same respondents, across a serial mass media campaign. Yet different patterns of awareness or 'awareness profiles' may exist such as: 'never', 'early', 'late', or 'always' aware. Using these four 'awareness profiles', we will report on the evaluation of the Find Thirty every day® campaign presenting results on demographic differences between groups and change over time in levels of walking and total physical activity.

Methods: Find Thirty every day® was a population-wide mass media campaign delivered in Western Australia between 2008–2010. Multiple communication channels were used including: 30-second television advertisements, radio, print media and billboards. The study cohort comprised 405 participants, who completed periodic computer assisted telephone interviews that included questions on unprompted and prompted recall of the campaign over the two years.

Results: Almost one third (30.4%) of respondents were 'never aware' of the campaign, with 10% 'always aware'. The remainder of respondents recalled the campaign at only 38.0% ('early') or 21.9%, ('late') aware. There were no significant demographic differences between the awareness profile groups except on gender. Surprisingly, there were no significant differences between the 'awareness profiles' on walking or total physical activity at follow up.

Conclusions: This study applies a new approach to the assessment of campaign awareness. The results show the Find Thirty every day® campaign messages delivered over two years resulted in more fluctuating levels of awareness, and overall a low level of sustained awareness. The use of awareness profiles can provide greater insights into the reach of mass media campaigns and these findings have important implications for the planning, execution and evaluation of future campaigns aimed at physical activity in adult populations.

499 Turning health policy into health promotion: A critical analysis of causality in a United Kingdom health campaign

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The UK Department of Health (DOH) is responsible for the nation's government health policy. Similar to other health departments around the world, the DOH, through the National Health Service, makes great effort to influence health outcomes. In England in 2009 Change4Life was established, which attempts to 'drive, coax, encourage and support people … [to] eat well, move more and live longer'. The programme intends to reach 'everyone'. According to the DOH, such was the extent of the obesity problem, the campaign would 'need to achieve a scale never previously witnessed'. Contemporary health promotion logic suggests that health research informs public policy, which in turn leads to a marketing campaign. This research tests this logic through a critical analysis of research, policy and marketing material which contributed to Change4Life. A critical health psychology perspective (Murray & Campbell, 2003; Marks, 2004) is employed to understand how ideas about health are produced between health research, policy and the eventual marketing campaign. A variety of UK Department of Health research, policy and marketing documents from 2008 to 2011 were analysed. The analysis focused on the continuity of ideas about causes of good health and poor health. This research found that ideas about the causes of poor health and good health are modified throughout the health promotion process. In the case of Change4Life, this resulted in marketing tactics which were wholly contrary to the preceding psychographic research. In particular, "critical insights" in the research phase regarding how parents understand health messages were not incorporated into the resultant marketing. In the case of Change4Life, the oscillations identified indicate disjunctures in the health promotion process. For future marketing campaigns, these findings are significant to the extent they suggest a need for a reflection about the flow of ideas throughout the health promotion nexus. The findings also indicate a limitation of framing research, which positions public health as a set of organisations with synonymous principles and practices. The oscillations suggest a more nuanced research approach might be useful to study causal dynamics within policy in general and health promotion in particular. Since oscillations about causal claims appeared despite significant resources devoted to Change4Life, it is apparent there is a need to reflect on the use of social marketing in health campaigns.

500 Community-wide campaign using social marketing to promote physical activity in middle and old-aged people: A cluster randomized controlled trial*

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Introduction: Recently, community-wide campaigns (CWCs) have received broad attention for promoting physical activity. However, well-designed trials assessing the effectiveness of CWC for promoting physical activity are insufficient. Therefore, this study aims to evaluate the effectiveness of a CWC for promoting physical activity in middle and old-aged people.

Methods: A cluster randomized controlled trial with a community as the unit of randomization was conducted using a population-based random-sampled evaluation by self-administered questionnaires. The evaluation sample included 6000 people aged 40 to 79 years living in communities located in Unnan City Shimane, Japan. We randomly allocated 9 communities into intervention group and 3 into an evaluation-only control group as clusters. The intervention was a CWC to promote physical activity comprised of information, education and support delivery which were decided according to the social marketing process. Social marketing process included situational analysis; market segmentation and targeting; setting objectives; and marketing strategy development. In this study, we analyzed the data of baseline in 2009 and a 1-year follow-up in 2010. The primary outcome was a change in the engagement in the regular physical activity based on the previous recommendation (ACSM/AHA, 2007, 150+ m/w walking and/or daily flexibility activity and/or 2+ d/w muscle-strengthening activity). According to our logic model for the CWC, we also analyzed awareness, knowledge, belief and intention variables.

Results: A total of 4414 (73.6%) respondents in the study communities were included in the analyses. The awareness of the CWC was 79% in the intervention group. The knowledge about physical activity in the intervention group was significantly higher than the control group at 1-year follow-up (P<0.001). However, there were no significant differences between groups about belief and intention (P=0.69 and P=0.34, respectively). The primary analysis revealed the 1-year CWC did not significantly promote the recommended level physical activity (control: 65% to 60%; intervention: 63% to 59%, adjusted odds ratio: 0.97 (0.84–1.14)).

Discussion: The CWC successfully reached most of residents and changed their knowledge in 1 year. However, it did not significantly promote behavior, physical activity in itself. These results were consistent with Baker and his colleagues' logic model (2011) for community wide interventions which suggested that changes in awareness and knowledge could be observed in short term, while changes in belief, intention and behavior might need a longer period. Effects in medium and long term of this CWC will be examined in the future.

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501 Unplug and Play: Helping families to switch off the screen

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Introduction: Almost three-quarters of Western Australian (WA) primary school aged children exceed the Australian recommendations for electronic media use. In 2008, the Heart Foundation developed Unplug and Play, funded by the Department of Health WA. This low-budget initiative was WA's first campaign to address the time children spend in sedentary behaviour, particularly electronic media for entertainment. The campaign targeted parents of children aged 6–12 years, and aimed to raise awareness of the health issue and national guidelines, and provide solutions to reduce electronic media use and increase active play.

Methods: The campaign featured radio and print advertising, a supporting brochure delivered to parents through schools, a webpage and public relations activities. Solutions based messages were themed around the results of formative research with parents and addressed social and physical environmental influences on sedentary behaviour at home. The campaign featured two phases of advertising materials across seven media bursts. Post campaign impact evaluation consisted of cross-sectional computer assisted telephone interviews of parents (n=405) in 2008 and 2011.

Results: Total awareness of the campaign increased from 48% in 2008 to 64% in 2011 (p<0.01), with over 90% of parents who were aware correctly comprehending the message at both times. On weekdays, 62% of children in 2008 and 54% in 2011 exceeded two hours of electronic media use a day. On weekend days this was higher at 92% in 2008 and 88% in 2011. Most families in 2008 (82%) and 2011 (87%) had household rules about electronic media use at home. Almost all parents reported rules were important and effective in controlling electronic media use, yet 25% found rules hard to enforce. Approximately one third of adults did not abide by the rules and 68% indicated rules did not apply during school holidays. Changes in the home physical environment between 2008 and 2011 included a significant increase in electronic game consoles at home (p<0.05) and a decrease in VCRs (p<0.01). Additionally by 2011, television (100%), personal computer (99%) and internet access (98%) had almost reached saturation.

Discussion: This modest campaign was able to penetrate the parent target population with evidence based messages for strategies to limit children's electronic media use. However, despite increased campaign awareness, electronic media use on weekends and holidays remains particularly high. Given the prevalence of sedentary behaviour and the increasing accessibility of sedentary entertainment options, further interventions to limit children's screen-time and encourage active play are warranted.

502 Motivated to walk but nowhere to walk to: Moderation of a mass media campaign by mix of local destinations

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Introduction: The importance of promoting regular moderate-intensity physical activity, particularly walking, to reduce the risk of numerous chronic diseases is well established (Bauman 2004, World Health Organization 2004). Mass media is an important strategy used to increase population levels of physical activity (Cavill & Bauman 2004). *WV Walks* was a mass media campaign targeting insufficiently active adults (aged 40 to 65 years) to increase their walking in North-Central West Virginia (Reger-Nash et al. 2008). Having a variety of neighbourhood destinations shows well-established associations with walking in the literature (Duncan et al. 2005, McCormack et al. 2004, Owen et al. 2004). However, little is known about how the impact of mass media walking-focused campaigns might vary by neighbourhood destination opportunities for walking.

Methods: Baseline telephone surveys (n=1223 adults aged 40 to 65 years) pre-campaign in the intervention region North-Central West Virginia (response rate=57%) and 611 in the comparison community (response rate=46%). Follow-up surveys, post-campaign, were successfully completed on 887 respondents in the intervention community and 426 respondents in the comparison community. A destination mix score (range 0–15 self-reported destinations) was created, and dichotomised into low (0-3 destinations, n=622) and high scores (4+ destinations, n=683). Differences in mean baseline days walked and mean change in days walked, between respondents with high and low destination scores, were assessed using Mann-Whitney and T-tests respectively. Regression analysis assessed the relationship between changes in days walked and access to a mix of destinations in intervention and control communities, adjusted for gender, age and education.

Results: An increase in days walked among insufficient walkers, in the intervention group were significantly greater in those with 'high' access to destinations (mean=1.65), compared with 'low' access (mean=0.95). Results of the adjusted regression models, when confined to those insufficiently active at baseline in the intervention community, showed respondents with high destinations increased their walking by 0.64 days more than those with low destinations (p<0.05). There was no significant difference in high versus low destinations within the comparison community.

Discussion: Living in a neighbourhood with a greater mix of local destinations may increase the behavioural response to a mass-mediated walking campaign in the target group. Careful consideration of environmental barriers to campaign communications is needed for future campaign planning.

503 Physical activity mass media campaigns: Impacts on different socio-economic groups

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Introduction: People who are poor, who live in disadvantaged areas and who have low levels of formal education, have poorer health and earlier mortality that people who have material resources, live in affluent neighbourhoods and have high levels of formal education. Purposive mass media campaigns have been a popular means of conveying public health information over recent decades in many developed countries.
Objectives: This research was undertaken to examine whether population-wide mass media campaigns impact equally on all socio-economic groups.
Methods: Data from the evaluations of two physical activity campaigns in Australia and one in Hawaii were reanalyzed to assess the differences between different education groups in: campaign recall, knowledge about physical activity recommendations, self-efficacy for physical activity, intention to be active and physical activity behavior.
Results: Recall of all three campaigns was equally likely in all educational groups. Improvements in knowledge appeared to slightly favour the more educated. Self-efficacy improved only in one campaign and there was a slight trend of more improvement in self-efficacy among the least-well educated in that campaign and was related to campaign recall. There were no differences between education groups in the likelihood of improvement in intention to be physically active. There were no significant increases in physical activity behavior following any of the campaigns or in any education group.
Conclusions: These results confirm evidence from other campaign *evaluations that* the impacts of physical activity mass media campaigns are similar in different socio-economic groups. There is room for improvement in the design and execution of physical activity mass media campaigns so that they have a more positive impact on the least active, and most disadvantaged in our communities.

504 "I like to watch" – audience experiences of media coverage of physical activity and sedentary behaviour

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Introduction: The mass media are recognised as key elements of the obesogenic environment and powerful influencers of public understandings and behaviours. There is growing recognition of the public health implications of media framing of causes, solutions and responsibility for physical activity (PA) and inactivity and the need for more intensive research investigating physical activity-related media. Media messages can only contribute to healthy active living if audiences are exposed to the messages and respond to them by adopting healthier activity patterns. This qualitative study investigates audiences' experiences of and assessments of media coverage of activity and inactivity.
Methods: We interviewed 46 members of the public from five weight categories, three age groups and three geographical regions. We asked them what they thought about media coverage of physical activity and sedentary behaviours. Analysis of resulting interview transcripts employs content analysis, frame analysis and thematic nVivo coding. Ethics clearance has been obtained from the institutional HREC committee REF NO. 2010-033A. Funding for this Discovery Project was provided by the Australian Research Council.
Results: Many of these members of the public commented that there was not enough news and media coverage about physical activity, that the media focused too much on professional, commercialized sport, sensational news and conflicting information and provided too little coverage of the 'practical', 'day to day stuff'. Participants said they liked to watch professional sport: "I like physical activity – I could watch it all day", media coverage can be encouraging, and government campaigns were visible, but they would like to see more news coverage of non-professional PA and more educational and advisory information. Audiences said inactivity received even less media coverage and was usually associated with obesity stories. Many participants had seen media coverage of kids spending too much time on computers but some said there was too little about adult inactivity and sedentary jobs. The media could offer more practical advice, although one participant acknowledged resisting media messages: "I might not listen to it as much because I know that I need to get out more."
Discussion: Media audiences appear to be receiving more messages about obesity and overweight than about physical activity and inactivity, audiences feel the focus is often on children and lacks practical advice about causes and solutions. Interventions aimed at increasing interactions between physical activity researchers and professionals and the media have the potential to draw the media spotlight onto the crisis of inactivity.

505 Adolescent walking and biking to school in the Danish SPACE Study: The influence of individual, social and school site factors

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Introduction: Active transport to school (ATS) contributes to adolescent physical activity, but the prevalence of ATS seems to be declining worldwide. In Denmark there have been reported some of the highest prevalence's for ATS – especially biking to school – but there are a large variation between schools. The aim of this part of the SPACE Study was to investigate the influence of individual, social and physical environmental variables on adolescent ATS in Denmark.
Methods: This part of the SPACE study draws data from the baseline measurement of 1348 adolescents attending grade 5 and 6 in 14 schools in the Region of Southern Denmark. Information about ATS was assessed with a 5-day diary. The independent variables were obtained through school records, student questionnaire, Statistics Denmark and GIS data from Danish Cadastre. The effect of the independent variables on adolescent ATS was evaluated using multilevel statistical models.
Results: 1269 adolescents with a mean age on 12.5 years (SD 0.6) reported at least 6 trips to or from school. The modal spilt was 13.5% walking, 72.4% biking, 8.2% by car and 6.0% by bus. The network distance to school had a negative relationship with ATS. For trips below 1 kilometer active travel modes accounted for 96.5% of all trips and the active modal share was still high up to 4 kilometers e.g. 93.6%, 75.1% and 62.8% for the trips between 1.0–1.9km, 2.0–2.9km and 3.0–3.9km, respectively. Besides the negative association with network distance to school the multivariable analysis showed that children had significant higher odds ratio for ATS if they perceived their route to school as safe. They had significant lower odds

ratio for ATS if they agreed in high speed traffic in their neighborhood and higher odds ratio if they agreed on many neighborhood paths. Age was positively associated with ATS while gender didn't show a significant relationship. On the social level the adolescents had higher odds ratio if they agreed that their parents biked weekly or encouraged biking, and if their parents had higher household income and Danish ethnicity. On the physical environmental level the school walkability index was also significantly associated with higher odds ratio for ATS.

Discussion: The result supports the ecological health behavior model and previous conceptual frameworks which states that ATS has multiple pathways on different levels i.e. individual, social and physical environmental. In our sample where ATS prevalence was high, many of the independent variables showed significant relationship.

506 Is the bus an overlooked source of active transport to school in Canadian youth?

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Introduction: Active transport to school is associated with greater levels of physical activity (PA) and is integral to youth health-promotion strategies; yet many schoolchildren live great distances from school or in unwalkable neighbourhoods, rendering passive transport a necessity. Subtle PA-differences between car- and schoolbus/transit-users have been reported in youth, but most research focused on the active vs passive transport paradigm. Hence, we aimed to assess the association between all modes of transport and objectively measured PA in Canadian youth.

Methods: We recruited students from 10 secondary schools in British Columbia, Canada to participate in the Health Promoting Secondary Schools Study (n=440, 49% boys; 15.3±0.4yrs; Fall 2011). As part of the school-based assessment, participants completed a travel survey and wore an accelerometer (ActiGraph GT3X(vertical)/GT1M) for 7 days. For the present analyses, inclusion criteria for accelerometry were ≥10hrs wear-time on ≥2 weekdays and valid travel data (n=219, 42% boys). We converted accelerometer counts to daily minutes of moderate-to-vigorous-PA (MVPA; ≥3METs) for an average school-day, and an hour before and after school.

Results: Car was the most common form of transport (39%), followed by active transport (37%) and schoolbus/transit (24%). There was no difference in boys' school-day MVPA using active transport (96.6±28.2min) or schoolbus/transit (95.5±32.3min), but both were significantly higher than car users (71.2±24.5min). In girls, active transport users (82.1±22.8min) accumulated significantly more MVPA than car users (63.7±24.9min), but neither was different from schoolbus/transit users (76.2±28.9min). Car users' MVPA was significantly lower during the hour before (approx. -50%) and after (approx. -30%) school than in other transport users. When commuting hours were discarded, car users accumulated significantly fewer minutes of MVPA during the remainder of the school-day (boys: -18min (95% CI -29.2–-6.7), girls: -9min (95% CI -17.3–-1.3)) than other transport users, and were less likely to achieve government guidelines of ≥60 min MVPA/day (Boys: OR 0.21, 95% CI 0.06–0.72; Girls: OR 0.40, 95% CI 0.19–0.86).

Discussion: Compared with youth who actively commute or use the schoolbus/transit, youth who travel to school by car were not only less active during commuting hours, but also throughout the rest of the school-day. Mechanisms are elusive, but may include a reduced PA-facilitating independence or a more sedentary lifestyle in elective car users. Further research in larger, more representative samples is warranted. Regardless, schoolbus/transit use should be encouraged and facilitated among youth.

507 Parents' neighbourhood self-selection and children's active transport to school

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Introduction: Active transport to school (ATS) is an important contributor to overall physical activity levels in youth. Distance to school is widely acknowledged as a key predictor of active transport behaviour. Although neighbourhood walkability is recognised as a key predictor of active transport in adults, this relationship is not well understood for children. The effect of parents' preference for high walkable neighbourhoods on children's transport to school, also, is not known. The purpose of this study was to investigate the relationship between neighbourhood walkability, parents' neighbourhood self-selection (NHSS) and children's active transport behaviours.

Methods: Data were drawn from the Understanding Relationships between Activity and Neighbourhoods (URBAN) study; a multi-centred, stratified, cross-sectional study of associations between physical activity, health, and the built environment in adults and children residing in New Zealand (NZ). Participants were recruited randomly from 48 neighbourhoods (stratified by high/low walkability, high/low Māori population) across four NZ cities. Data are for 188 children (94 male) aged 6–14 years, with a mean (SD) BMI of 17.2 (3.0). Parents' NHSS for a walkable neighbourhood was classified as "prefer high walkability, live in high walkability" and "other". ATS (walking or cycling) was treated as a repeated measure for all days of school attendance. Bivariate logistic regression was conducted and factors related to ATS at P<0.20 entered into a multivariable logistic regression model. Backwards elimination of non significant factors was conducted until all factors remained significant.

Results: Gender (female), age (older vs younger), high neighbourhood walkability, short distance to school (< 750 m), and NHSS were significantly associated with ATS p<0.01. Following backwards elimination of multivariable logistic regression model, female sex, distance to school, and NHSS remained significant. Those living between 750 m and 1500 m (OR 0.36, 95% CI 0.24, 0.56) and those living >1500m away (OR 0.15, 95% CI 0.08, 0.27) were less likely to ATS (p<0.001) than children living <750 m of school. Girls were more likely to ATS than boys (OR 1.99, 95% CI 1.30, 3.00, p=0.001). Those living in a high walkable neighbourhood with parents who preferred a high walkable neighbourhood were significantly more likely to ATS than their counterparts (OR 2.14, 95% CI 1.37, 3.33, p=0.001).

Discussion: The results indicate that parent preferences for high walkable neighbourhoods may have a stronger influence on children's ATS than residing in a high walkable neighbourhood alone.

508   Young and free? A study of children's independent mobility in urban and rural Australia

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Introduction: Evidence suggests that Australian children's active transport (e.g. walking/cycling for transport) has declined in recent decades. However, little is known about their independent mobility (i.e. freedom to move without adult accompaniment), which is beneficial for their mental and physical health. This study aimed to examine children's independent mobility in urban/rural areas.

Methods: Cross-sectional study of 430 primary (48% boys; 72% urban) and 258 secondary schoolchildren (52% boys; 51.6% urban) and their parents. Using surveys parents reported mobility licences granted to their children (e.g. being allowed to cross main roads alone), access to outdoor play spaces and mobile phone ownership. Children reported their independent mobility on school journeys and on weekends. Mobility licences and independent mobility were examined by sex, urban/rural location and age-group. Regression analyses examined associations between mobility licences and independent mobility; and how access to play spaces, and mobile phones were associated with mobility licences.

Results: On average, boys were granted more mobility licences than were girls, but there were no significant differences by urban/rural location. Independent mobility varied by urban/rural location on school journeys but not on weekends. Boys attending urban primary schools had highest rates (44%) of walking/cycling independently to school; those attending rural secondary schools had the lowest (14%). For all boys, each additional mobility licence was associated with increased odds of walking/cycling independently to school, regardless of age-group or urban/rural locality. Associations between these variables varied by age-group among urban girls (primary, OR=1.81; 95% CI 1.30–2.51; secondary, OR=0.71; 95% CI 0.55–0.92), but were not significant for rural girls. Around half of all primary schoolchildren did no independent activities on the weekend. For boys attending urban primary (OR=1.81; 95% CI 1.13–2.89) or rural secondary schools (OR=2.34; 95% CI 1.46–3.76), and girls attending urban secondary schools (OR=2.02; 95% CI 1.07–3.83), each additional mobility licence was associated with increased odds of engaging in at least one independent activity on weekends. Among urban boys (primary, B=0.45; 95% CI 0.32–0.59; secondary, B=0.49; 95% CI 0.18–0.79) and rural primary school-aged girls (B=0.55; 95% CI 0.20–0.91) access to outdoor plays paces was significantly associated with mobility licences. Mobile phone ownership was associated with mobility licences only among boys attending urban primary schools (B=0.85; 95% CI 0.11–1.59).

Discussion: Many Australian children in urban and rural areas lack independent mobility. Further research should examine social/physical environmental influences on parental restrictions to inform interventions that aim to promote independent mobility.

509   The influence of ethnicity on children's independent mobility

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Introduction: Independent mobility (unsupervised play and travel) is an integral component of physical activity. *The Kids in the City* (KITC) study is investigating family and neighbourhood influences on the independent mobility and physical activity of children 9–11 years living in six suburban neighbourhoods in Auckland, New Zealand. A mixed methods approach has been used to collect quantitative (GPS, accelerometer, travel diaries) and qualitative (go along interviews) data from children. Parents' role as 'gatekeeper' to their children's independent mobility and physical activity has been examined through computer-assisted telephone interviews (CATI) and focus group discussions. This paper examines predictors, including ethnicity, of children's transport mode use in the trip to and from school.

Methods: The paper draws on CATI survey data gathered from 153 parents (17% Māori, 24% Samoan, 27% Other Pacific ethnicity, 12% European, 20% Asian/other). The survey covered child, parent and household demographics, perception of neighbourhood physical and social environments, child's mode and accompaniment to and from school, and independent mobility to other settings, parent's neighbourhood safety concerns, household car and bike availability. An ordinal logistic regression model was used to examine the extent to which transport mode to and from school was predicted by demographics and neighbourhood variables. The ethnic group categories used in analyses were: Māori, Samoan, Other Pacific ethnicities, and European/Asian/other. The three categories for transport mode use to and from school were: car both ways, walking both ways, and mixed mode use.

Results: Car availability (p<0.0001), connectivity (p=0.003) and ethnicity (p=0.001) were significant predictors of transport mode to and from school. Gender (p=0.7) or having an older sibling (p=0.1) were not. The odds of a child of 'Other Pacific Island' ethnicity walking both ways were 6.1 times greater than those of a child of 'European/Asian/Other' ethnicity (p=0.001). The odds of a child of 'Other Pacific Island' ethnicity walking both ways were 4.1 times greater than those of a child of 'Samoan' ethnicity (p=0.02). For every 1-unit increase in connectivity score, the odds of a child walking both ways increases by 37%.

Discussion: The study provides evidence that ethnicity and social connectivity are associated with children's transport mode use in the trip to and from school. The study suggests changes in neighbourhood social relations and ethnic specific practices may provide opportunities for reducing restrictions placed on children's movement.

510   Using travel diaries for measuring children's independent mobility and active travel – Examples and experiences

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Introduction: Travel diaries are increasingly being used to measure children's independent mobility (IM) and *active travel (AT)*. However, the methodological procedures and challenges of collecting travel diary data from children are usually not reported in papers.

Purpose: To provide an overview of issues related to using travel diaries to measure children's IM and AT, and identify best practice procedures to maximise response rates and compliance.

Methods: Three case studies will be presented: 1) the combined Independent Mobility and Active Travel in Children/Children's Active Travel, Connectedness and Health Studies (Australia); 2) the Kid's in the City Study (New Zealand), and 3) the Transit Oriented Development Study (Australia). Methodological procedures and experiences relating to travel diary data collection, participant compliance, data quality and appropriate thresholds for data inclusion were examined.

Results: Travel diaries had to be simple and visually appealing in design to promote participants' compliance. Children required clear definitions of travel related concepts (e.g. journey, trip). The diaries provided important contextual information on children's IM and AT related travel, including frequency and duration of trips, trip accompaniment, and frequented destinations. A diary period of at least four days including weekdays and weekend days was required to capture children's travel behaviour sufficiently, while not over-burdening participants. Numerous inconsistencies occurred when completing travel diaries. These included destination irregularities, inaccurate departure and arrival times, and underreporting of incidental and short duration journeys. Overall, researchers spent considerable time on interviewing children to follow up on missing days or inconsistent information.

Conclusions: The collection of comprehensive travel diary data requires extensive monitoring and follow-up of the trips children record. Given the inconsistencies and missing days of child-reported travel diary data, this travel measurement alone is insufficient to fully capture children's travel behaviour. A combined approach of measuring IM and AT through various measurements such as travel diaries, surveys and GPS is suggested.

511 | The cycling 'dilemma' in youth: Was recreational- or commuter cycling first?

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Introduction: Cycling is associated with greater levels of health-related fitness in youth. Commuter cycling is rare in most Western societies, often stemming from parental concerns over safety. We previously postulated that recreational cycling might be a means to increase cycling competence and confidence in children and youth, leading to commuter cycling later on. The aim of this analysis was to investigate the longitudinal association between recreational and commuter cycling over a 2-yr period in English youth.

Methods: At baseline (T1, summers 2007–2008), grade 7 students (n=1611, 12.03±0.45yrs) from 10 state-run secondary schools in the East of England took part in the school-based health and fitness survey. All measurements were replicated 24 months later (T2, n=1579, 14.02±0.44yrs). This analysis was restricted to youth with valid T1 and T2 data on 7-day recall recreational cycling (dichotomised as never or ≥once/week) and regular school-commuting mode (n=1421, 54% boys). Multivariate logistic regression analyses were adjusted for area deprivation and bike ownership (T1: 97%, T2: 92%).

Results: The prevalence of commuter cycling was similar at the two time points (boys: T1 12.1%, T2 12.4%; girls: T1 2.0%, T2 1.4%). Recreational cycling was slightly more common in boys at T1 (75%) than at T2 (71%), but halved over the same period in girls (65% vs 33%). Commuter cycling at T2 was not significantly predicted (OR, 95% CI) by recreational cycling at T1 in either boys or girls, but was predicted by commuter cycling at T1 (boys: 10.3, 6.0–17.8; girls: 15.6, 2.7–91.4). Recreational cycling at T2 was significantly predicted by recreational cycling at T1 in boys (2.0, 1.3–2.9) and girls (1.7, 1.2–2.5), as well as by commuter cycling at T1 in boys (3.8, 1.7–8.5) and in girls (3.1, 0.9–11.3).

Discussion: Contrary to our postulate, recreational cycling did not lead to commuter cycling. Instead, the *present findings suggest* reverse-causality, whereby purposeful commuter cycling actually increased the odds for both continued commuter cycling and recreational cycling 2-yrs later. Our analysis is, however, limited by the low – albeit all too realistic – prevalence of (female) commuter cyclists (wide 95% CI). The time-course studied does not capture important phases of transition, such as primary to secondary school, or youth to adulthood. Future research is needed to fully evaluate the intricacies of cycling behaviours in youth; regardless, both recreational and commuter cycling should be encouraged.

512 | Children's cycling skills: Development of a test and determination of individual and environmental correlates

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Background: Cycling is an enjoyable and accessible form of physical activity for children. However, safety issues are found to be strongly related to cycling behaviors and the quality of children's cycling skills is found to play an important role in cycling accidents. Therefore, this study developed a test to gain a detailed insight into the cycling skills of 9-10 year old children and evaluated the relative contribution of individual and physical environmental factors in explaining variance in cycling skills.

Methods: Children (n=93; aged 9–10), from five primary schools in Flanders took a cycling test consisting of 13 test stations. In addition, parents completed a questionnaire on school commuting behavior and attitudes. An exploratory factor analysis was conducted to investigate the factor structure of the cycling test and ICC's were calculated to examine interrater reliability. Descriptive statistics were executed on children's cycling skill scores. Independent t-tests and One-way ANOVA were performed to examine differences in cycling skills. Regression analyses were conducted to evaluate the relative influence of individual and environmental correlates to cycling skills.

Results: Three factors were extracted: the 'during-cycling skills', the 'before/after-cycling skills' and a 'transitional-cycling skills' factor. These factors accounted for 56.74% of the total variance. Furthermore, ICC's ranged from 0.75 to 0.98. For each cycling skill 25% of children scored higher than 8/10. For cycling a slalom, cycling over obstacles and dismounting the bicycle 50% of children scored maximum. For cycling in a straight line, looking over the left shoulder, cycling on a sloping surface and signaling, 10% of the children scored lower than 3/10. Additionally, 18.4% of children scored lower than 3/10 on at least two cycling skills. Parental perceived motor competence of the child explained 10% of the variance in cycling skills (beta=0.33), residential density explained 12% of the variance (beta=-0.37). TV-watching (beta=-0.25) and family SES (beta=0.21) were also significantly associated with children's cycling skills.

Conclusion: In order to get an overall picture of the cycling skills of children, the 'during-cycling skills', the 'before/after-cycling skills' and the 'transitional-cycling skills' need to be examined. Furthermore, Flemish children of the 4th grade scored well on cycling skills. However, cycle training programs should focus more on one-handed skills and those children scoring lower than three out of ten on one or more cycling skills. Furthermore, children living in a low walkable neighborhood and children with good motor competences rated by their parents scored better on cycling skill.

513 Effects of school distance and travel mode on sedentary time in children

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Introduction: Sedentary behaviour is a likely contributor to overweight and obesity in children. Here we quantify the effect of travelling to and from school on sedentary behaviour.

Methods: Children (5–13 y, n=268) from four cities in New Zealand who participated in the URBAN study (Understanding Relationships between Activity and Neighbourhoods) wore a hip-mounted accelerometer for seven days. Minutes spent sedentary (accelerometer count <100 min^{-1}) were derived for school days for the two hours of school travel (0800–0859 and 1500–1559) and for two after-school hours in the late afternoon (1600–1759). Shortest street network distance to school was calculated from residential address using Geographical Information System procedures and parsed into tertiles (means of ~500, 1300 and 3000 m) for analysis. Children completed a daily travel log identifying mode of school transport, which was dichotomised into active (walking and cycling) and passive (motorised transport). Proportions (%) of sedentary minutes during the two travel hours and during the two after-school hours were analysed with an over-dispersed logistic mixed linear model that included adjustment for city, weather, gender and age. Effects were interpreted probabilistically relative to a smallest important difference in proportions of 5%.

Results: Children living in the middle tertile of distance from school were sedentary for a smaller proportion of travelling time (42±10%, mean±true between-child SD) than those living in the closest or furthest tertiles (47±10% and 49±10% respectively); the differences were clear and likely substantial (90% confidence limits±6%). Children who travelled by motorised transport were clearly more sedentary in each of the distance tertiles (closest to furthest: 50 vs 44%, 46 vs 39%, and 54 vs 27%; 90% confidence limits±7%). Children were much more sedentary in the late afternoon, with little difference between proportions in the two lowest tertiles of school distance (58±10%, 58±10%) and a possibly greater proportion sedentary in the furthest tertile (61±10%).

Discussion: The combined effects of time taken to travel actively and proportion travelling actively contribute to least sedentary time in children who live ~1–2 km from school. All children could benefit from after-school activities to reduce sedentary time, and those living furthest from school may have the greatest need.

514 Physical activity and school active transport behaviours of Queensland school children

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The Queensland Child Health Status survey series monitors behaviours that may threaten the health of children. This study reports on physical activity and active transport behaviours of 5 to 17 year olds. Computer assisted telephone interviewing was used to collect information from 2,484 parents/guardians on 1,292 boys and 1,192 girls (86% response rate) in mid–2011. Physical activity was defined as parents reporting that their child undertook 60 minutes or more physical activity every day in the past week. School transport data was collected for a usual week. Less than half (44%, 95% CI: 41.8–46.2) met the physical activity criterion, with boys being more active than girls (49.1% and 38.5%, respectively). The proportion of children meeting the physical activity criterion decreased with age (5–7 years 62.1%, 95% CI: 57.4–66.5; 8–11 years 52.3%, 95% CI: 48.3–56.3; 12–15 years 32.1%, 95% CI: 28.5–36.0; 16–17 years 26.4%, 95% CI: 21.6–31.8). About half (47.4%) travel to or from school every day by car, and three quarters (73.9%) travel to or from school by car at least once a week. Of children using active transport (overall 29.8%, 95% CI: 27.8–31.9), defined as walking or by bike or scooter (25.1%, 5.4% and 1.7%, respectively) to school, the average number of trips per week was 7.1 (95% CI: 6.8–7.4) with an average weekly duration of 104 minutes (95% CI: 96–111). The per trip average time for walking (16.1 minutes, 95% CI: 15.1–17.1) and cycling (15.8 minutes, 95% CI: 13.5–18) are similar. Trip time and total weekly duration commuting to or from school increased with age (12.6 and 20.6 minutes trip time, 69 and 140 weekly duration among 5–7 years and 16–17 year olds, respectively). Cycling to school is the preserve of boys in the later primary and early secondary years. The percentage of children meeting the physical activity criterion and doing active transport to or from school was significantly greater for 16–17 year olds (44.9%, 95% CI: 33.5–56.8) than 5–7 year olds (24.5%, 95% CI: 19.5–30.4). In logistic regression analysis adjusting for age, active transport was associated with 27% higher odds of meeting physical activity guidelines. When effect measure interactions between age and active transport were investigated, the odds of meeting physical activity guidelines were 2.5 times higher among active-transport-using youth aged 16–17 years compared to those aged 5–7 years. Active school travel may represent an opportunity to increase physical activity levels, particularly in older children.

515 Critical incidents in sport

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Critical Incidents (CI) shock members of an organisation and put the organisation's communication, action, and support structures under extreme pressure. The effects of a CI in sport are compounded by the complexity of the relationships found between the members of sporting clubs, organisations, and codes. Professional and personal relationships tend to cross hierarchical, socio economic, age, expertise, and cultural divides due to the members shared passion for their sport and all that that entails. This means that those charged with taking the lead are often under emotional duress at the time when they must act and provide support for the members. We will be using the racing and motorsports industries to illustrate the processes of CI development, implementation and maintenance. When a death occurs on the track, the whole industry feels it intimately; often those in investigative positions and those responsible for CI response have to deal with their own grief and shock while discharging their duties. Because of the interlocking and overlapping of relationships and responsibilities within the racing industry, it is crucial for the administration, or ruling body, of an organization, to respond promptly and personally to their shocked community. In addition to practical assistance, industry members need to know that the ruling body really cares and that there is an atmosphere of shared and ongoing concern. This presentation will introduce examples of critical incidents exploring individual and organisational responses to CI, while tracing the development of an industry specific CI protocol from its inception to implementation. In addition, we will relate some of our experiences as critical incident consultants, sharing a variety of the challenges and lessons we have learnt in the field.

516   Evaluation of physical activity interventions: A standardised approach

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Background: A key challenge for physical activity promotion is the identification of interventions that are effective at increasing participation in physical activity. It is essential that we build up a strong knowledge base of effective interventions, and that we encourage the discontinuation of ineffective interventions that may waste public resources. As well as detailed academic intervention research, there is an urgent need for systematically conducted evaluations of practical public health programmes. However, this is hampered by a lack of consistency in measurement. Research among public health practitioners in the UK indicates that while interventions are commissioned by a variety of organisations, they are often poorly evaluated, with inconsistent data being collected on outputs, impacts and outcomes.

Objectives: The UK's National Obesity Observatory set out to support high quality, consistent evaluations of weight management interventions, through the development of a standard evaluation framework (SEF) for weight management interventions. Building on the success of this initial document, a specific SEF for physical activity was produced, alongside a partner document on dietary interventions. The SEFs are intended to support the collection of data and facilitate future comparisons across public health programmes.

Methods: The physical activity framework includes a theoretical framework for evaluation, key data collection criteria and guidance on assessment methods. The framework was developed in conjunction with leading academics and public health practitioners in the areas of obesity, diet and physical activity, to ensure that the document was evidence-based, robust and suitable for application in a public health setting.

Results: The Standard Evaluation Framework (SEF) for weight management interventions was published in 2009. Training workshops and a user survey have shown the SEF to be widely used, including being a mandatory requirement for commissioning in some regions. The Physical Activity and diet SEFs have recently been published and feedback has been positive. An online tool has been developed to enable details of evaluations that have been conducted using the SEFs to be collated and compared. This work sets standards for key criteria for data collection when evaluating interventions relating to obesity or its behavioural determinants.

Conclusions: While the SEFs have been well received for their contribution to more systematic evaluation of weight management interventions, some significant challenges remain, including the shortage of validated tools to measure diet and physical activity; a lack of resources being allocated for evaluation; and an ongoing need for practical evaluation support.

517   10,000 Steps Flanders': Evaluating the state-wide dissemination of a physical activity intervention in Belgium

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Introduction: The whole-community intervention '10,000 Steps Ghent' (2005–2006) which was based on socio-ecological models, showed to have positive effects on adults' physical activity. As a result, in 2007 the Flemish government provided funding for the dissemination and implementation of '10,000 Steps' in the entire region of Flanders (Flemish-speaking part of Belgium – 6,250,000 inhabitants). The purpose of the present study was to evaluate the effects of 4 years of this state-wide intervention '10,000 Steps Flanders'.

Methods: In 2011, a random sample (n=1500) of the adult (25–75 years) Flemish population was selected. Respondents were contacted by telephone and asked to complete the long-version of the International Physical Activity Questionnaire (IPAQ) and some questions about awareness of the project. In addition, participants were requested to wear a pedometer and register their steps during seven consecutive days. The baseline study sample of the pilot intervention '10,000 Steps Ghent' served as the comparison sample for the present analyses: in 2005, the IPAQ was completed by 1682 adults and pedometer steps were obtained from 1240 participants. Comparison analyses between both samples were conducted using independent-samples t-tests.

Results: In 2011, a total of 965 respondents (64%) completed the IPAQ and 284 (19%) completed pedometer registrations. Comparison of the IPAQ data revealed that the present Flemish sample reported 39.6min/day more work-related (t=5.1, p<0.001) and 8.1min/day more leisure time (t=2.6, p=0.01) physical activity than the comparison sample of 2005. Also walking (t=5.8 , p<0.001), moderate- (t=8.4, p<0.001) and vigorous-intensity (t=9.3, p<0.001) physical activity were respectively 6.0 min/day, 27.6min/day, 9.7 min/day higher in the present Flemish sample than in the comparison sample of 2005. Transport-related (t=12.0, p<0.001) physical activity on the other hand, was 2.3min/day higher in the comparison sample than in the Flemish sample. Furthermore, the present Flemish sample took significantly more daily steps (10,856+/-4591) than the comparison sample of 2005 (9535+/-4112; t=4.5, p<0.001). Especially younger (18-59 years) men and older (60+ years) women of the Flemish sample showed higher proportions of meeting the 10,000 steps/day guideline compared to the sample of 2005. Finally, in 2011, 59.5% of the Flemish sample had already heard of the project, while this was 54% in the comparison sample of 2005.

Discussion: This study showed that a state-wide dissemination of the '10,000 Steps' project is likely to have contributed to increased physical activity levels in Flemish adults. Overall a positive impact was found, however, younger women and older men remain important target groups.

Methodological challenges in conducting a systematic review of community wide interventions to increase physical activity

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Introduction: Evaluating the effectiveness of interventions designed to increase the physical activity in communities is often a difficult and complex task, requiring considerable expertise and investment, and often constrained by methodological limitations. These limitations, in turn, create additional challenges when these studies are used in systematic reviews as they hinder the confidence, precision and interpretation of results.
The objective of this paper is to summarise the methodological challenges posed in conducting a systematic review of community-wide physical activity interventions to help inform those conducting future primary research and systematic reviews.
Methods: We conducted a Cochrane systematic review of community-wide interventions to increase physical activity. We assessed the methodological quality of the included studies. We will investigate these in greater detail, particularly in relation to the potential impact on measures of effect, confidence in results, generalizability of results and general interpretation.
Results: The systematic review was conducted and has been published in the Cochrane Library. A logic model was helpful in defining and interpreting the studies. Many studies of unsuitable study design were excluded; however several important methodological limitations of the primary studies evaluating community-wide physical activity interventions emerged. These included: the failure to use validated tools to measure physical activity; issues associated with pre and post test designs; inadequate sampling of populations; poor control groups; and intervention and measurement protocols of inadequate duration. Although it is challenging to undertake rigorous evaluations of complex interventions, these issues result in significant uncertainty over the effectiveness of these interventions, and the possible factors required for a community-wide intervention to be successful. In particular, the combination of several of these limitations (e.g. un-validated tools, inadequate sampling, and short duration) is that studies may lack the sensitivity to detect any meaningful change. Multiple publications of findings for the same study also made interpretation difficult; however, interventions with parallel qualitative publications were helpful.
Discussion: Evaluating community wide interventions to increase physical activity in a rigorous way is incredibly challenging. These findings reflect these challenges but have important ramifications for researchers conducting primary studies to determine the efficacy of such interventions, as well as for researchers conducting systematic reviews. This new review shows that the inadequacies of design and evaluation are continuing. It is hoped that the adoption of such suggestions may aid in the development of systematic reviews, but more importantly, in enabling translation of such findings into policy and practice.

Developing human dynamics models of physical activity and sedentary behavior to inform interventions

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Introduction: Developing and investigating physical activity and sedentary behavior interventions is expensive. There are a multitude of parameters and combinations of these to consider. It is virtually impossible to empirically find the optimum intervention. Advances in human dynamics offers showed that patterns of physical activity and sedentary behavior can be modeled. Computer simulations using these models should enable to optimize intervention parameters.
Methods: Human dynamics models of activity were developed using Markov chains and Queuing theory. The NHANES 2003–2006 accelerometry data (N~11625) were used to test the validity of models.
Results: Physical activity and sedentary behavior can be modeled based on stochastic models. Synthetic physical activity patterns generated are ecologically valid and reproduce amounts and variability of behaviors at individual and population level. The model accurately reproduce the pattern and statistics of bouts of sedentary behavior, and physical activity at different intensities (LIPA, MVPA, Vigorous).
Discussion: The effect of interventions can be modeled using Monte Carlo techniques based on these models and empirical evidence. Parameters of interventions can be evaluated before human testing enabling to refine and tailor intervention. As large database of objectively measured data such as NHANES and other (e.g. BIOBANK in the UK) are becoming available it is becoming possible to feed these models with enough empirical data to develop simulations equivalent to experimenting on a whole country scale. Coupled with health economics model these tools could help optimize cost/effectiveness of physical activity and sedentary behavior interventions.

Reporting of external validity elements among studies of physical activity interventions in Latin America

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Introduction: Systematic reviews are helpful for informing public health practice, however, they are focused primarily on intervention effectiveness. Yet, issues of potential population impact and feasibility influence real-world generalizability and represent critical information for public health planning. The current study assessed the reporting of external validity elements among articles of evaluated physical activity (PA) interventions conducted in Latin America (LA).
Methods: An external validity assessment tool (EVAT) was developed to gather information about the reporting of external validity elements among 19 studies from LA, published between 1980–2011, and classified as school-based PE (n=8), multi-component instructional programs (n=5), PA classes in community settings (n=4), community-wide policies and practices(n=1), and community-wide campaigns (n=1). These interventions were selected because they possessed sufficient evidence for recommendation from a recent systematic review, were candidates for recommendation, or were being widely implemented in practice. Adapted from previous tools and guides, the EVAT was designed for evaluations of programs, as well as environmental or policy interventions. It was organized into five sections: *Reach, Adoption, Implementation, Outcomes for Decision-making*, and *Maintenance and Institutionalization*. Two abstractors were assigned to independently assess each study with subsequent discussion about any discrepancies. Descriptive analyses included the frequency of studies reporting each element and overall.

Results: The average reporting of elements was 31% (range=0-100%). Three elements describing Reach were reported by most studies (58–95%), with representativeness being reported by only 5% of studies. Few studies reported on elements related to *Adoption*, namely recruitment (26%), participation (5%) and facilitators of intervention adoption (32%). Regarding *Implementation*, nearly all studies reported intervention characteristics (100%) and frequency of intervention exposure (84%). Few studies reported other information about the delivery agents such as selection process (11%), participation rate (5%), training (37%) and payment (11%). For *Outcomes for Decision-making*, 68% of studies reported them in a way that could be compared to clinical guidelines or public health goals, and 32% reported other benefits of the intervention beyond PA. However, few studies reported effects on quality of life (11%), adverse consequences (5%) and cost of intervention (16%). The six elements representing *Maintenance and Institutionalization* were reported by less than half of the studies (16–42%).

Discussion: The reporting of external validity elements was low among studies of PA interventions in LA. Future research is needed to develop frameworks and tools for rating external validity. Enhanced reporting of external validity elements will aid in the translation of research into practice.

521 The impact of the 'Healthy Dads, Healthy Kids' community RCT on fathers' physical activity-related parenting practices and children's physical activity

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Introduction: The importance of the family in influencing the physical activity behaviours of children is well established. Emerging evidence has highlighted the importance of fathers as role models and facilitators of physical activity for their children. However, fathers are rarely targeted as agents of change in family-based programs. The primary aim of this study was to evaluate the impact of the Healthy Dads Healthy Kids (HDHK) program on children's physical activity levels and a number of key physical activity-related parenting variables.

Methods: RCT in 50 overweight/obese fathers (mean [sd] age=40.0 [5.3] years; BMI=32.7 [3.5]), and their children (n=86, 59% boys, mean [sd] age=7.8 [2.6] years) were stratified by fathers BMI category (overweight, obese class I & II) and randomised to one of two groups: 1) the HDHK program or 2) wait-list control group. The 3-month intervention involved fathers attending seven face-to-face group sessions (90 minutes each). Three sessions involved both fathers and children and four sessions *were attended by fathers only*. *Assessments* were *made at baseline* and 3-month follow-up for objectively measured physical activity (7 days pedometry) and parenting variables relating to physical activity (self-efficacy, beliefs, modeling, logistic support, rules, intention, limit sedentary behavior, co-physical activity, reinforcement and control) which were adapted from previously validated *parenting* measures.

Results: Results revealed a significant intervention effect for children's physical activity levels (p=0.045). Significant intervention effects were also found for a number of physical activity parenting variables; self-efficacy (p=0.008), modeling (p=0.003), limit setting/sedentary behavior (p=0.013), reinforcement/praise (p=0.006) and control/sedentary behavior as reward (p=0.002). No significant intervention effects were found for a father's beliefs, logistic support and intention.

Discussion: Participation in the HDHK program resulted in improved physical activity levels in children *and positively impacted* on fathers' physical activity parenting practices including paternal self-efficacy, role modeling of physical activity, limiting of children's sedentary behavior and reinforcement/praise for physical activity directed towards children. Our findings suggest that targeting and improving a father's physical activity-related parenting practices may be a promising strategy to improve children's physical activity levels.

522 Results from the dissemination of a telephone-delivered intervention for healthy lifestyle and weight loss: The Optimal Health Program

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Introduction: A strong evidence base supports the efficacy of telephone-delivered interventions targeting physical activity and/or dietary change across diverse settings and target populations. For such interventions to achieve their potential public health impact they need to be implemented and evaluated in a range of community practice settings. However, there is a paucity of published evaluations of such interventions in dissemination contexts. The recent uptake of the Logan Healthy Living Program (rebadged as the Optimal Health Program), an evidence-based 12-month telephone-delivered intervention targeting physical activity and healthy eating, by a community-based primary health-care organization, provided the opportunity to evaluate outcomes within an applied practice setting.

Methods: Overweight/obese primary care adult patients without chronic illness, living in an area characterized by socio-economic disadvantage were eligible for referral (by their General Practitioner) into the program which targeted weight loss, physical activity and healthy eating. Given the dissemination context, a single-group repeated-measures design was used with participants assessed at 6-months (mid-program and end of the more intensive phase of telephone contacts: n=109) and 12-months (end-of-program: n=46). Primary outcomes were objectively-measured weight and waist circumference and self-reported physical activity and dietary intake. Analysis was via paired t-tests or non-parametric equivalent per data distributions. As the program is ongoing, data presented come from a 'snap shot' of participant and program outcomes after approximately two years of the program becoming fully operational.

Results: The Optimal Health Program received 280 referrals, with 237 of 259 (92%) eligible participants consenting to participate and completing the baseline assessment (75% female; age=46.4±11.7 years; BMI=36.7±7.5 kg/m^2). A statistically significant improvement between baseline and mid-program was observed for weight [mean change (SE) -2.86 (5.58) kg] and waist circumference [-3.4 (6.6) cm], underpinned by significant physical activity and dietary behavior change. Improvements in weight [mean change (SE) -4.6 (7.5) kg], waist circumference [-3.1 (9.2) cm], physical activity and diet were also observed at end-of-program. Among program completers (n=46), the median number of calls received was 15 of 22 intervention calls (range=6 to 24).

Discussion: Findings suggest that telephone-delivered weight loss and healthy lifestyle behavior change programs can provide an effective model for use in applied primary health-care settings. While numbers are small to date, findings are consistent with the randomized trial evidence that underpins the Optimal Health Program.

523 'Physical Activity at Home (PAAH)', evaluation of a group versus home-based physical activity program in middle-aged adults

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Introduction: The adoption and longer term adherence to physical activity by adults to reduce the risk of chronic disease is a challenge. Program method, deliverer and participant preference may be important factors in increasing physical activity adherence and program effectiveness. To investigate this, we compare a community group exercise program to a physiotherapist-led home-based physical activity program, targeting middle-aged adults.

Methods: 'Physical Activity at Home' uses a pragmatic quasi-experimental design comparing a non-randomized group and home-based intervention over 6 months. Sedentary community dwelling 50-65 year olds with no serious medical conditions or functional impairments were recruited via two mail outs using the Australian federal electoral roll. Initially participants were invited to a 6 month community group exercise program (n=93). Those not interested in the group exercise program were invited to take part in a 6 month physiotherapist-led home-based physical activity program (n=65). Outcome measures were taken at baseline and at the end of the intervention period. The primary outcome is physical activity adherence derived from exercise diaries. Secondary outcomes include the Active Australia Survey, accelerometry, aerobic capacity (step test), quality of life (SF-12v2), blood pressure, waist circumference, waist-to-hip ratio and body mass index.

Results: Of the 158 participants recruited, 129 (82%) completed final assessments. At baseline approximately 75% of participants were at risk of chronic disease. Home-based participants were more likely to be younger, working full time and not be in a relationship (p<0.05). Fifty percent of the group participants attended less than 50% of group exercise sessions. Ninety percent of home-based participants received ≥4 of the planned 6 telephone support calls, with mean call length 4.5 minutes. Intention to treat analysis found adherence to the physical activity sessions prescribed was the same for both interventions (26% vs 28%) but home-based participants were more aware that they could accumulate physical activity in 10 minute blocks (82% vs 64%, p<0.05).The number of participants achieving 'sufficient' physical activity significantly increased for both interventions (p≤0.001).

Discussion: Both the physiotherapist-led home-based physical activity program and the community group exercise program increased the amount of self-reported 'sufficient' physical activity. Physical activity adherence appears to be the same for both interventions although there was an improvement in home-based participant's knowledge on how this could be achieved. The physiotherapist-led home-based physical activity program, requiring few resources, appears to have increased the adoption of physical activity and adherence to physical activity program requirements for sedentary middle-aged adults, particularly those not interested in or unable to attend a group exercise program.

524 Perceived environmental factors related to adults' leisure-time physical activity: Findings from Europe, Australia and the USA

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Introduction: A growing body of evidence shows that objective and perceived built environment factors are positively associated with physical activity in adults. However, built environment correlates are behavior-specific and the factors associated with leisure-time physical activity are less understood than those associated with active transportation. Furthermore, most previous studies of associations of built environment attributes with physical activity have been conducted in single countries. Limited within-country variability in environmental attributes and physical activity levels can potentially contribute to an underestimation of the strength of the associations. Therefore, the purpose of this study was to examine the strength, direction and shape of the associations of neighborhood environmental perceptions with recreational walking and leisure-time moderate-to-vigorous physical activity, using pooled data from four study sites (Baltimore [USA], Seattle [USA], Adelaide [Australia] and Ghent [Belgium]) in culturally- and environmentally-diverse countries. Moreover, site- and gender-specificity of the associations were examined.

Methods: Data from the four study sites were pooled. In total, 6,014 adults (20–65 years, 55.7% women) were randomly recruited in high-/low-walkable and high-/low-income neighborhoods in the four sites. All participants completed the Neighborhood Environmental Walkability Scale (environmental perceptions) and the International Physical Activity Questionnaire. General additive mixed models were used to estimate the strength and shape of the associations between environmental perceptions and leisure-time activity (walking and moderate-to-vigorous physical activity).

Results: Perceived residential density, aesthetics and reporting few barriers to physical activity in the neighborhood were included in a 'recreational walking-friendliness' index. This index was linearly positively related to recreational walking in all study sites except Ghent. No gender-differences were observed. The 'leisure-time activity friendliness' index consisted of perceived residential density, proximity to recreation facilities, aesthetics and perceiving few barriers in the neighborhood. This index had a positive linear association with leisure-time moderate-to-vigorous physical activity that was significant in all sites but Ghent. Again, no gender-differences in the associations were found.

Discussion: Similar environmental attributes were related to both outcome measures in men and women, but the present findings were clearly site-specific, imposing possible challenges for built environment recommendations. In Europe, interventions to promote leisure-time activity may need to target promotion of existing opportunities rather than built environment improvements. In the USA and Australia, a focus on the factors identified in this study, may be of most relevance for promoting leisure-time physical activity.

525 Relationship between the physical environment and different domains of physical activity in European adults: A systematic review

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Background: In the past decade, various reviews described the relationship between the physical environment and different physical activity (PA) domains. Yet, the majority of the current review evidence relies on North American/Australian study results, while only a small proportion of findings refers to European studies. Given some clear environmental differences across continents, this raises questions about the applicability of those results in European settings. This systematic review aimed at summarizing Europe-specific evidence on the relationship between the physical environment and different PA domains in adults.

Methods: Seventy eligible papers were identified through systematic searches across six electronic databases. Included papers were observational studies assessing the relationship between several aspects of the physical environment and PA in European adults (18–65y). Summary scores were calculated between each environmental factor and different PA domains.

Results: Convincing positive relationships with several PA domains were found for the environmental factors walkability, access to shops/services/work and the composite factor environmental quality. Remarkably, transportation PA was more frequently related to the physical environment than recreational PA. Possible evidence for a positive relationship with transportation PA emerged for walking/cycling facilities, while a negative relationship was found for hilliness. In contrast to non-Europe-specific reviews, the environmental factors access to recreational facilities, aesthetics, traffic- and crime-related safety were primarily unrelated to different PA domains in Europe.

Discussion: Most findings of the present review on European studies are in accordance with results from North American/Australian reviews and can contribute to a wider generalization of the relationship between the physical environment and PA. Nevertheless, the unassociated results on access to recreational facilities, aesthetics and different forms of safety are likely to be Europe-specific findings and need to be considered when appropriate interventions are developed. More research assessing domain-specific relationships with several understudied environmental attributes is needed.

526 Walking for recreation and perceptions of the neighborhood environment in older Chinese urban dwellers

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Introduction: Engagement in walking for recreation can contribute to healthy aging. Although there is growing evidence that the neighbourhood environment can influence walking for recreation, the amount of such evidence in relation to older adults is scarce and limited to Western low-density urban locations. Asian urban environments are typified by distinctive environmental and cultural characteristics that may yield different patterns to those observed in Western countries. Therefore, the main aim of this study was to examine associations of perceived environmental attributes with overall and within-neighbourhood walking for recreation in Chinese elders (65+ years) residing in Hong Kong, an ultra-dense Asian metropolis.

Methods: A sample of 484 elders was recruited from 32 neighbourhoods stratified by socio-economic status and walkability (dwelling and intersection densities). Validated questionnaires measuring perceived neighbourhood environment and weekly minutes of overall and within-neighbourhood walking for recreation were interviewer-administered.

Results: Results showed that the level of recreational walking was twice to four times higher than that reported in Western adults and elders. While overall walking for recreation showed a general lack of associations with perceived environmental attributes, within-neighbourhood recreational walking was positively related with proximity of recreational facilities, infrastructure for walking, indoor places for walking, and presence of bridge/overpasses connecting to services. Age and educational attainment moderated the associations with several perceived environmental attributes with older and less educated participants showing stronger associations.

Discussion: Traditional cultural views on the benefits of physical activity and the high accessibility of facilities and pedestrian infrastructure of Hong Kong may explain the high levels of walking. Although specific neighbourhood attributes, or their perception, may influence recreational walking within the neighbourhood, the compactness and public-transport affordability of ultra-dense metropolises such as Hong Kong may make it easy for elders to compensate for the lack of favourable neighbourhood attributes by walking outside the neighbourhood.

527   Association of perceived environment with changes on walking in adults of low socioeconomic level: Preliminary results of 'Ambiente Ativo' Project

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Introduction: Evidences suggest an association between perceived environment and physical activity. However, little is known about the influence of perceived environment upon changes in walking behavior in interventions aimed to promote physical activity, especially in low socioeconomic areas. Therefore, our aim was to explore if changes in weekly steps after six months of participation in the "Ambiente Ativo" Project were associated with perceived environment in adults living in low socioeconomic areas.

Methods: The "Ambiente Ativo" Project was an intervention study with a sample of 152 healthy adults, inactive in leisure time, that lived in the east zone of São Paulo city (Brazil), and that were served by the Health Family Strategy (Brazilian primary health care public system). There were three intervention groups: supervised exercise program (SEP) (n=53), health education program (HEP) (n=50), and control (CON) that did not receive any intervention (n=49). Steps were pedometer-assessed (Digiwalker CW 700) by seven days at baseline and after six months.

The outcome was the difference between both measures (=6 months – baseline), analyzed as both a continuous (weekly steps) and a dichotomic variable (until group median; above of group median). Independent variables were perceived environment aspects, assessed using a previous validated scale considering: nearby facilities, general safety, traffic safety, and social support related to physical activity. For each subscale we created a dichotomic variable (negative; positive). Student t-test, ANOVA one- and two-way, and chi-square test were used for data analyses.

Results: There was no evidence of different changes on weekly steps after six months between groups (CON: mean=-3652.7, dp=17146.5; SEP: mean=-9533.0, dp=24419.7; HEP: mean=-1575.6, dp=21370.7; p=0.14). Percentage of positive perceptions about environment were: nearby facilities (CON=59.2%, SEP=66.7%; HEP=77.8%, p=0.13), general safety (CON=51.0%, SEP=61.1%; HEP=38.9%, p=0.07), traffic safety (CON=81.6%, SEP=40.7%; HEP=83.3%, p<0.001), and social support (CON=53.1%, SEP=74.1%; HEP=57.4%, p=0.07). None perceived environment aspect was associated with changes in walking in all groups, neither considering the outcome as a continuous nor a dichotomic variable (p>0.10).

Discussion: This preliminary analysis found that there is no evidence that changes in walking after six months of participation on "Ambiente Ativo" Project depends on perceptions about the environment, but further analyses need to be done. Search for other factors that may influence physical activity changes also need to be done, including intrapersonal aspects and objective environment. This information is crucial to understand how to improve future programs with people in these areas.

528   Physical activity of adult Czech population in perceived neighbourhood environments – National cross-sectional study

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Introduction: Neighbourhood environment and community design (walkability) was recognized as one of the key determinants of health behaviour and lifestyle among the general population in developed countries. Few studies have been published describing built environment related to physical activity (PA) levels in residents of the post-communist countries. Czech participation in international research indicates differences in social, cultural and historical progress of physically active behaviour within developing countries. Therefore the main purpose of this study was to analyze the relationship between weekly physical activity and neighbourhood environment of adult population in the Czech Republic.

Methods: Nationwide data collection of adults PA was done in the Czech Republic regions between years 2005-2009 using the long version of IPAQ and NEWS-A questionnaires. The research sample was randomly selected from the addresses database available at the Ministry of Interior of the Czech Republic and in the study participated 3868 males and 4840 females (aged 40,84±9,09). The data obtained from the questionnaires were processed and entered into the database and then statistically analyzed using Kruskal-Wallis ANOVA test and to set the effect size coefficient η^2 was used. Binary logistic regression was used to compare dichotomous results. Data were processed in software Statistica 9 and SPSS 18.

Results and discussion: For both males and females lower socio-economic status (SES) and higher walkability significantly indicated the highest total weekly PA [H(7, 8708)=21,41; p=0,003; $\eta2=0,003$]. Lower walkability and higher SES in both men and women was significantly related to PA realized in and around their home H(7, 8708)=288,875 p<0,001; $\eta2=0,033$]. In agreement with results of other studies, higher walkability was significantly related to higher level of walking in Czech adult population [H(7, 8708)=55,67; p<0,001; $\eta2=0,007$]. Walking and cycling for transportation were also positively related to areas with higher walkability [H(7, 8708)=103,62; p<0,001; $\eta2=0,012$]. Specific neighbourhood urban settings in the Czech Republic express that residents of smaller communities are more likely to have higher level of total PA. Smaller communities indicate higher walkability and PA than in developed countries, which is another national specificity. More than 60% of adults meet the general recommendations for moderate to vigorous PA; however increasing prevalence of overweight and obesity within the population (more than 50% of adults) and no clear national strategy in healthy urban planning are the key points that need to be addressed while changing the health indicators based on knowledge of the economic costs of less active population.

529 To what extent may local crime rates, perceptions of crime and personal safety limit walking in deprived neighbourhoods?

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Introduction: Raising levels of physical activity is a concern of urban regeneration policy in the UK. Walking is an accessible form of physical activity for most people, yet concerns about personal safety in the neighbourhood are often known to limit this. Actual crime rates and the perceived prevalence of crime contribute to residents' sense of security.

Method: We analyzed cross-sectional data obtained in 2008 from approximately 4000 adults, from 30 deprived neighbourhoods in Glasgow, UK. The data address residents' perceptions of the seriousness of crimes of violence against the person (assaults and muggings) and anti-social behaviours (people being intimidated; racist harassment; drug use/dealing; drunken/rowdy behaviour in public; gang activity; young people loitering), trust in their neighbours, feelings of safety walking alone in the neighbourhood at night, and the quality of policing in the area. The survey data are linked to aggregated data about local reported crime rates (personal and property crimes) for the 3-year period July 2005–June 2008. We developed a multilevel logistic regression model to examine the associations of these potential predictors with the frequency with which women and men of different ages walked around their neighbourhood for more than 20 minute at a time (0 days vs 1–7 days per week). Results: There were no differences found between men and women, although walking around the neighbourhood became less frequent with age. The perception that violence against the person was a slight or serious problem in the neighbourhood was associated with reduced odds (OR=0.8) of walking in the neighbourhood. However, none of the perceptions of the seriousness of the antisocial behaviours, nor ratings of the police, predicted neighbourhood walking. Feeling safe walking in the neighbourhood after dark was associated with greater odds of neighbourhood walking (irrespective of the time of day) (OR=1.7). Trust in others in the neighbourhood to exert informal control on young people harassing someone in the street was also associated with higher odds of neighbourhood walking (OR=1.3). Finally, contrary to expectation, there was a small, significant increase in the odds of doing neighbourhood walking as the 3-year crime rate increased.

Discussion: Our first attempts to investigate the relative importance of actual and perceived levels of crime and antisocial behaviour yield intriguing results. It would appear that perceptions may be more important in influencing neighbourhood walking behaviour than actual levels of local crime. Further analysis of our data is required to examine these patterns in greater detail.

530 Neighborhood walkability, income and physical activity: Moderating effects of gender

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Introduction: The most common recommendation for future directions in research on built environments and physical activity is to examine potential moderators, such as sociodemographic characteristics. Research has found gender differences in physical activity determinants, but only few studies have investigated such differences in environmental correlates. The aim of this study was to analyze moderating effects of gender in the relationship between neighborhood walkability, income and physical activity.

Methods: Data were used from the Neighborhood Quality of Life Study, conducted between 2001 and 2005 in the King County-Seattle, WA, and the Baltimore-Washington DC regions. Study participants were adults aged 20–65 (n=2,199) and were categorized in quadrants by crossing high/low walkability (based on GIS) and high/low neighborhood income. The outcome variable was moderate to vigorous physical activity (MVPA) assessed by accelerometers for which one or two time points were available for analysis. Three-level multilevel models were fitted to account for repeated measures nested within subjects and subjects nested within neighborhoods. Gender by walkability and gender by income interactions were tested in the model. Results: There were significant gender by income (p=.002) and gender by walkable (p=.03) interactions. Among males, there was little difference in total MVPA between high and low income neighborhoods, whereas for females high income areas had, on average, a total MVPA 3.8min higher than low income areas. Higher MVPA was observed in higher walkable neighborhoods for both males and females although males had a larger difference between high and low walkable communities than females (7.2 min vs 4.1 min).

Discussion: We found that gender significantly moderated the relationship between the built environment, income and physical activity. Analyses in this research area should be stratified by sociodemographic attributes as differences in the associations between population subgroups could weaken or even mask the effect of walkability in total populations. Environmental interventions might not have the same effect in men and women and such differences should be compensated for in multi-level interventions. Urban planners and policymakers should take account of demographic differences in the associations to ensure that all subgroups of the population can achieve sufficient levels of physical activity.

Are physical environments and physical activity differentially associated by urban-rural status among mid-older aged adults? The WELL study

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Introduction: There is currently a poor understanding of associations between physical environments and physical activity in rural settings. Rural adults represent 30% of the Australian population, and their environments are characterised by large open spaces, low population densities, fewer physical activity facilities, and limited public transport. This study aimed to determine whether the physical environment and physical activity were differentially associated according to urban-rural status among Australian adults aged 55–65 years.

Methods: Survey data were collected from 4,082 adults aged 55–65 years randomly selected from urban and rural areas of Victoria, Australia. Participants reported neighbourhood aesthetics, safety and walking environments. Leisure, transport, work and domestic activity were reported using the International Physical Activity Questionnaire (long), and domain-specific and total MET-hours/week calculated. For each domain and total activity, analyses included: 1) log binomial regression to calculate rate ratios (RR) of any activity versus none; and 2) for participants reporting any activity, linear regression with a normalising transformation, to estimate associations between environmental factors and MET-hours/week. Interaction terms between environmental variables and urban-rural status were added to test for differential associations. Analyses (n=3,558) adjusted for sex, education, employment, general and comparative health, illness/injury/disability, body mass index, and clustering by neighbourhood.

Results: Rural adults were significantly less active for leisure but reported more domestic activity than urban adults. Rural women reported significantly less transport activity than urban women, and rural men reported significantly more total and occupational activity than urban men. For rural adults higher personal safety resulted in an 11.1% (3.3–18.8%) greater rate of any participation in transport-related activity and 1.9% (0.2–3.6%) greater participation in total activity, while urban adults showed no such associations with safety. Rural adults reporting more aesthetically-pleasing environments had 1.9% (0.4–3.3%) higher rates of doing any total activity. For those participants reporting any activity, urban adults with supportive walking environments had a mean leisure-time activity 4.2 (2.3–6.1) MET-hours/week greater than those with less supportive walking environments, whereas rural adults showed no such association.

Discussion: As well as identifying different patterns of physical activity, the findings suggest that certain aspects of the physical environment and physical activity are differentially associated according to urban-rural status. This means that environmental interventions may need specific tailoring according to urban-rural setting. Among rural adults, personal safety and aesthetics may be key targets for physical activity promotion, while among urban adults the walking environment may be an important target to promote leisure activity.

Neighbourhood environment and physical activity among older adults: Does the relationship differ by driving status?

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Introduction: Despite numerous health benefits of physical activity, older adults remain the least active age group. There is a dearth of research on built environments and physical activity among seniors and most studies did not consider potential moderators. Since some seniors give up driving, their physical activity may be more dependent on neighbourhood environments. This study examined driving status as a moderator of the association between neighbourhood environments and physical activity among seniors.

Methods: In this observational epidemiological study, seniors (66+yr, 56% women, 30% minorities) were recruited from selected neighbourhoods in two US regions. Respondents completed a written survey and wore accelerometers. Neighbourhood environments were measured by geographic information systems and the validated Neighborhood Environment Walkability Scale. Driving ability was defined as having a driver's license, having a car in the household, and feeling comfortable to drive. Outcome variables included accelerometer-based total physical activity and self-reported transport and leisure walking. Multi-level generalized linear regression was used to model associations of each environmental variable with an outcome, specifying an environment by driving status interaction, adjusted for demographic characteristics, living situation, health conditions, and lower-extremity function. Significant interactions were further explored by stratified analyses.

Results: Non-driving able seniors (n=154) were more sedentary but more likely to report transport and leisure walking than driving able seniors (n=726). Overall, more neighborhood attributes were associated with reported walking than with accelerometer-based outcomes. With objective physical activity, only objective walkability and reported land use mix were significant and the associations tended to be stronger among driving able seniors (p for interaction=0.061). For reported transport walking, almost all environmental attributes tested (objective walkability, reported residential density, land use mix, street connectivity, walking/cycling infrastructures, esthetics, pedestrian safety structures, transit access) were significant, and the magnitude and direction of associations were similar among driving able and non-driving able seniors. With leisure walking as the outcome, however, almost all environmental attributes were significant among driving able seniors but none was significant among non-driving able seniors (five significant interactions at p<0.05).

Discussion: Driving ability moderated the association of neighbourhood environments with leisure walking among seniors. The association was only significant among driving able seniors, which is counter to hypothesis. A possible explanation is that non-driving able seniors may walk more in protected indoor environments. To improve the understanding of effects of driving ability on seniors' physical activity, future studies should include location-specific physical activity measures and explore contexts of activities.

533   Adult physical activity within park activity areas: Differences by gender and race/ethnicity

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Introduction: Given their ubiquity and free access across communities, parks have significant potential for combating population-level concerns related to physical inactivity and obesity. Growing research suggests the design of parks is important, but few studies have explored users' physical activity (PA) levels within specific park activity areas or especially how this may vary by socio-demographic characteristics. The purpose of this study was to examine differences across gender and race/ethnicity in the PA of adults observed in different park settings.

Methods: The System for Observing Play and Recreation in Communities (SOPARC) was used in four large Kansas City, Missouri parks to record the PA of park users by gender (male/female), age group (child/teen/adult/senior), race/ethnicity (White/Black/Asian/Hispanic/Other), and intensity level (sedentary/moderate/vigorous). Each park was observed for a total of 39 hours (Fri–Sun, 0700–2000) across two summer weekends. Logistic regression was used to examine the likelihood of males vs females or Whites vs non-Whites engaging in moderate-to-vigorous PA (MVPA) within the seven activity areas most used by adults.

Results: A total of 6401 adults were observed during the study, with strong inter-rater reliabilities (0.84–0.98) for all recorded user characteristics. Observed park users were 51.5% female (n=3297), 68.4% White (n=4383), and 44.6% engaged in MVPA (n=2854). The target areas most used by adults were trails (n=2770), open spaces (n=1412), playgrounds (n=531), picnic shelters (n=464), tennis courts (n=336), dog parks (n=306), and pools/splash pads (n=266). Across all activity areas, males were not more likely to be observed engaged in MVPA than females (OR=1.07, 95% CI=0.97–1.18), but Whites were more often observed being active than non-Whites (OR=1.32, 95% CI=1.18–1.48). Within individual activity areas, males were significantly more likely to be observed being active than females in open spaces (OR=1.30, 95% CI=1.02–1.66), but there were no differences for any of the other park areas examined. Compared to non-White persons, White persons were significantly more likely to be observed being active on trails (OR=1.20, 95% CI=1.01–1.45), but less likely to be active at picnic shelters (OR=0.36, 95% CI=0.21–0.62).

Discussion: Better understanding differences in PA across gender and race/ethnicity within different areas can aid park design and programming efforts aimed at increasing users' activity levels. Although some important disparities were uncovered, overall, males and females and Whites and non-Whites exhibited relatively similar PA levels in most park areas, thus suggesting that parks may be venues for mitigating inequities in total PA that are frequently observed across different socio-demographic groups.

534   Evidence-based policy on physical activity: The tale of the Emperor's New Clothes

KEYNOTE

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A central challenge facing the public health community is stimulating population-level changes in healthy behaviours including physical activity. But how can we achieve the sort of cultural and environmental changes that are needed to see meaningful changes in the health behaviours of whole communities and populations? In recent years the physical activity research community has increasingly aimed to provide the evidence to inform the process of 'evidence-based policy making' to help ensure that policy decisions are made that help to create more healthy and active social and physical environments. However, the science of evidence-based policy making is in its infancy, and we know little about what type of evidence policymakers actually want, and the type of evidence that is most likely to stimulate change. There has tended to be a focus on effectiveness evidence ('does it work?'); an increasing emphasis on cost effectiveness evidence ('will it be worth the investment?'); but less on implementation ('how can we make this work?') and even less on political acceptability ('will people still vote for me if I do this?'). And yet the last point is often the most important when it comes to making public policy decisions. There are numerous examples of interventions that have been shown to be effective and cost effective but are not implemented due to perceptions about public unacceptability. Instead of a logical and coherent approach to implementing interventions based on the best available evidence, it appears that in the last two decades there have been many examples of the national-level programmes that may have seemed right at the time, but were based on poor evidence. Like the story of the 'Emperor's New Clothes', these have been followed slavishly until enough voices have been raised in protest. From exercise referral schemes to the notion of the 'Olympic Legacy', governments have continually backed interventions despite a lack of evidence on their effectiveness. Instead of continuing to search for the silver bullet – the single intervention that will transform activity levels – we need to move towards a more sophisticated understanding of the complex system that influences current lifestyles. This will require a shift from the implementation of piecemeal interventions that work only in specific situations or with defined communities, to using the best available evidence from across the spectrum to take a systems approach to creating the social and physical environments in which people will choose to be active.

535   MSK imaging – Best practice and the future

SYMPOSIUM

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This symposium will be divided into 4 parts:
1. Muscle – Associate Professor Connell
2. Joints of Upper Limb – Dr Linklater
3. Tendons (and Intervention) – Associate Professor Connell
4. Joints of Lower Limb – Dr Linklater

This imaging symposium is designed to be informative and demonstrate current best practice. The speakers will also address future applications and interventions. Best practice in 2012 includes the routine usage of 3T MR imaging, low dosage ionising radiation and state of the art ultrasound performed by an experienced sonographer or sonologist.

Musculoskeletal imaging is a radiology specialty in its own right and this is reflected in expert image interpretation and slick guided interventions. There are few radiology facilities in the country that are dedicated solely for the purpose of msk imaging and intervention. Dedicated units will have specialised software and hardware to enhance image quality, decrease imaging time and troubleshoot diagnostic dilemmas.

3T MR imaging has been available for some time. A 3T unit typically has 4 times as much power as a traditional 1.5T unit, and this translates into thinner slices, higher matrix resolution and less time inside the scanner. Thin slices, for example are essential for characterising the small ligaments in the wrist joint or grading articular cartilage. Furthermore, 3T MRI allows for advanced musculoskeletal sequences including hyaline cartilage mapping, spectroscopy, and muscle diffusion. Of course, 3T MR machines cost more than standard 1.5 units.

There are many different cartilage sequences available including T2 mapping, T1 roe, and dGEMRIC. What they have in common is the potential ability to identify hyaline cartilage breakdown by showing water and proteoglycan changes before morphological changes occur. Spectroscopy has been used in our institution to measure muscle metabolites, such as carnosine, and intracellular content of fatty infiltration, say in the rotator cuff. Muscle diffusion is a promising tool for the diagnosis of compartment syndromes.

Radiography has entered the digital age. This means higher spatial and contrast resolution, but also a substantial reduction in the dose of ionising radiation. This is also true of the latest generation of CT scanners. The number of slices per revolution has increased from one to now 256 or 512 slices. Computer power allows for complex reconstructions and 3D rendering. A state of the art practice will have equipment that minimises that amount of ionising radiation that a patient is subjected to – this is particularly important for children. The referring practitioner has an obligation to ensure his patients are exposed to the least amount of radiation.

Ultrasound has also undergone many changes in the last decade. Resolution has continued to improve. Color and power Doppler imaging are useful tools for demonstrating hyperaemia and neovascularisation. For many physicians, ultrasound is now used to augment the physical examination and to guide intervention. Advanced applications include the use of elastography to measure stiffness of muscles and tendons, and contrast agents that can be used to demonstrate ingrowth of new vessels. Experience remains the key ingredient for msk ultrasound – many hours of scanning are necessary to become an expert in this field.

536   Resistance training to improve power and sports performance in adolescent athletes: A systematic review and meta-analysis

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Introduction: Resistance training can improve health-related fitness in untrained adolescents. The impact of resistance training on muscular power and sports performance in adolescent athletes is less clear. The purpose of this review was to determine the effectiveness of resistance training programs to improve muscular power and sports performance in adolescent athletes.

Methods: Systematic review and meta-analysis of previously published studies investigating resistance training in adolescent athlete populations. A systematic search of Medline, Embase, and SPORTDiscus databases was conducted on 21st March 2011 to identify relevant studies. A risk of bias assessment of included studies was also conducted.

Results: Thirty four studies were identified. All but two of the studies reported at least one statistically significant improvement in an alactic muscular power outcome. The most common indicators of alactic power were vertical jump (25 studies) and sprint running (13 studies) performance. Fourteen studies provided data to allow for pooling of results in a meta-analysis. A positive effect was detected for resistance training programs on vertical jump performance (Mean Difference 3.08 cm [95% CI 1.65, 4.51] $Z=4.23$ [$P<0.0001$]). The risk of bias was high in 18 (52.9%) and medium in 16 (47.1%) studies. No studies had a low risk of bias.

Discussion: There is sufficient evidence to conclude that resistance-training interventions can improve muscular power in adolescent athletes. Almost half the included studies reported their resistance-training intervention improved sports performance, though objective evidence supporting these claims, particularly in team sport athletes, was lacking. The overall quality of the included studies was low, notable issues were a lack of participant randomisation, adequately described randomisation procedures, and power calculations to determine whether studies were adequately powered to detect hypothesised effects. Further study of the unique contributions of change in muscular power and change in motor skill technique on sports performance is needed.

537 Effects of synchronous music on elite athletes during training activities

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Introduction: Running in time to music has been shown to provide a range of benefits that include ergogenic effects and enhanced psychological responses. Elite performers running in naturalistic settings have rarely been studied in this context and the present investigation sought to address this gap in the research literature.

Methods: Effects of three experimental conditions (no music, synchronous music, music-led) were evaluated among a sample of six junior elite runners and two elite triathletes during regular training runs. Each participant completed a baseline run, during which stride rate was assessed, followed by three experimental runs in counterbalanced order over their normal training course. Measures of in-task feeling states and RPE were taken, and mood responses were assessed pre- and post-run. A custom-designed application for the Apple iPhone was developed to a) deliver participant-selected music that was synchronized to individual stride rates, b) facilitate measurement of in-task feeling states and RPE, c) facilitate measurement of pre- and post-run mood responses, and d) determine distance run using the in-built GPS tracking facility.

Results: Compared to the no music condition, participants ran an average of 467 m (7.5%) further in the same amount of time when running to music (t=2.5, p<.05) and 447 m (7.2%) further during the music-led condition (t=1.3, p>.05). Given that RPE ratings taken at the end of each run were significantly lower for the music condition (t=3.7, p<.01) and music-led condition (t=2.8, p<.05) than the no music condition, this improved performance was achieved with reduced perceived effort. Reported feelings became progressively less positive in the no music condition but became more positive for both music conditions from mid to end run. Pre- to post-run mood changes were more positive for both music conditions compared to no music, especially for the music led condition.

Discussion: The present findings indicate that using synchronous music during training runs was associated with improved performance but reduced perceived exertion and enhanced psychological responses among a small sample of elite athletes. This suggests that judicious use of music in training activities carries potential benefits in elite sport. It should be noted, however, that considerable time and effort is required to select playlists that are synchronised to individual stride rates.

538 Effect of intermittent hypoxic training on cardiovascular responses to altitude (2800m)

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Introduction: Intermittent hypoxic exposure (IHE) prior to ascent to high altitude is postulated as a beneficial pre-conditioning strategy in the prevention of high altitude illness. Variations in arterial stiffness and endothelial function (vascular tone) may also be important in the pathogenesis of altitude related illness. The influence of IHE pre-conditioning on cardiovascular adaptations (notably arterial stiffness and vascular tone) to altitude is less clear. This study explored the impact of normobaric IHE pre-conditioning on acute cardiovascular adaptations to high altitude.

Method: Participants were assigned to one of three intervention groups: control (no IHE), IHE at rest (IHE-rest) or IHE with training (IHE-training) matched for fitness, age and sex. In the 14-day period prior to a high altitude expedition IHE groups completed 10 x 2 hour hypoxic exposures in an environmental chamber (12.2% O_2 equivalent to 4300m), at rest (IHE-rest) or rest plus 20 minutes running at 80% heart rate reserve (calculated from individual pre-determined VO_2max at altitude). Arterial stiffness (SI) and vascular tone (RI) responses were recorded using a non-invasive finger photoplethysmography technique at sea-level (baseline), pre and post IHE intervention period, 12 and 72 hours post arrival at altitude (Lukla, Nepal, 2800m).

Results: Thirty apparently healthy participants (18 male, 12 female, age range 20-62 years) free from cardiovascular disease were recruited (n=10 per condition). Two-way repeated measures (intervention x time) ANOVA revealed no main effect for intervention for SI (control△1.07±1.41 m.s^{-1}, IHE-rest△0.50±0.65 m.s^{-1}, IHE-training△1.07±0.81m.s^{-1}; P=0.083) or RI (control△3.3±4.4%, IHE-rest△7.6±25.6%, IHE-training 7.2±18.1%; P=0.174). There were no between-group interaction effects for any cardiovascular measurements (P=0.059 for RI; P=0.112 for SI).

Conclusion: Intermittent hypoxic exposure prior to ascent to high altitude does not significantly alter vascular tone or arterial stiffness in apparently healthy adults. The impact of IHE pre-conditioning on *endothelial* function at higher altitudes and in the prevention of altitude related illness remains to be elucidated.

539   Using a body-worm accelerometer to identify the start and end points of a stride during walking

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Introduction: Many body-worn accelerometers provide an accurate measure for number of steps during walking, however the start and end point of those steps is often not reported, meaning the individual step duration cannot be determined. There has been recent interest in using cadence for measurement of walking intensity in large datasets. However, calculating an accurate value for cadence requires that the duration of walking is known as well as the number of steps taken and when a bout starts and ends. This study aimed to develop and validate an algorithm to identify the start and end points of a stride from the acceleration output of a body-worn sensor.

Methods: The algorithm was developed on acceleration data collected from 25 healthy adults (15 females; mean±SD age 40±13years), walking for 0.2–1.5km at slow, normal, fast and variable self-selected speeds. Participants wore an activity monitor (activPAL™), and the 10Hz raw acceleration signal was examined to manually identify the occurrence of consistent points in the stride (approximating to heel strike). A separate validation data set was collected from 20 participants (12 females; 34.5±6.9years) walking for 1.5km at slow, normal and fast self-selected speeds. The number of steps identified (number of strides*2) for the validation data was compared to observation (criterion measure). Accuracy of the algorithm in identifying the start and end points of each stride was compared to manual identification.

Results: The step count from observation (mean±SD) was 653±40 (slow), 608±44 (normal) and 579±41 (fast). The developed algorithms determined a step count of 656±41 (slow), 612±44 (normal) and 580±43 (fast). The percentage error between observational data and the algorithm output was 0.39±0.67 (slow), 0.45±0.84 (normal) and 0.09±1.17 (fast). This was comparable to the step count provided by proprietary activPAL™ algorithms. The accuracy of the algorithm in identifying the start and end of a stride for the validation data was 99.4%, with 0.4% overcount (algorithm identified non-existent points).

Discussion: The algorithm developed, identified the start and end points of a stride with >99% accuracy, and was as accurate as proprietary algorithms in correctly identifying number of steps. The algorithm could be used to identify the start and end of a stride in a consistent manner allowing a precise measure of cadence or additional assessment of stride characteristics. In addition, accurate determination of strides would be useful for determining step characteristics to separate types of walking (e.g. stair climbing).

540   Body loads and physical impacts in National Rugby League players

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Background: Rugby league is a collision sport, often described as the most physically demanding of team sports. A number of studies have identified the physiological and anthropometric characteristics of sub-elite and elite rugby league players and examined the physiological responses during a professional rugby league match. Advances in match analysis technologies such as Global positioning systems (GPS) have permitted comprehensive analysis of on-field performance in terms of movement patterns, distances covered, physiologic demands and body loads. GPS enables quantification of collisions and the repeated high intensity effort demands of training and competition in rugby league. This study investigated player movement demands and collision impacts during match play.

Methods: Elite rugby league players from the 2012 National Rugby League (NRL) competition were recruited. The players wore GPS units during each competition match. Match play video footage was linked to GPS data for movement pattern analysis. Outcome measures of movement demands (distance, distance per minute and maximum speed) were analysed. In addition, impacts sustained during tackles and physical contact were assessed via accelerometer data were categorized into one of six zones. The highest impact forces were in Zone 5 (8–10G) and Zone 6 (>10G).

Results: A total of 42 NRL players were recruited (age 21±2.8 yr, body mass 102.7±19.2 kg and height 184.5±6.2 cm). To date, players averaged 33.3±14.5 minutes of play per half, 2971.3±1288.0 m distance covered per match, 90.9±25.0 m/min workload (distance covered each minute) and an average maximum running speed of 7.7±2.1 m/s. A total of 824 tackles were recorded with 523 tackles (63.47%) recording impacts in zone 5 and 301 tackles (30.95%) in zone 6. These high impact tackles were majorly comprised of five key playing positions 7 (half back), 8 (prop forward), 9 (hooker), 11 and 12 (second row forwards).

Conclusion: These preliminary findings show that more than half of tackles completed in a match are at high collision forces. The key defensive positions of half back and forwards contribute to the majority of high impact tackles throughout a game. Although these results may be unique to individual teams' defensive play strategies, they are indicative of the significant physiological demands of collisions in rugby league. GPS analysis can provide further insight into the physical demands of competition.

541   Reliability and validity of a talent identification test battery for seated and standing Paralympic throwing

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Introduction: Paralympic throwing events are contested by athletes with impairments of strength, range of movement and coordination of varying severity. The events contested comprise javelin, discus and shot put thrown from a seated or standing position, as well as the club throw. The club is unique to Paralympic sport, and is thrown from a seated position using one of three techniques: over-arm (similar to javelin); round-arm with a straight elbow (similar to the discus action); and a backwards overhead technique. The ability to identify talented individuals in Paralympic throwing events would be advantageous for sporting institutes, coaches and athletes to predict future success in international competition and promote participation. Unfortunately the complex nature of the impairments and the unique biomechanics of Paralympic throws means that tests used to identify talented non-disabled throwers may not be valid for Paralympic throwers. To date valid and reliable talent identification (TID) tests for Paralympic throwing events has not been reported in the literature. This study aimed to evaluate the reliability and predictive validity of a novel TID battery for seated and standing throwing.

Methods: Participants were 28 non-disabled physically active people (13 male, 15 female) aged 23.6 years (±5.4). Participants performed five criterion throws using a club – two over-arm (one seated, one standing), two rotational (seated and standing) and a seated backwards overhead throw (seated) – as well as eleven TID tests (three anthropometric and eight physical). Participants completed a second testing session within seven days of the first. Test-retest reliability was evaluated using independent t-test, Intra-class correlation (ICC; 3,1) and Standard Error Measurement (SEM); strength of association between individual tests and five criterion throws was assessed using Spearman's correlations; and a preliminary indication of the combination of tests with the greatest predictive validity was obtained using forward selection linear regressions.

Results: The mean Intra-class correlations for the physical TID tests were 0.86. Spearman correlations were all significant and ranged from 0.5 to 0.9. Indicative predictive validity for test combinations ranged 56% (seated throws) and 84% (standing throws).

Discussion: In athletes without disabilities, the tests developed were reliable and, in combination, provided a valid indication of characteristics of throwing performance in all five criterion throws. Evaluation of the TID battery in athletes with disabilities is now warranted.

542 | Actiheart based estimates of body expenditure are accurate during treadmill walking, arm ergometry and bicycle ergometry

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Introduction: The Actiheart system (CamNtech Neurotechnology Ltd, Cambridge UK) is a small portable device that collects ECG derived heart rate and 3-dimensional accelerometer data, and uses these data to estimate body energy expenditure (BEE). High levels of accuracy for Actiheart based estimates of BEE have been reported over a range of daily activities. However, with the exception of treadmill walking, previous studies have used daily activities that are difficult to standardize and have poorly defined workloads. This study compared the accuracy of Actiheart based estimates of BEE during different types of standardized exercise with matching workloads under laboratory conditions.

Methods: BEE was estimated with an Actiheart system and simultaneously measured by indirect calorimetry with a portable telemetric Jaeger Oxycon mobile system. Measurements were made at rest and during light to moderate exercise involving treadmill walking (zero incline), arm ergometry and bicycle ergometry. Treadmill exercise was carried out during 3 minute bouts at 3, 5 and 7 km/hr. Ergometry exercise (arm and bicycle) was separately carried out during 3 minute bouts at equivalent workloads of 150, 300 and 600 kpm/min.

Results: All data are means±1 SD. Ten healthy men were studied (29.2±3.7 years of age). Oxygen consumption was 324±66, 716±110, 1020±128 and 1675±193 ml/min at treadmill speeds of 0, 3, 5 and 7 km/hr, respectively. Oxygen consumption was closely matched during rest and during equivalent workloads for each of the 3 modes of exercise (all $P>0.25$; ANOVA, no post hoc tests required). Actiheart BEE estimates agreed closely with simultaneous indirect calorimetric BEE measurements under resting conditions, and for each of the 3 workload intensities for each of the 3 different modes of exercise (all $P>0.25$; 2 tailed paired Students t tests). BEE for Actiheart versus indirect calorimetry was 6.1±2.3 versus 6.0±1.1, 16.9±3.0 versus 16.4±1.7, 23.2±3.3 versus 22.3±2.5 and 40.6±2.8 versus 37.5±4.0 kJ/min at treadmill speeds of 0, 3, 5 and 7 km/hr, respectively.

Discussion: The Actiheart system accurately estimated BEE under conditions of rest and during 3 different modes of standardized exercise with matching workloads ranging from light to moderate intensity. These findings provide further evidence that the Actiheart system has potential for accurate, non-invasive and routine monitoring in sports and clinical settings.

543 | Physiological responses during incremental exercise test in a stationary bicycle underwater

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Introduction: Cycling underwater is a low impact exercise and become an important component of therapy, patients in orthopedic or neurological disabilities, elderly people and injured athletes. Currently, the power output is not available to measure during cycling underwater and to increase the intensity; subjects need to increase the revolutions per minute (RPM). Moreover, blades connected to the bottom bracket of the stationary bicycle increases the frontal surface area (FSA) against the water. Therefore, the aim of this study was to determine the physiological responses during incremental cycling test underwater in a stationary bicycle that has a possibility to change the length of FSA.

Methods: Fifteen healthy subjects performed three underwater incremental cycling tests in a random order. The incremental exercise tests were performed in a swimming pool with a constant water temperature (28–30ºC). After a 5-min warm-up period at 50 revolutions per minute (RPM) followed by a 2 min. of passive recovery, the test began at 50 RPM and the intensity was increased by 3 RPM every stage of 1 min. until volitional exhaustion. The resistive force against the water was provided by RPM and the FSA of the blades. The FSA had three different sizes witch means less or higher resistance against the water for the same RPM (FSA_1=500cm^2; FSA_2=580cm^2; and FSA_3=660cm^2). The study was performed with the three FSA.

Results: The maximal cadence was significantly higher for FSA_1 (90±4) compared with the others. Also, the maximal cadence of the FSA_2 (87±4) was significantly higher than FSA_3 (83±3). However, the maximal values of VO_2, HR, [La], and RPE were not significantly different for both FSA. The equation from %VO_2peak–%HRpeak predicted similar percentage values of VO_2peak for both FSA. However, when %VO_2peak and %HRpeak were plots against RPM significantly differences were found for the predicted values in both regressions.

Discussion: Normally the participants of cycling underwater activities are usually required to pedal at predetermined cadence following an external rhythm from the instructor. According to this, we decide to plot %VO_2peak and %HRpeak against RPM and found significant differences in the sub-maximal and maximal cadence depending on the model. In conclusion, the practical applications for the exercise prescriptions on the stationary bicycle need to consider the length of the FSA because for the same cadence the participants would be in a different physiological domain.

544 Sex-based differences in salivary α-amylase activity following maximal cycling exercise

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Introduction: Determining sex-based differences in response to exercise is an important biological determinant of vulnerability to psychological and physiological stress. Previous studies have shown sex-based differences in basal salivary α-amylase activity, which is still controversial. The sex-based effects on salivary α-amylase activity following maximal cycling exercise remain to be clarified. The purpose of this study was to investigate the sex-based effects of maximal cycling exercise on salivary α-amylase activity in physically active men and women.

Methods: Recreationally active men [n=14; age: 19.9±1.4 year; height: 171.2±3.6 cm; body weight: 67.5±11.9 kg; body mass index: 23.0±3.5 kg/m^2; body fat: 15.1±6.6 %; peak oxygen uptake (VO$_2$peak): 58.4±9.5 ml/kg/min] and women [n=13; 20.9±0.3 year; height: 160.1±5.6 cm; body weight: 54.7±5.8 kg; Body mass index: 21.3±1.8 kg/m^2; Body fat: 21.7±3.0 %; VO$_2$peak: 44.4±5.0 ml/kg/min (mean±SD)] served as the subjects. After an overnight fast, all subjects performed an incremental cycling exercise until volitional exhaustion to obtain peak oxygen uptake on an electromagnetically braked cycle ergometer. Each subject performed a cycling exercise at an initial power output of 0 W for three minutes, which was increased by 25 W every 1 min until exhaustion. Pedaling frequency was 60 rpm. Expired gases and heart rate were continuously measured using a respiratory monitor system and electrocardiograph. At the 10-min period before and after maximal cycling exercise, salivary α-amylase activity was determined with a biosensor qualified by Yamaguchi et al. (*J Int Med Res*, 34: 152–159, 2006).

Results: With regard to the salivary α-amylase activity, two-way (time x sex) analysis of variances (ANOVA) showed significant main effects for time and sex (Pre: 63.4±27.3, Post: 97.7±48.5 for Men; Pre: 60.2±21.8, Post: 89.3±58.0 kIU/L for Women, p<0.05). In contrast, no significant interaction was observed. The percent increase of salivary α-amylase activity was two-fold higher in men than in women.

Discussion and conclusions: Few studies have focused on sex-based differences in basal salivary α-amylase, which has been inconclusive. The main result of the present study indicate that salivary α-amylase activity following maximal effort of cycling appears to be lesser in women than in men, which could in part be explained by the disparity of the activating reaction of the sympathetic-adrenomedullary system and hypothalamic- pituitary-adrenal axis.

545 Respiratory muscle training enhances maximal minute ventilation and forced vital capacity in adolescent athletes

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Introduction: Respiratory difficulties in athletes are common, especially in adolescents, even in the absence of exercise-induced bronchoconstriction. Immaturity of the respiratory muscles coupling at high respiratory rates could be a potential mechanism. Whether respiratory muscle training (RMT) by means of eucapnic hyperventilation can positively influence it is yet unknown. Goal: We investigated the effects of RMT on ventilation and performance parameters in adolescent athletes and hypothesize that RMT will enhance respiratory capacity.

Methods: 12 healthy subjects (8 male, 4 female, 17±0.5 years) from a sports/study high school class, competitively involved in various sports (minimum of 10 hours per week) underwent respiratory function testing, maximal minute ventilation (MMV) measurements and a maximal treadmill incremental test with VO$_2$max and ventilatory thresholds (VT1 and VT2) determination. They then underwent one month of RMT (4 times/week) using a eucapnic hyperventilation device (Spirotiger®), with an incremental training program. The same tests were repeated after RMT.

Results: Subjects completed 14.8 sessions of RMT, with an increase in total ventilation per session of 211±29% during training. Borg scale evaluation of the RMT session was unchanged or reduced in all subjects, despite an increase in total respiratory work. No changes (p>0.05) were observed pre/post RMT in VO$_2$max (53.4±7.5 vs 51.6±7.7 ml/kg/min), VT2 (14.4±1.4 vs 14.0±1.1 km/h) or peak running speed (16.1±1.7 vs 15.8±1.7 km/h). MMV increased by 9.2% (176.7±36.9 vs 192.9±32.6 l/min, p<0.001) and FVC by 3.3% (4.70±0.75 vs 4.85±0.76 *litres, p<0.05). Subjective* evaluation of respiratory sensations during exercise and daily living were also improved.

Conclusions: RMT improves MMV and FVC in adolescent athletes, along with important subjective respiratory benefits, although no changes are seen in treadmill maximal performance tests and VO$_2$max measurements. RMT can be used to improve ventilation characteristics in healthy adolescent athletes, and it reduces their perception of breathing effort during exercise.

546 A new submaximal cycle ergometer test for prediction of VO$_2$max

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Introduction: Maximal oxygen uptake, VO$_2$max, is an important, independent predictor of cardiovascular health and mortality. Despite this, it is rarely measured in health controls or clinical practice. The aim of this study was to create and evaluate a new non-maximal cycle ergometer test based on delta heart rate (ΔHR) response between a lower standard workrate and individually chosen higher workrate.

Methods: A mixed population sample (n=143) with regard to sex (55% women), age (21 to 65 years), and activity status (inactive to highly active) was included. The participant pedaled for four minutes at standard rate (0.5 kilopond and 60 rpm). Then, with maintained pedalling rate, the resistance was increased to a higher individually chosen workrate to obtain a rate of perceived exertion of 14-15 on Borg's RPE scale. HR was recorded as the mean of the last minute on each workrate. Thereafter, the participants performed a maximal treadmill test to determine actual VO$_2$max. For reliability testing, two submaximal tests were performed with one week in between. ΔHR between the two workrates was related to the increased power output (ΔPO). A multiple linear regression model included ΔHR/ΔPO, sex and age for the best estimate of VO$_2$max.

Results: The association between estimated and observed VO_2max for the mixed sample was r=0.91, SEE=0.302 L·min-1 when mean measured VO_2max was 3.23 L·min-1. The corresponding coefficient of variation was 9.3%, a significant improved precision compared with one of the most commonly used submaximal exercise tests, the Åstrand-test, which in the present study estimated to 18.1%. Test-retest reliability analysis over one week revealed no mean difference in estimated VO_2max. We believe that the improved precision of the new test is mainly due to the use of ΔHR response between the two workrates, rather than HR response to one workrate, as commonly used in other cycle tests (e.g. the Åstrand test). ΔHR reduces the impact of the commonly featured variability in absolute submaximal HR response due to nervousness or ambient temperature, and to variability in mechanical efficiency.

Discussion: A new submaximal cycle ergometer test for prediction of VO_2max is presented, which is low risk, easy administrated and without need of laboratory equipment. It is applicable in a mixed population and valid within a wide capacity range.

547 — The design and implementation of a novel method for quantifying training loads in elite rowing: The T2minute method

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Introduction: A systematic approach to managing the training of elite athletes is supported by accurate training load measurement. However, quantifying the training of elite Australian rowers is complex due to unique challenges: 1) the multi-centre, multi-state structure of the national program; 2) the variety of training undertaken, incorporating rowing-specific and non-specific modalities, with continuous and interval efforts that span the full intensity spectrum; and 3) the limitations of existing quantification methods for capturing total training loads undertaken from varied training. These challenges highlighted a need to create a consistent, location-independent framework for prescribing training in elite rowing, with a capacity to account for varied training.

Methods: An in-house proprietary measure (the T2minute method) was developed at the National Rowing Centre of Excellence (NRCE), as a collaborative project between sport scientists and national squad coaches. The design phase was informed by assessments of the existing training measures, and built upon standardised intensity zones established at the Australian Institute of Sport. A common measurement unit was chosen: one T2minute equates to one minute of on-water single scull rowing at T2 intensity (~60–72% VO_2max). Each intensity zone was assigned a weighting factor according to the curvilinear relationship between power output, intensity, and blood lactate response. Each training mode was assigned a weighting factor based on whether coaches perceived it to be "harder" or "easier" than on-water rowing. With coaches' feedback, the method was refined over a period of five months. The T2minute method was implemented as the core framework for prescribing training for elite Australian rowers throughout the 2009–2012 Olympic cycle.

Results: The implementation of the T2minute method successfully established consistency with training prescription and monitoring practices within the NRCE high performance program. The national roll out this method has influenced rowing training methodology at elite and sub-elite levels in Australia. Since implementation, the method has undergone scientific validation. Further research is underway, utilising the method to explore complex relationships between rowers' training and performance outcomes.

Conclusion: The T2minute method is a novel approach that allows rowing coaches and sport scientists to utilise one consistent system to quantify load from varied training. Its implementation represents a considerable achievement in establishing a common framework for managing the training process within a complex organisational structure. This collaborative approach used to develop the T2minute method provides unique insight into the important considerations and practical challenges of applying training science to enhance elite sport performance.

548 — Cortical bone distribution at the tibial shaft in adolescent female athletes

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Introduction: The distribution of cortical bone in long bones is not uniform and varies in cross-section and along its axial length. Furthermore, evidence exists of region-specific effects of growth and loading on cortical bone distribution with little difference in volumetric cortical bone mineral density (vBMD) across the whole bone. An open source analysis tool (BoneJ) of three-dimensional images acquired using peripheral quantitative computed tomography (pQCT) assesses the distribution of cortical bone around the neutral axis (polar distribution) and circumferential layers within the cortex (radial distribution). The aim of this study was to compare the polar and radial distribution of cortical bone at the tibial shaft in elite adolescent female athletes exposed to different loading activities with non-athletic controls.

Methods: Cortical distribution at the tibial shaft (38% of tibial length measured distally) was assessed using pQCT in four groups of adolescent females aged 12 to 18 years (mean 14.9 y). Groups comprised gymnasts (n=24), track and field (n=33), water polo (n=30) and controls (n=26). Radial and polar vBMD was measured in three concentric cortical divisions (radial) and thirty six, ten degree cortical sectors (polar) originating from the neutral axis. Cortical and total bone area, endocortical and pericortical radii, and bone strength were also measured.

Results: After covarying for age, height and weight, the high-impact sports of gymnastics and track and field displayed greater cortical bone area, total bone area and pericortical radius (P<0.05) compared with the weight-supported sport of water polo and controls. Gymnasts displayed less cortical vBMD at the midcortical and pericortical divisions than water polo and controls (p<0.05). There were no differences between groups in endocortical vBMD. Despite evidence of reduced cortical vBMD at the mid and pericortical envelope, gymnasts and track and field athletes showed greater bone strength (strength strain index) than water polo and controls (p<0.05).

Discussion: Sports involving high-impact, weight-bearing activity appear associated with reduced cortical vBMD, particularly at the mid- and pericortical bone divisions. It is plausible that repeated exposure to high-impact loads causes microdamage which serves as a stimulus for bone remodeling resulting in decreased vBMD. Despite reduced cortical vBMD, results highlight the osteogenic benefits of weight-bearing activity on enlarging the bone cross-section leading to an increase in bone strength.

549 Injury surveillance data captured by Sports Trainers at the 2007, 2009 and 2011 Australian University Games

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Introduction and background: Injury surveillance data including capture of injury incidence and severity is considered an essential component in effective sports injury prevention. Sports Trainers are frequently the first and sometimes only practitioners contacted by athletes with medical conditions or injuries related to sport. Therefore the medical encounter data collected by Sports Trainers can be of significant benefit in identifying injury trends which can in turn assist future planning of medical services for sport. However accurate, standardised encounter data is necessary to allow meaningful data analysis and comparison.

Method: The Australian University Games (AUG) is a major multi-sport event held biennially on the Gold Coast. In 2007, 2009, 2011 the medical service primarily comprised SMA Accredited Sports Trainers who provided immediate care at the competition venues, supported by the Queensland Ambulance Service and a referral network involving local Doctors and Physiotherapists. Medical encounter data was collected from the Sports Trainers using a standardised Medical Encounter Log for all presentations. This form was supported by a more detailed Injury Report Form for presentations requiring any form of assessment or referral for further care. Medical encounter data was collected primarily to identify occasions of service by sport, and also the type of injury and the body part injured. However, additional content analysis of the Medical Encounter Logs and Injury Report forms was also performed to identify consistency and accuracy of reporting.

Results: 947 medical presentations were recorded during the AUG 2007, 1467 in 2009 and 1958 in 2011. Analysis of the completed medical encounter logs and injury report forms revealed considerable inconsistency and inaccuracy of reporting by Sports Trainers with 35.04% of the forms being incorrectly completed in the 2007 AUG. This included repeated incorrect use of the "TOTAPS" assessment tool on the Injury Report Form, despite the fact that the TOTAPS tool is a key component of the Sports Trainer training program.

Discussion: Based on the data collected it appears medical surveillance by Sports Trainers is useful with respect to incidence but less so regarding establishing severity of injury. It is recommended that additional training of Sports Trainers in the use of standardised injury surveillance reporting is undertaken to improve the quality of medical data procured at sporting events for the purpose of improving injury prevention and event management planning.

550 The association between ground conditions and injury: An evaluation of current practices

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Introduction: Ground conditions have been identified as a factor associated with injury risk in a range of sports. However, the available literature is largely limited as there are no standardised practices for the measurement of ground conditions, and this has largely resulted in an intuitive relationship between ground conditions and injury. A review of literature was therefore needed to evaluate current practice and provide recommendations for future studies that measure ground conditions and injury risk. The aim of this review was therefore to identify studies which addressed this relationship, in a sporting context.

Method: A systematic approach including comprehensive searching of multiple databases from the earliest records available until the end of 2011 was implemented. Studies were identified by screening of titles, abstracts and keywords according to the inclusion criteria defined a priori. A classification scale was developed to rate the methodological quality of studies.

Results: A total of 78 full-text papers were assessed for eligibility, of which 26 met all inclusion criteria. Methodological quality varied, with analytical observational studies and descriptive observational studies the most common. Within these, only four objectively measured ground conditions, and only one study that utilised subjective assessment provided descriptors to explain their subjective classifications. Interestingly, all studies reviewed reported ground hardness as the measured ground characteristic. Findings indicate that harder grounds are associated with increased injury risk, although the lack of detail regarding assessment of ground conditions necessitates cautious interpretation of key findings.

Discussion: There is a dearth of high quality evidence of the extent to which injury risk is associated with quality of the sports playing surface. This systematic review provides insight into quality research designs and identifies essential issues for consideration in future studies, including the reliability and validity of equipment to directly measure ground conditions. For future studies that are limited to subjective assessment, the level of training and reliability of ground assessments should be considered. In addition, descriptions of subjective ground categorisations and number of locations observed for the overall assessment should be noted. Inclusion of other factors that have been postulated to affect injury risk (grass cover, grass type, soil type, evenness and footwear) will also add immense value to the quality and repeatability of work in this area and provide invaluable information for future injury prevention strategies. Adoption of review recommendations will draw more definitive conclusions regarding the relationship between ground conditions and injury risk.

551 Subjective assessments of playing surface conditions: Are they accurate?

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Introduction: The condition of playing surfaces, particularly natural grass, has commonly been associated with injury risk. The validity of surface measurements is critical for an accurate interpretation of the associated risk. The majority of published studies (85%) have relied on subjective ground condition descriptors and although subjective measurements are a common and relatively cheap option, their ability to accurately represent the condition of the surface is unknown. The aim of this paper is to examine the level of concordance between direct/objective ground measurements and subjectively rated ground hardness and moisture levels on natural grass surfaces.

Methods: Subjective measurements of ground hardness and soil moisture were recorded on 36 occasions during an Australian football season using a four-point scale of 'very soft' to 'very hard' and 'very wet' to 'very dry'. Objective hardness measurements using a 2.25kg Clegg hammer and soil moisture using a volumetric moisture meter were collected on the same grounds the day before matches. Data were excluded if there was any change in ground conditions due to rainfall between testing and the match. Objective measurements were collected at nine locations and the average, maximum, and minimum values across the ground were calculated and categorised according to previously published classifications. Frequency distributions were calculated and a Somer's D statistic was computed to measure the level of concordance between the subjective and objective measures.

Results: A moderate, significant relationship was found between the subjectively rated hardness and the average (D=-0.48, $p<0.01$), maximum (D=-0.46, $p<0.01$), and minimum (D=-0.42, $p<0.01$) Clegg hammer values. A low, non-significant relationship was found between the subjectively rated moisture levels and the average (D=0.11, p=0.56), maximum (D=0.26, p=0.12), and minimum (D=0.15, p=0.45) objective moisture values. Only 25% of the 'very wet' objective measures were correspondingly subjectively rated and 43% of the times the ground was subjectively rated as 'hard' it was objectively classified within low/normal or the preferred range.

Discussion/Implications: Overall, the subjective assessments were more accurate for hardness than soil moisture. However, the low level of relationship for moisture is alarming given the reliance on this type of ground condition assessment in injury risk factor studies. If subjective ground measures are to be used in the future, there is a need to standardise practices and to ensure that the reliability of assessors and details of the assessed locations are stated in all future publications.

552   Investigating risk factors in paediatric snowsport injuries: Characterisation of head impacts

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Introduction: Previous research on snowboarders' head impacts suggested that snowboarder's head impacts are not rare but when they do occur, they are generally of low magnitude, however they were not able to determine what the participant was doing at the time of the impact. To build on this previous research this project tracked the participants' speeds, distance travelled and location via the SpiElite and, thus, able to more accurately interpret what was happening if a head impact did occur. This project aimed to build upon this previous research by investigating the characteristics of head impacts incurred by paediatric snowsports participants to inform future snowsport safety strategies given the suggestion that traumatic brain injury is the leading cause of death in snowsports and the increasing discussion about the need to wear helmets. This was to be achieved via, Measuring the frequency, location and severity of snowsport head impacts through the use of Giro 9 snowsports helmets instrumented with Simbex's Head Impact Telemetry (HIT) System; Correlating head impact data with GPSports' SpiElite data logging system.

Method: A descriptive study was conducted involving a convenience sample of paediatric snowsport participants recruited via public and private schools who participated in resort based, lift-accessed snowsport programs in the Snowy Mountains during 2009–11. Participants wore *the* HIT-enabled helmet and SpiElite during their normal snowsport activity.

Results: Data was collected from 124 participants over 162 sessions recording 709 hours of data and 3,238.9km of travel. The maximum speeds recorded *ranged* from 4.3km/h to 82.2km/h, *mean=42.4km/h*. Of all the 970 *head* impacts/accelerations recorded only three could be verified to be as a result of falls given the criteria for a fall *used* in this project, *i)* that the head impact exceeded *40g*, ii) that the incident occurred on-snow, and iii) that there was an impact on the body over 2g, with a concurrent immediate decrease in velocity following the impact. None of them recalled having experienced a head impact after the event.

Discussion: The key insights drawn from this research are: Paediatric snowsport head impacts are very rare, and if they do occur are generally of low magnitude; Those most at risk of a head acceleration >40g were male snowboarders; Post-event recall was not a good indicator of experiencing a head impact; Consideration should be given to raising the standard design speed testing for snowsport helmet protective devices to reflect actual snowsport behaviours and maximum speeds achieved.

553   An investigation of in-game landings in elite netball: Implications for injury risk

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Introduction: Injury surveillance data reveals lower limb injuries, particularly those sustained during non-contact landings, to be commonly associated with netball. While netball specific landings have been frequently examined within a laboratory setting, very little attention has been given as to how players land in game situations. Understanding landing during game play and the associated events may aid in improving the ecological validity of laboratory based research and subsequent efficacy of intervention strategies. Therefore, the purpose of this study was to identify the landing techniques employed by netball players and examine the game events associated with these landings; and assess which landing technique/s may increase the risk of injury due to the specific events associated with landing technique.

Methods: A descriptive design using computerised analysis software (Dartfish, Australia) was employed. Players from the Australian female netball team were observed during three international matches from 2009/2010. Landings were identified and categorised for the type of landing performed, as well as key events directly associated with the landing occurrence. The frequency of the various landing techniques and associated events were collected; and direct binary logistic regression was used to assess which key events had significant associations with the types of landings examined.

Results: A total of 1328 landings were observed across the three games analysed, with a variety of techniques employed by each court position. Events within the landing analysis categories of level of rotation, movement prior to the land, movement immediately after the land, game activity after the land, height of pass, and proximity of opponent were found to have significant associations with various landing techniques.

Discussion: Players used a variety of landing techniques throughout the matches observed. The choice of technique may be dependent on the situation and needs of the player. Landings were shown to occur with a wide range of surrounding events and the techniques employed were associated with these. When training players on how to land appropriately or undertaking laboratory based research, a wide range of scenarios and landings should be performed to ensure game specificity is met. Single limb landings were found to be associated and frequently occur with previously identified risk factors for lower limb injury. Injury prevention strategies surrounding netball and landing should therefore place emphasis on the correct way to perform single limb landings.

554   Injury incidence in a group of U17 and U19 Rugby League players

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Introduction: Sports injuries are concerning during childhood and adolescence. To date most of injury research has focused on adult high performance athletes. Finding of such research cannot be generalized to the younger competitors. Injury incidence in adult high performance rugby league is higher than in many other team sports however little is known about incidence in younger players at the lower levels of competition.
Methods: Participants were 29 male, junior Rugby League players in U17s and U19s divisions,17 forwards and 12 backs, mean age 17.5 years (SD+1.1). Data collection occurred mid-season. Players completed a validated 12 month retrospective injury and sports history questionnaire, checked against club records. Fitness testing was also performed and consisted of Height, weight, vertical jump, lower limb static strength and stability testing (lunge test), 40 m sprint (Light gates; splits at 10, 20 and 40m), agility (T-test) and Beep test.
Results: Rugby league specific sports injuries were reported by 91.3% (27/29) of the participants, of these 37% had sustained the same injury previously. Non rugby league injury was reported by 31% (9/29). Two players reported no injuries, both were backs. Overall rugby league injury incidence was 45 per 1000 hours of exposure to rugby league training and competition, backs incidence was lower than for forwards. All forwards reported a rugby league injury with 69% categorized as moderate or above in severity, cf 38% for backs. The most common site of injury was the ankle (22.2% of injuries) followed by knee (14.8%) and hamstring (11.1%). Mechanisms of injury most frequently reported were: awkward landing (27%); being tackled (27%) and tackling (18.9%).
Discussion: Rugby league moderate and severe injury incidence in this study is higher than previous similar studies. Variation in injury definitions utilized within the literature complicates direct comparisons with literature. The finding that forwards had a higher incidence of injury is consistent with previous research as is the finding that the majority of injuries are sustained in tacking situations. The injury profiles of these age group players are very similar to those of adult high performance players. The low number of players reporting no rugby league injury in this study prevented statistical analysis to identify the relationships between injury risk and training/playing/fitness variables. The high rate of injury and re-injury in these teams is of concern. Further research is required before d the factors that contributed to this can be determined.

555   Games and mental skills: Enhancing life satisfaction, self-worth, and happiness of former gang members

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Many policy makers and practitioners serving at-risk youth have tended to use a deficit approach that sees these individuals as having weaknesses that need to be avoided or diminished. Gang members possess the potential for positive development so a strengths-based approach that enables individuals to develop their capabilities for positive contributions to self and society may be effective. The purpose of this study was to determine the effects of physically active games and mental skills training on Mexican ex-gang members' self-concept, life satisfaction, perceived control, and happiness. Male (n=9) and female (n=11) former gang members aged 15-47 (M=21.3) voluntarily participated in ten 2-hour sessions containing games to improve communication, trust, and problem-solving, and the development of mental skills such as imagery, goal setting, attention, and self-confidence. Many of the participants had begun taking and/or selling drugs at a young age, and some had been the victims and/or perpetrators of physical violence (e.g. stabbings). Some of the participants had previously been incarcerated. Questionnaires were completed in the first and tenth sessions. Mean attendance was 7.86 out of 10 sessions. Results indicated significant improvements in happiness, life satisfaction, and physical appearance, close friendship, behavioural conduct, scholastic competence, athletic competence, social acceptance, and global self-concepts. Mental skills training and games appear to be an effective combination for improving the quality of life of former gang members. These findings indicate the relevance of sport psychology to avenues outside of traditional sport. In addition to the presentation of the results of the study, the session will include a description of the structure of the sessions and examples of some of the activities.

556   Minimising risk in high risk settings: Do the 3 E's of injury prevention (education, enforcement or engineering) work?

KEYNOTE

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It is well documented that regular physical activity can improve health and quality of life. There is however, a cost to physical activity – namely the burden of injury. Injuries resulting from sports and physical activities are a significant health problem in many countries, including Canada. After recognising the scale of the problem, in 1979, the government of Québec adopted the *Act Respecting Safety in Sports* to significantly contribute to the establishment of safe environments. Through its mission that is to "foster the development of recreation and sport in a safe and healthy environment and promote an active lifestyle for all Quebecers", the Québec Ministry of Education, Leisure, and Sport (QMELS) supervises the execution of this act. In accordance with it, one of the QMELS's directives is to "ensure that the safety and physical security and well-being of participants are provided for during sports and physical activities". To realise its mission, the QMELS developed and implemented safety measures based on the 3 E's of injury prevention: Education, Enforcement, and Engineering. The aim of this presentation is to show how different and combined safety measures based on the 3 E's of injury prevention were developed and implemented to reduce the incidence of injuries in alpine skiers, snowboarders, and ice hockey players in Québec. More specifically, strategies such as the promotion of personal protective equipment use, regulations, and environmental modifications will be discussed. The importance of having access to well-documented facts on the injury problem at hand, as well as on the effects of the potential safety measures will be addressed. Based on our Québec experience and from published literature in the field of injury prevention and safety promotion, some factors influencing the adoption of healthy public policy will be presented. Finally, an answer to the question "Do the 3 E's of injury prevention work?" will be suggested.

557 Relationship between physical activity related energy expenditure and cardiovascular disease factors among adults

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Introduction: It is known that physical activity (PA) can decrease cardiovascular disease (CVD) risk levels. However, PA is difficult to measure accurately in free living situations and it is commonly measured by questionnaires and accelerometers. The relationship between variables derived from these methods and CVD risk factors is generally low, which may be due to measurement error. It is believed that derived PA variables from measurements of total daily energy expenditure (TDEE) and resting metabolic rate (RMR) can better represent PA; however, there is little or no information about the relationship between these variables and CVD risk factors. The purpose of this investigation was to determine the relationship between different PA related energy expenditure variables and CVD risk factors.

Methods: The sample includes 209 adults (136 women and 73 men; 35.2±11.5 y; BMI 27.2±4.9 kg/m^2; mean±sd). TDEE was measured by DLW for 2 weeks, and RMR was measured with a ventilated hood. Physical activity level (PAL) was calculated by dividing TDEE by RMR, activity energy expenditure (AEE) was defined as (TDEE*0.9)/RMR and activity related energy expenditure (AREE) was defined as the residual from the regression of TDEE on RMR. In addition, height, weight (and BMI) and blood pressure were measured, and fasting cholesterol, glucose and triglyceride levels were assayed. Fasting insulin was measured in a subsample of 87 participants. The relationships between AEE, AREE, PAL and CVD risk factors were explored in an analysis stratified by sex and using Pearson correlations.

Results: There were no significant correlations between the PA related energy expenditure measures and CVD risk factor for women. PAL, AEE, and AREE were significantly correlated with HDL-C (p<0.05) in men: r=0.32, 0.31, and 0.31 respectively. PAL and AEE were also significantly correlated with fasting glucose in men: r=-0.23 and -0.24.

Discussion: In this sample, different measures of PA related energy expenditure were not correlated with any CDV risk factors in women, but were correlated in men. PA related energy expenditure measures were only significantly correlated with HDL-C and glucose. The CVD risk reduction attributed to physical activity might be due to reasons other than total and PA related energy expenditure, including cardiorespiratory fitness.

558 Associations of leisure time, commuting and occupational physical activity with fitness and clustered cardiovascular risk factor

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Introduction: There is strong evidence that consistent physical activity (PA) reduces cardiovascular disease (CVD) and its risk factors. A majority of previous studies have concentrated on leisure time physical activity (LTPA), while commuting (CPA) and occupational (OPA) physical activity have been less studied and the results are inconsistent. The aim of the present study was to assess the associations of different type of PA with cardiorespiratory fitness (CRF) and with clustered CVD risk factor.

Methods: 846 men participated (26±5 yrs.). Low, moderate and high categories were used for self-reported LTPA (0-some light PA/week, brisk PA 1–2 times/wk and brisk PA ≥3times/wk); CPA (0–15 min/day, 15–30 min/d and >30 min/d); and OPA to low (sedentary work, walking quite much at work and, much walking and lifting at work). Cardiorespiratory fitness (CRF) was measured by using cycle ergometer test until exhaustion. Clustered CVD risk factor was defined, when an individual had ≥2 risk factors: glucose (>6.1 mmol/L), triglycerides (>2.0 mmol/L), HDL (<1.0 mmol/L), LDL (>3.0 mmol/L) and blood pressure (systolic >140 mmHg and/or diastolic >90 mmHg). OR's were adjusted for age and smoking with the other two types of PA.

Results: Cardiorespiratory fitness. Compared to the low LTPA group, likelihood for better CRF was higher in moderate (OR 1.77, 95% CI: 1.43–2.20) and high (OR 3.09, 95% CI: 2.42–3.95) LTPA groups. Similarly, the likelihood for better CRF was higher in moderate (OR 1.30, 95% CI: 1.06–1.60) and high (OR 1.65, 95% CI: 1.33–2.04) CPA groups when compared to the low CPA group. There were no statistical differences in either moderate (OR 1.22, 95% CI: 0.97–1.55) or high (OR 1.10, 95% CI: 0.91–1.33) compared to the low OPA group. Clustered CVD risk factor. The likelihood for having clustered CVD risk was significantly higher in the low (OR 2.75, 95% CI: 1.37–5.51) or moderate (OR 2.32, 95% CI: 1.18–4.59) CPA groups compared to high activity group. However, the likelihood for having clustered CVD risk was not significantly different in low (OR 1.83, 95% CI: 0.93–3.60) or moderate (OR 1.28, 95% CI: 0.66–2.47) LTPA or OPA (low: OR 1.51, 95% CI: 0.87–2.66) (moderate: OR 1.08, 95% CI: 0.55–2.12), when compared to their respective high activity group.

Discussion: The present findings support the beneficial associations of higher LTPA and CPA with better cardiorespiratory fitness and emphasize associations of higher CPA on lower clustered CVD risk. Various approaches should also be adopted to encourage active commuting.

559   The impact of body mass index and physical activity on endothelial function and inflammation

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Introduction: Obesity is associated with a chronic state of low inflammation, altered adipokine release and increased inflammatory marker secretion which may profoundly affect vascular endothelial function (EF). Regular physical activity (PA) has been associated with less inflammation and improved EF. Therefore, the purpose of the current study was to evaluate the impact of obesity and PA on EF and inflammation.

Methods: The results presented here are sub-analyses of the Mechanisms and Longitudinal Outcomes of Silent Myocardial Ischemia (MOSMI) study. A total of 326 women and men undergoing a standard nuclear medicine exercise stress were recruited. All patients underwent a Forearm Hyperaemic Reactivity test which measures brachial artery reactivity; a proxy of EF, and their relative uptake ratio (RUR) was established. Participants were also administered a self-report questionnaire on leisure time PA, including summer and winter activities as well as gym time. Average metabolic equivalent hours/week was calculated. Body mass index (BMI) was calculated and blood samples were taken and analysed for inflammatory marker C-reactive protein (CRP) and sedimentation rate (SR), an indicator of inflammation.

Results: Analyses adjusting for age, sex, smoking status, and history of cardiovascular disease revealed a main effect of BMI on RUR (F=17.17, p<.0001) such that participants with a higher BMI had reduced RUR score, indicative of endothelial dysfunction. Additionally, we observed a main effect of BMI on CRP level (F=14.43, p<0.001), whereby participants with higher BMI's had higher CRP levels. However, we did not observe a main effect of PA on RUR or CRP levels, nor was there an interaction between BMI and PA. Conversely, a significant main effect for both BMI (F=4.93, p=.03) and PA (F=5.17, p=.02) were shown for SR. In addition, there was an interaction effect of BMI and PA on SR (F=4.89, p=.03). Additional analyses showed that SR did not differ across BMI categories in those with lower PA levels. However, in participants with higher PA levels, SR increased with increasing BMI.

Discussion: We observed impaired EF and elevated inflammation in the overweight participants. There appears to be no effect of PA on either EF or CRP levels; however, the results indicate that PA may have a beneficial effect on SR. Also, there seems to be a multiplicative effect of BMI and PA on SR. Overall, results suggest that BMI may be a better determinant of EF then PA; however, both may affect inflammation. Additional studies are needed to evaluate these relationships.

560   Total sitting time, leisure screen time and cardiometabolic risk in adults. Cross-sectional analysis of the HUNT3 cohort, Norway

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Introduction: Recent studies have found that higher amounts TV-viewing and other screen-based activities are associated with greater cardiometabolic risk in adults. However, few studies have examined associations between total sitting time and cardiometabolic risk. This study aimed to examine associations of total sitting time and leisure screen time with cardiometabolic risk biomarkers in adults.

Methods: Waist circumference, BMI, total cholesterol, HDL cholesterol, blood pressure, non-fasting blood glucose, glutamyltransferase (GGT) and triglycerides were measured in 48,882 adults aged 20 years or older from the Nord-Trøndelag Health Study 2006–2008 (HUNT3). Associations of these biomarkers with self-reported total sitting time (h/day) and leisure screen time (computer use (LTPC), TV-viewing) were tested using multiple regression models adjusted for sex, age, education, BMI, physical activity, smoking status, fruit and vegetable consumption, and general health status. We ran models for the whole sample and stratified by cardiometabolic disease status.

Results: In the whole sample, reporting total sitting time ≥10 h/day was associated with poorer levels of BMI, waist circumference, total cholesterol, HDL cholesterol, diastolic blood pressure, non-fasting glucose, GGT and triglycerides compared to those reporting total sitting time <4 h/day (all p<0.05). High leisure screen time (any LTPC and TV≥4h/day) was associated with poorer BMI, waist circumference, total cholesterol, GGT and triglycerides compared to no LTPC and TV<1h/day (all p<0.05). Similar but non-significant patterns were observed in participants with cardiometabolic disease.

Discussion: Total sitting time and leisure screen time are associated with poorer cardiometabolic risk profiles in adults. This study's cross-sectional nature does not allow conclusions of causality to be made. Nonetheless, the results add to the increasing evidence base about the potential health benefits of reducing time spent in sedentary behaviour throughout the day and of limiting TV-viewing and computer use during leisure-time.

561   Sedentary time decrease in patients with cardiovascular risk factors participating in a structured lifestyle intervention program

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Introduction: Sedentary time is recently recognized as an independent risk factor for cardiovascular disease and all-cause mortality. A Swedish randomized controlled trial demonstrated that sedentary time was reduced in overweight individuals after receiving physical activity on prescription. However, it is still not known if this is doable in a clinical setting among individuals with cardiovascular risk factors.

Methods: An intervention program at a Department of Cardiology consisted of an individual visit to a nurse for an initial health check-up and lifestyle counseling. The patients received an individual prescription of physical activity and a pedometer. Thereafter, the patients participated in a structured lifestyle course with their spouses. The program included five meetings with a physician and a nurse and the topics highlighted were physical activity as well as sedentary time, food habits, nicotine, alcohol, stress and cognitive behavior therapy. Physical activity level as well as sedentary time at work and during leisure time was measured with a questionnaire at baseline, after six months and after one year.

Results: Up to date 99 patients are enrolled in the program and 49 have fulfilled a six month as well a one year visit. Self-reported sedentary time decreased from baseline to 6 months and 1 year (7.5, 6.2, and 6.0 h/day respectively, p for trend <0.001). The participants also reported increased low intensity everyday life activity. In parallel, there was a significant decrease in systolic blood pressure (137, 132 and 130 mmHg respectively, p trend=0.02), diastolic blood pressure (83, 80 and 79 mmHg respectively, p trend=0.04), waist circumference (110, 109 and 107 cm respectively, p trend <0.001), and an increase in self-rated fitness (p trend <0.001).

Discussion: Sedentary time was significantly reduced after six months and one year (1.3 and 1.5 h/day respectively) in patients with cardiovascular risk factors participating in a structured life style intervention program. Also, there was a significant improvement in major cardiovascular risk factors and self-rated fitness.

562   The acute effect of 'breaking-up' prolonged sitting on cardiovascular risk factors in overweight/obese adults

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Introduction: We have recently shown in a controlled laboratory setting that regularly 'breaking up' prolonged sitting with frequent short bouts of light- or moderate-intensity walking activity acutely lowers postprandial blood glucose and insulin concentrations. However, we are yet to report the effect of interrupting sitting time on secondary outcomes relating to cardiovascular disease. Consequently, we compared the effect of a single prolonged (7-hour) bout of sitting with a similar duration of sitting combined with intermittent bouts of light-intensity or moderate-intensity activity on blood pressure, blood lipids and CRP.

Methods: Overweight/obese adults (n=19; age range 45–65 yrs) were recruited for a randomized three-week, three-treatment acute cross-over trial: 1) uninterrupted sitting; 2) seated with 2-minute bouts of light-intensity walking at 3.2 km/hr every 20 minutes; and 3) seated with 2-minute bouts of moderate-intensity walking at between 5.8–6.4 km/hr every 20 minutes. Following the completion of baseline measurements and an initial 2 hour steady-state period, participants consumed a standard test meal (75 g glucose, 50 g fat). Serum triglycerides were assessed hourly to calculate the incremental area under the curve (iAUC) and high sensitivity C-reactive protein (hsCRP) was assessed at baseline and 7 hours. Seated brachial artery blood pressure was also measured every hour as a single measurement, 5 mins prior to each activity bout, with an automated oscillometric blood pressure monitor (Philips SureSigns VS3 Monitor). GEE models were adjusted for sex, age, BMI, fasting blood pressure and treatment order.

Results: Systolic blood pressure decreased similarly and significantly during the light and moderate-intensity activity conditions [light: 120±4mmHg (hourly mean±SEM), p=0.002; moderate: 120±3mmHg, p=0.02] compared to uninterrupted sitting (125±4mmHg). Diastolic blood pressure was also significantly reduced with both activity conditions (light: 78±3mmHg, p=0.006; moderate: 78±3mmHg, p=0.03) compared to uninterrupted sitting (79±3mmHg). No significant group differences were observed in triglyceride iAUC, hsCRP and the hourly measurement of heart rate.

Discussion: These findings indicate that breaking up prolonged sitting with frequent short breaks of either light or moderate-intensity physical activity may have favourable effects on seated blood pressure. Further studies are needed to evaluate the chronic effects of breaking up sedentary time on cardiovascular disease risk factors and the feasibility of such strategies in the general community.

563   Is incidence of a health condition associated with physical activity change in adults over two years?

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Introduction: Physical activity is a recommended component of self management of many health conditions. The aim of this study was to examine if health status change or incidence of any of arthritis, diabetes, cardiovascular disease, or hypertension was associated with a change in physical activity level over a two year period.

Methods: Data were from a mail survey conducted in Brisbane in 2007 and 2009 (n=6427). Participants were mid aged adults aged 40–65 years at baseline. At each time point, respondents indicated whether or not they had each of arthritis, diabetes, cardiovascular disease, or hypertension. Incidence was defined as a change from "no" to "yes" for any of the four health conditions. A measure of physical activity during the previous week was derived (MET.mins) and categorized as inactive, very low, low, recommended, high, or very high level. Change in physical activity level was categorized as increase, decrease, or no change. Respondents indicated overall health status using a five point likert scale (strongly agree to strongly disagree) and change in health status was categorized as improve, decline, or no change. Data were analyzed using multi-level multinomial logistic regression with the reference category being no change in physical activity level.

Results: Over the two years, 21% of adults developed at least one of the four health conditions, and 18% had improved and 23% had declined in health status. Approximately 34% increased their physical activity level and 30% decreased. About 19% of adults who had recommended to very high levels of physical activity in 2007 were below the recommended level of physical activity in 2009. After adjusting for the effects of sex, age, education, body mass index, and wellbeing, incidence of a health condition was not significantly associated with either an increase (OR=1.18, 0.96–1.44) or decrease (OR=1.14,0.92–1.41) in physical activity level over two years. However, those with an improved health status had higher odds for an increase in physical activity level (OR=1.32, 1.07–1.63), and those with a decline in health status had higher odds for a decrease in physical activity level (OR=1.45, 1.20–1.76).

Discussion: This study offers no evidence of association between incidence of the four health conditions and a change (either increase or decrease) in physical activity. Subjective heath status could be a more useful means by which to understand changes in physical activity. However, further research is needed to examine the temporality of this association.

564 | Lifestyle intervention improves cardiovascular disease risk factors in young overweight women

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Introduction: Heart disease claims the lives of 31 women every day in Australia. Despite this, heart health programs only target older women. A number of modifiable risk factors for cardiovascular disease (CVD) such as inactivity and abdominal obesity (elevated waist circumference) already exist in young women (aged 18 to 30 years) in Australia. Reductions to risk factors following a multi-disciplinary lifestyle intervention are yet to be explored in young women, already at risk of CVD. The overall aim of this study was to test the effectiveness of a 12-wk multi-disciplinary lifestyle intervention (exercise, nutrition and cognitive behavioral therapy [CBT]) on CVD risk factors, specifically abdominal obesity (defined as a waist circumference ≥80cm) and cardiovascular fitness in inactive young women, as an early detection and primary prevention program.

Methods: Nineteen Caucasian women (age 22.3±3.3 y, body mass 87.1±19.9 kg), with abdominal obesity (waist circumference 90.7±9.4 cm) and poor aerobic fitness (predicted VO_2max 28.3±7.2 ml·kg^{-1}·min^{-1}) participated in the intervention comprising weekly: i) two supervised (aerobic and resistance training circuit) and one unsupervised (brisk walk or jog) exercise sessions; ii) nutrition education about healthy lifestyle choices provided by a dietician; iii) one-hour group CBT session which offered psychosocial support and developed skills to overcome personal barriers. Paired-sample t-tests compared means of pre and post CVD risk factors and lifestyle-related changes.

Results: Waist circumference (87.3±9.8 cm, $P<0.01$, $d=0.3$) and cardiovascular fitness [predicted VO_2max] (32.8±6.6 ml·kg^{-1}·min^{-1}, $P<0.05$, $d=0.6$) were improved in association with the lifestyle intervention. Preliminary analysis also showed positive dietary changes over the 12-week program with a reduction in total energy consumption and fat intake compared to baseline data.

Discussion: The intervention in this study was effective in reducing waist circumference. Waist circumference is a strong indicator of single and multiple risk factors in CVD. Therefore, a lifestyle intervention incorporating physical activity, nutrition education and CBT may be effective as a primary prevention program for reducing cardiovascular risk factors, as well as enhancing cardiovascular fitness, in young overweight women. The sustainability of positive health changes requires exploration to ascertain the continued effectiveness of such programs.

565 | Sport participation and metabolic health in adolescents: Is more always better?

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Introduction: High levels of physical activity and sports participation are associated with more advantageous metabolic outcomes. The aim of this study was to examine the effect of the level of competition in sports and its effects on metabolic risk.

Methods: Participants from the 'Tracking Adolescents' Individuals Lives Survey' (TRAILS) with measures for sport participation and with fasting blood samples were included in this analysis (n=1188). Data on sport participation (type, frequency and duration) were collected at age 16 (September 2005–Dec 2007) by questionnaire. Level of competition (not active in sports, active in sports but not in competition, local, regional, national or international competition) were filled in. A clustered metabolic risk score was calculated as the mean of the Z-scores of waist circumference, triglycerides, HDL-cholesterol and mean arterial pressure. Insulin resistance (IR) was assessed as HOMA-IR. Cardiorespiratory fitness (CRF) was estimated using the Shuttle Run Test in a subsample (n=565).

Results: With the increasing level of competition, this study observed increasing time spent in sports (p<0.001), more training sessions (p<0.001) and higher VO_2max (p<0.001). Also HOMA-IR (p=0.003) and fasting insulin concentrations (p<0.001) were different. Not engaging in sports or competition at the highest level showed increased insulin concentrations and HOMA-IR. Interestingly, being active at a regional level showed lowest insulin concentrations and HOMA-IR. No effects on the clustered metabolic risk score were found.

Discussions: This study showed a U-shaped association curve between level of sport competition and insulin and HOMA-IR with lowest levels for regional competitors. Therefore engaging in (inter)national competition level and thus participating in sports more often is not always healthier.

566 | Physical activity interventions to promote employee health and wellbeing: A Stage of Change approach

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Introduction: Sitting time and sedentary activity is developing into a major public health priority. Research suggests time spent in sedentary behaviours represent a unique aspect of human behaviour, independent of physical activity. A challenge for any physical activity intervention programme is to create sustained change in behaviour. This research applied the health psychology Stage of Change behaviour change model to a one-year organisational intervention to promote physical activity and reduce sedentary behaviours in employees.

Method: Ten worksites were recruited and allocated to a staged intervention, standard intervention or control intervention group. Intervention information was delivered to participants, which was dependent on their intervention group allocation and their readiness to change physical activity behaviours. Health assessments were conducted onsite to collect physiological measures (height, weight, Body Mass Index (BMI), body composition, blood pressure and resting heart rate) and psychological measures (lifestyle and physical activity information, sitting time data, work ability, self reported general health and job attitudes). Results from baseline and mid-intervention data-points are presented.

Results: A total of 1120 participants signed up to participate in the intervention programme. In terms of the demographic profile, 54% were male and the average BMI score was 26.7 (range=16.8 – 49.6, SD=4.8) kg/m^2. At the mid-intervention assessment, 86.5% of participants reported using a pedometer compared to 24.2% at baseline. The mean time spent walking on a particular day of activity for the sample at the mid-intervention point was 129 (SD=97.3) minutes compared to 53.8 (SD=71.4) minutes at baseline. There was a statistically significant difference in BMI scores for the groups during mid-intervention: F (2, 368)=3.43, p=.03. Post-hoc tests indicated that mean BMI scores for the staged intervention group (M=25.7 kg/m^2, SD=4.9 kg/m²) was significantly different from the standard (M=27.2 kg/m^2, SD=4.4 kg/m²) and control (M 27.2 kg/m^2, SD=4.9 kg/m²) intervention groups.

Discussion: The results provide an insight into how physical activity interventions can be modified to deliver tailored information based on an individual's readiness to change their physical activity behaviours. Participants in the yearlong intervention are now being followed up for a further twelve months. This research has developed tried and tested physical activity interventions that could be usefully adopted by organisations to maintain and promote the health of workers across the life course.

567 The interpersonal and ecological factors influencing employee health status in South African worksites

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Introduction: The workplace has been identified as an opportune setting for health promotion programs and can include environmental approaches to increasing access to healthy choices. The aim of this research study is to investigate the relationship between the availability of wellness facilities with employee health status and lifestyle behaviors (physical activity (PA), nutrition) in South African worksites.

Methods: Employers (n=71) and employees (n=11472) volunteered to participate in a national Healthy Company Index survey. The Human Resource Manger completed the Employer Questionnaire that assessed current health promotion initiatives, on-site facilities, company health-related policy and leadership support. The Employee questionnaire included self reported clinical measures and lifestyle behaviors (PA, nutrition habits). A facilities score was calculated (out of 100). Due to the clustered nature of the data Hierarchical linear models were fit to calculate the relationship between facilities scores and employees meeting or not meeting guidelines.

Results: Participants were 36±10 years and 80% of the employees were participating in less than 150 minutes of PA week and 60% were overweight or obese. The mean BMI was significantly lower (25.7±5.7) in those who categorized their health as excellent, compared to those in the good (27.2±6.7), fair (29.3±29.1) and poor (30.9±8.4) categories (p<0.005). Habitual levels of PA were significantly higher (120min/wk; SD 107.8) amongst those who rated their health as excellent and lowest for those rating their health as poor (21.5min/wk; SD 55.6). The mean total facility score was 58.5±25.5. The number of facilities at each company explained 5.4% of the variance in PA among employees (r=0.054; p=0.036). The odds of employees meeting PA guidelines increased significantly by 1.11 (p=0.002) for every additional PA facility. Similarly, facilities scores were higher for employees eating 5 or more servings of fruit and vegetables per day (12.0±5.1 vs 11.3±5.3, p<0.001).

Conclusion: The worksite environment might play a role in increasing employee PA and improving health status. Employers should be encouraged to create supportive environments to promote healthy lifestyle behaviors.

568 Working Late: Strategies to enhance productive and healthy environments for the older workforce

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Introduction: Working Late is a four year collaborative research project addressing practice and policy issues associated with later life working. The project is funded by the New Dynamics of Ageing (NDA) Programme. Working Late is developing and evaluating innovative interventions and design solutions to promote health and quality of working life for employees of all ages. This is particularly important given the increasing age of the workforce, with data suggesting that in the UK, as elsewhere in Europe, there are now twice as many workers aged 50 and over than those aged 25 years or younger (Ilmarinen, 2001). The ageing workforce creates a demand for research to support evidence based policy and practice, promoting the productivity, workability and quality of life of older workers and the economic competitiveness of the UK. The present paper provides an overview of four interconnected projects on the Working Late research programme.

Method: The Working Late multidisciplinary research adopts a mixed method research approach of focus groups, interviews, surveys and interventions. The defining feature of the research programme is engagement with agencies, employers and older workers to guide the research process and disseminate the findings. The four interconnected work packages on the programme examine: User Engagement and dissemination; Dynamics of later life working; The Occupational Health Context; and The Work Environment.

Results: To date, the research has successfully achieved four aims. Firstly, the identification of barriers and facilitators to working late, including the impact of age discrimination legislation and the logistics of the journey to work. Secondly, the identification of optimal, evidence based occupational health provision and best practice in occupational health services accommodating the older worker. Thirdly, the research has developed, implemented and evaluated workplace interventions to promote the health and workability of workers across the life course. Finally, the research has developed design models for an inclusive workplace which optimises health, well being, safety and productivity of workers across the life course.

Discussion: Through the active and continuous engagement with users, this research has been able to deliver effective and wide ranging dissemination of the findings. Ultimately, the implementation of this research and the adoption of its outputs will contribute to improved working practices, support services and the working environment allowing freedom of access to work and improved quality of working life of older people.

An international study of an automated web-based walking program (Walk@Work) to increase workday step counts in lower active office workers

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Introduction: The benefits gained from workplace walking are arguably offset by the considerable investment of time and effort required to run and maintain a successful program. This study evaluated whether a minimal contact, automated web-based intervention program, designed to increase workday walking, encouraged step count increases in an international sample of lower active office workers.

Methods: The study used a pre-post test design. A convenience sample of self-reported inactive (<150 minutes moderate-to-vigorous physical activity per week) university office workers (n=330; 45.5±10.8 years; BMI 27.1±5.5 kg/m^2; 288 women) were recruited at worksites in Australia (x2), Canada, Northern Ireland and the United States. These workers were given a pedometer (Yamax SW 200) and access to our website program (Walk@Work) between January 2009–11. The program encourages gradual increases of 1,000 daily steps above baseline, every two weeks (phases I–III), over a six week period; enables participants to enter and track daily step counts relative to individualised targets; and provides a range of progressive ecological support strategies (i.e. prompt emails, tips, discussion boards and walking maps) tailored to the work environment. For analyses, step counts entered by workers into the website were downloaded and intention-to-treat applied. Mean workday steps were compared using a mixed factorial ANOVA with timeline (baseline [2 weeks]; intervention [6 weeks]; maintenance [4 weeks post-intervention]), worksite and baseline activity status (inactive <5,000 steps/day; low active 5,000–7,499 steps/day; somewhat active 7,500–9,999 steps/day) as the within and between participant factors.

Results: 62% of workdays were captured for step count analyses (or 12,196 from 19,800 days). For the total sample, step counts significantly increased (p<0.000) from baseline (5,892±2,016 steps/day) to phase III of the intervention (7,252±2,504 steps/day), and were maintained post-intervention (7,369±2,631 steps/day; overall increase of 1,477 steps/day from baseline). Intervention effects were consistent across worksites, but differed relative to baseline activity status (p<0.000). Workers who were somewhat active (n=79; baseline of 8,573±677 steps/day) demonstrated the lowest increments in workday walking (overall increase of 929 steps/day), whereas inactive workers (n=125; baseline of 3783±853 steps/day) benefited the most from the program (overall increase of 1,837 steps/day).

Discussion: The study findings indicate Walk@Work increased workday step counts in this international sample of lower active university office workers. The program was particularly effective with inactive workers, increasing walking by nearly 20 minutes/workday. These increases occurred through a minimal contact, automated program, were maintained four weeks post intervention, and were equally effective across different worksites and countries.

Walking Works! Evaluation of a workplace walking project in England

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Introduction: Strategies are urgently needed to increase the proportion of the UK adult population who participate in recommended levels of physical activity; promoting walking provides one such strategy. The workplace offers an ideal setting in which to promote walking both as a mode of transport for the daily commute and during the working day. This study evaluated project implementation and the impact of the Walking Works (WW) project which aimed to increase walking during the daily commute, and whilst at work, in five organisations from different sectors and regions of England.

Methods: Volunteer walking champions (WCs) were recruited from within participating organisations to deliver workplace walking initiatives. Organisations took part in national campaigns, e.g. Walk to Work Week, and delivered other initiatives, e.g. pedometer programmes, lunchtime walks and promotional activities. Project implementation was assessed through interviews with the project coordinator, WCs and business representatives. All employees in all participating organisations were invited to complete an online survey at baseline and follow-up (16–22 months later). The survey assessed confidence and intention to walk to work, and walking levels during daily commuting and whilst at work.

Results: WCs delivered a variety of activities to promote workplace walking however additional support, resources and ready-to-use materials were needed. Visible senior management support was essential for project recognition, communication and employee engagement. WW was well received by employers and WCs perceived employee participation in project activities to be good, however only 15-61% of survey respondents reported participating in at least one activity. Survey response rates were low (range: baseline 15-39%; follow-up 5-36%). Significant increases in intention (18–36%) and confidence (23–30%) to walk more for the daily commute were observed in two organisations however the proportion of employees walking during their daily commute increased in only one of these (by 21%). There were no significant increases in walking during the working day, except for frequency of stair use in one organisation.

Discussion: This evaluation highlighted important learning about project delivery and identified key areas for improvement. Further evaluation is needed, with higher survey response rates, to better understand employee participation in workplace walking activities and the impact on walking levels. Whilst promotional activities may improve attitudes towards walking in the short-term, environmental or policy changes both within and outside the workplace may be required for longer-term sustainable increases in commuter walking and walking at work.

Effects of 1-year worksite structured exercise intervention at different volumes and intensities on physiological markers of health status

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Introduction: Addressing diet, physical activity and exercise in the workplace environment has the potential to improve health status of workers; contribute to a positive and caring image of the company; improve staff morale; reduce staff turnover and absenteeism; enhance productivity; and reduce sick leave, health plan costs and workers' compensation and disability payments. Structured exercise interventions are particularly effective to improve musculoskeletal fitness levels and as a result health and quality of life, but evidences coming from long-term specific interventions delivered at the worksite are very limited.

Purpose: To assess the effects of a 1-year structured exercise programme (SEP) (linear periodization) in physiological markers of health status in a group of employees trained at different intensities and volumes.

Methods: a group of employees (n=200) completed a 1-year SEP at the worksite organized with a linear periodization model, in 4 mesocycles of 12 weeks each one. Participants were randomized in one of the 4 different groups: control group (n=46), 2-days per week (n=51), 3-days per week (n=49), and more than 3-days per week (n=54). A comprehensive fitness test protocol was applied at the beginning, after 6 months of intervention and at the end of the year, after proper familiarization process before the initial testing. Testing included a complete health screening, fitness levels, lipids profile, fasting glucose, physical activity reported by IPAQ and directly measured by accelerometer (Mywellness key, Technogym, Forly, Italy), perceived wellbeing (SF-36), job performance and job satisfaction. The specific fitness testing included VO2 max test (modified Balke protocol), maximal strength (leg press, lat pull and bench press) and flexibility (sit and reach).

Results: significant improvements in cardiorespiratory and musculoskeletal fitness levels, cardiovascular risk factors, physical activity levels and wellbeing were identified in the active groups after the intervention, compared to the control group (p<0,05). The analysis of the specific results between groups showed no significance between the 2-days and the 3-days per week group (p>0,05), while the high frequency group (more than 3-days/week) achieved, as expected, higher levels of significant improvement (p<0,05).

Discussion: A strong commitment to integrate exercise into the lifestyle is mainly challenging for the most of the sedentary population, and despite the multiple benefits supported by evidences, the minimum dose to achieve the maximum results is a critical factor for engagement, especially at the beginning. Our study identified significant benefits just with two sessions per week, helping the participants to develop and active lifestyle at work.

572 Physical activity in shift workers of a poultry processing plant in southern Brazil

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Introduction: Physical activity (PA) is associated with beneficial effects for health and is a relevant behavioral factor in preventing morbidity and mortality. Shift work can influence the practice of PA, as well as being a contributing factor to the development of health problems because of changes in the circadian rhythm. The aim of this study was to access the prevalence and factors associated with PA in shift workers in a slaughterhouse chickens in southern Brazil that functions continuous 24 hours/day.

Methods: A cross-sectional study was conducted in 2010, with 1206 workers 18 to 50 years old that work on the production line in three different fixed shifts of eight hours (daytime or nighttime or night/daytime). Were considered physically active workers who had at least 150 minutes of total PA per week in leisure time and transportation activities. A standardized and pre-tested questionnaire was applied and the chi-square test was used for analysis of frequency distributions and linear trend.

Results: The mean age was 30.5 years (SD=8.7) and comprised 65.2% of women. The prevalence of physically active workers was 35.7% (CI 95%: 32.9–38.4), with no difference for sex (p=0.592), an inverse association with age (p=0.036) and direct with schooling (p≤0.001). The prevalence was higher in race/ethnicity black compared to white (42.1% vs 34.5%, p=0.045), those who do not live with partner than those who live (39.8% vs 33.6%, p=0.035) and among those the shift night/daytime over the nighttime and daytime (41.7% vs 34.6% vs 30.2%, p=0.002). Leisure time PA was higher in men than in women (25.2% vs 14.4%, p≤0.001) and in night/daytime shift over the nighttime and daytime (24.5% vs 18,2% vs 13.5%, p≤0.001). Transportation activities was greater in women than in men (50.6% vs 43.3%, p=0.016), in race/ethnicity black compared to white (55.9% vs 46.6%, p=0.018), and no have difference between shifts (p=0.137).

Discussion: There was a low prevalence of PA among workers, and the factors associated were age, schooling, race, living with partner and work shift. Men showed doing more PA in leisure time, women in transportation activities and workers of the shift night/daytime showed a healthier behavior, performing more leisure time PA in relation to others shifts. The study findings corroborates to an importance of actions that promote the increased of PA practice in shift workers.

573 Does modest weight loss translate into improvements in workplace productivity?

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Introduction: Overweight and obesity are increasingly linked to reduced productivity (i.e. increased absenteeism and reduced work performance) in the workplace. What is yet to be determined is whether a reduction in weight, of any magnitude, translates into an improvement in these productivity variables. The aim of this study was to investigate whether employees who lost weight in a workplace weight loss maintenance intervention also showed improvements in their productivity levels.

Methods: In a quasi-experimental-design study, 91 employees joined the 12-week weight loss initiative. Fifty-nine of these employees received a further 9-month maintenance component (intervention group, and different worksite). The relationship between the change in weight and that of productivity (using the WHO Health and Work Performance Questionnaire -HPQ) was assessed at 12 weeks and at 12 months by regressing productivity against weight change. Two standard deviations of the weight change (representing the range of weight change between subjects with typically low and typically high changes in weight) was multiplied by the regression slope. To quantify the standardised effect, this value was divided by the baseline standard deviation of the respective productivity variable, and assessed using magnitude-based thresholds: trivial, <0.2; small, 0.2–0.6; moderate, 0.6–1.2; large, >1.2. Inferences were made more informative by applying qualitative probabilities that reflect the uncertainty of the value; an unclear effect is shown if the confidence interval overlaps values that are substantial in a positive or negative sense.

Results: Relative to baseline, weight fell at 12 weeks by 3.8% (standard deviation 3.3%; 90% confidence interval±0.7%). At 12 months weight had fallen by 3.5% (5.6%;±1.4%) in the intervention group and by 3.5% (5.8%;±2%) in the control group. When regressed with productivity, the majority of the mechanistic inferences for each correlation represented unclear effects. The only noteworthy finding was a small inverse relationship between the change in weight and that of absenteeism after 12 months for the intervention group.

Discussion: There was little evidence that modest change in weight resulted in a change in productivity. It may be that weight change needs to be of a greater magnitude in order to translate into improvements in productivity, and/or that other factors influence absenteeism and how well one performs at work.

574 Changes in leisure-time physical activity and subsequent sickness absence

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Introduction: Sickness absence is major public health problem in many Western countries. Previous studies have shown an association between leisure-time physical activity and subsequent sickness absence. However, longitudinal observational studies examining changes in leisure-time physical activity and subsequent sickness absence are scarce. Thus the aim of this study was to examine how changes in leisure-time physical activity associate with subsequent sickness absence rates among middle-aged employees.

Methods: Baseline questionnaire data were collected in 2000–2002 among 40–60-year-old employees of the City of Helsinki. A follow-up survey was conducted among baseline respondents in 2007. Leisure-time physical activity was asked using similar questions in both surveys. Respondents were classified into three groups: 1) low activity (< 14 MET-hours/week), 2) active moderate (>=14 MET-hours/week in moderate-intensity physical activity) and 3) active vigorous (>=14 MET-hours/week including vigorous physical activity) at both surveys. This yielded nine groups describing stability and change of leisure-time physical activity. Subsequent sickness absence data were derived from the employer's registers (mean follow-up time 2.8 years). Associations of changes in leisure-time physical activity with shorter ($\leq$3 days) and longer (>3 days) sickness absence spells were examined, using Poisson regression analysis. 5144 respondents (men=828) were available for the present analyses.

Results: Those women and men who increased their leisure-time physical activity from low activity to active vigorous group had a lower risk of both shorter (RR=0.81, 95% CI 0.68–0.96) and longer (RR=0.65, 95% CI 0.51–0.81) subsequent sickness absence spells compared with those who had persistently low activity (age and gender adjusted model). Similarly, those who increased from active moderate group to active vigorous group had a lower risk of sickness absence. Those who were persistently active with vigorous intensity had the lowest risk of sickness absence (RR=0.59, 95% CI 0.51–0.68 for longer absences). Those who increased to active moderate group or those who were persistently active with moderate-intensity did not have less sickness absence compared with the persistently low activity group. Adjusting for changes in physical health functioning attenuated but did not abolish the differences found.

Discussion: The results suggest that vigorous intensity physical activity is important for reducing sickness absence. Thus more emphasis should be given to exercise aiming at increased fitness.

575 Economic evaluation of an occupational health guideline for prevention of weight gain among employees

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Introduction: Overweight and obesity have negative bearing on work presenteeism and absenteeism. Therefore worksite prevention programmes aimed at increasing physical activity and healthy eating are needed. Therefore an occupational health guideline for occupational physicians for the prevention of weight gain among employees was developed and evaluated in an RCT. This study evaluates the economic outcomes of this RCT.

Methods: It concerns an economic evaluation alongside an cluster RCT from both a societal and employer's perspective. The guideline consisted of a company-environment scan and an employee-directed intervention of up to five individual counseling sessions with an OP. Sixteen OPs randomized to the guideline (n=7) or usual care group (n=9) recruited 275 and 249 employees, respectively. Employees with unhealthy lifestyle behaviors or who were overweight were eligible to participate. Costs were collected using three-monthly retrospective questionnaires. Quality of life was measured with the EQ-5D, at baseline, 6, 12 and 18 months. Waist circumference and body weight were measured at baseline and 18 months.

Results: The occupational health care guideline resulted in less health effects but lower costs than usual care. Unfavorable differences were found between the guideline and usual care group on waist circumference (+1.6 cm, 95% CI 0.27;2.90) and weight (+1.1 kg, 95% CI 0.01;2.15); there was no difference in QALYs gained (-0.006, 95% CI -0.029;0.017). The mean cost-difference was €-99 (95% CI -2918;2772). Probabilities of cost-effectiveness were consistently below 55%. Net employer loss was €-158 (95% CI -2865;2672). Sensitivity analyses mostly showed worse outcomes.

Conclusion: The occupational health care guideline for preventing weight gain among employees was not cost-effective compared with usual care. From a Dutch employer's viewpoint, no financial return from implementing the guideline was shown. As a consequence it is not recommended to implant this guideline in its current form.

Trial Registration: ISRCTN/73545254 and NTR/1190.

576 How credible are older adults' responses to the Active Australia Survey? Findings from cognitive interviewing

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Introduction: Given the health benefits of physical activity (PA) for older adults and the ageing of the population, it is important to include older adults in PA surveillance. However, little is known about how older adults cope with PA recall and formulation of responses to questions about a behaviour as complex as PA. Our aim was to examine older adults' understanding and interpretation of a PA questionnaire used for surveillance in Australia, the Active Australia Survey (AAS). AAS asks about frequency of sessions of walking, moderate-intensity PA (MPA) and vigorous-intensity PA (VPA) over the previous 7 days and the total duration of these activities for that time period.

Methods: Participants were community-dwelling adults aged 65+ yrs. They each completed a face-to-face semi-structured interview, in which cognitive interviewing techniques were used. These included the 'concurrent think-aloud' method, in which participants thought out loud when answering questions, and probing. After interviews were transcribed, they were coded according to a Three-Stage Model, into the categories of 1) comprehension (understanding the question and wording as intended); 2) response formulation (information retrieval and determining how to formulate a response); and 3) response formatting (fitting the answer into pre-specified response formats).

Results: Twenty-two men and 21 women (aged 65–89 years) were interviewed. Half did not have a university degree. Overall, participants had the most difficulty with the walking items, and over-reporting errors were more common than under-reporting errors. Comprehension problems included confusion with the phrasing (e.g. continuous; at least 10 minutes; times), misunderstanding the scope of activities to include in each activity domain (e.g. reporting sports as walking), and misunderstanding the timeframe of activity to report (e.g. reporting a usual week). Problems with response formulation included difficulties in making accurate estimations of the frequency and duration of activities and reporting the same activity in multiple activity domains (e.g. reporting walking as both walking and VPA). The only response formatting problem was making mistakes in converting minutes into hours to fit responses into boxes on the survey form.

Discussion: Our findings suggest that AAS questions about walking, VPA and MPA may be interpreted differently by older adults than was envisioned by the survey developers. Findings also suggest that older adults use a range of methods for calculating frequency and duration of PA. The issues revealed in this study could help improve AAS and other questionnaires for use in PA surveillance of older adults.

577 Taking fewer than 5000 steps/day is associated with poorer balance in elderly women with osteoporosis

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Introduction: Taking fewer than 5000 steps/day is associated with reduced health-related quality of life (HRQOL) and higher prevalence of cardiometabolic risk factors, obesity and depression. In elderly individuals with osteoporosis, impaired balance and fear of falling can result in self-restricted physical activity and thereby fewer steps/day, which may negatively influence overall health. However, the associations between steps/day, balance, fear of falling and HRQOL are unclear. The purpose of this study was therefore to describe the cross-sectional relationship between steps/day and balance function, fear of falling and HRQOL in elderly individuals with osteoporosis.

Methods: Participants were 97 individuals >65 years (95 women) with osteoporosis, self-perceived impaired balance and fear of falling, enrolled in a randomized controlled trial (RCT) of a progressive balance and exercise training program. This study analyzed baseline data from the RCT. Steps/day was assessed by the Actigraph GT3X accelerometer (worn for one week), balance by the Modified-Figure-Eight test and One-leg stance, fear of falling by Falls Efficacy Scale International (FES-I) and HRQOL by EQ-5D. Participants were classified into two groups based on physical activity level, <5000 steps/day and ≥5000 steps/day. T-test and Wilcoxon rank-sum test were used to assess differences between groups.

Results: Complete data on steps/day were obtained from 92 individuals (90 women), 66–86 years (mean 75.4±5.5), with a median steps/day of 5922 (q1–q3, 3660–7562). In total 42% (all women) took <5000 steps/day. Taking <5000 steps/day was associated with poorer results in balance function; i.e. longer time (p=0.006) and more oversteps (p=0.001) in the Modified-Figure-Eight test and less time in One-leg-stance, right (p=0.009) and left (p=0.003). There were no significant differences between steps/day and fear of falling or HRQOL.

Discussion: Low physical activity level with fewer than 5000 steps/day is associated with poorer balance function in elderly women with osteoporosis. The results strengthen the need to study if improved balance function after participation in balance and exercise training also leads to higher physical activity level, an important premise for healthy ageing.

578 How many steps are enough? Dose response curves for objectively measured physical activity in an Australian community based sample

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Introduction: While the health benefits of physical activity are undisputed, the amount of physical activity needed to achieve various health benefits needs to be defined more rigorously. We set out to search for evidence of plateau effects: is there a level of PA beyond which there is no further health benefit?

Methods: A representative, cross-sectional, community sample of people aged 55–85 in Newcastle NSW wore a pedometer for a week in 2005–07 and completed a comprehensive health assessment. Age standardised step counts were compared to multiple markers of health using locally weighted regression to give results free of the effects of cut points.

Results: Step counts for the 2458 participants showed a strong association with many markers of health. There is a linear relationship between step count and markers of inflammation throughout the range of physical activity, this is also true for BMI in women and high density lipoprotein in men. For other markers, including waist:hip ratio, fasting glucose, depression, and SF 36 scores, the benefit of physical activity is mostly in the lower half of the distribution of step count. Results will be presented graphically for the health markers: BMI, waist:hip ratio, white blood cell count, fibrinogen, HDL cholesterol, fasting blood glucose, timed up and go test, SF36 physical function, CESD depression scores.

Discussion: For some outcomes there is no plateau in benefit, i.e. higher step count is always better, even beyond 12 000 steps per day. For other markers however there is a threshold effect, indicating that most of the benefit is achieved by 9000 steps per day, supporting this as a suitable public health target.

579 Quantifying the accumulation of sedentary time in older adult populations

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Introduction: In clinical practice, one of the principle aims in the rehabilitation of older adults is to maintain or increase physical activity. Despite this, observational studies have indicated that hospital patients tend to be largely sedentary. The purpose of this paper was to explore how sedentary (sitting and lying) and upright (standing and walking) events were accumulated in three different groups of older adults as it has been suggested that both the volume and pattern of these behaviours may impact health.

Methods: Two patient groups were recruited from a Glasgow city hospital; one group comprised community dwellers who were attending a day hospital (n=20) and the second included inpatients from a rehabilitation ward (n=20). A convenience sample of healthy older adults was also recruited (n=20). Seven days of activity data was recorded from all subjects using the activPAL™. Only daytime activity was analysed (between 0800 and 2000). Output from the device was recorded as separate sedentary events. All sedentary events, for each subject, were then ordered and normalised cumulative totals produced. Thresholds for accumulation of sedentary time (50%), duration of sedentary events (60min and 90min) for each patient were applied and the data between groups compared.

Results: The duration of sedentary events, for which 50% of the sedentary time was accumulated, was significantly longer ($p<0.01$) for the ward patients (78min) than the day hospital patients (40 min) and the general older adult population (26 min). The ward patients spent 61% of their sedentary time in periods above 60 minutes which was significantly greater than both the day hospital patients (29%) and the general older adult population (17%) ($p<0.001$). The ward patients also spent 44% in sedentary periods above 90 minutes which was significantly greater ($p<0.05$) than both the day hospital patients (12%) and the general older adult population (4%).

Discussion: The way in which sedentary activities were accumulated was very different showing that ward patients spend a very large proportion of their sedentary time in long events. This analysis technique permits the exploration of physical activity behaviours and could have significant importance in the formulation of guidance for rehabilitation and guidelines for the general population.

580 Determining accelerometer non-wear and sedentary time in midlife and older adults

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Introduction: More work is needed to refine automated algorithms to estimate accelerometer wear and non-wear time for different populations and instruments. None of the published studies to date have focused solely on an older adult population or included the Actical™ activity monitor. This study compared five different accelerometer-derived methods of identifying non-wear time and time spent in sedentary behavior (using the Actical™ activity monitor) with a daily log sheet criterion in a general population sample of adults ≥45 years of age.

Methods: Two hundred participants who reported wearing an Actical™ activity monitor for seven consecutive days and provided complete daily log sheet data (i.e. the criterion) were included. Four variables were obtained from log sheets: 1) dates the device was worn; 2) time the participant put the device on each day; 3) time the participant removed the device each day; and 4) duration of self-reported non-wear each day. Estimates of wear and non-wear using 60, 90, 120 and 150 minutes of consecutive zeroes plus a new method counting only overnight periods as non-wear were compared to number of minutes derived from log sheets.

Results: Compared with the log sheet, mean daily wear time varied from -45 to +20 min/day across the five algorithms. The lowest mean differences were +3 min/day and +11 min/day for the 120-min and 150-min algorithms, respectively. Mean weekly wear time for the 120-min and 150-min algorithms differed by -103 min/week and -9 min/week, respectively, compared with the log sheet. Mean weekly wear times for other algorithms displayed large differences ranging from +2.5 hours (overnight method) to -12 hours (60-min algorithm). The proportion of wear time being inactive and absolute time spent in physical activity of varying intensities was nearly identical for each method, and these mirrored values of log-sheet-derived outcomes.

Discussion: It is not possible to determine a minimum duration of zero counts that best differentiates between periods of wear and non-wear for all participants. However, the results of the current study indicate that utilization of either the 120-min or 150-min consecutive zero count algorithm will provide dependable *population-based* estimates of wear and non-wear time, and time spent being inactive and active at varying intensities in persons ≥45 years of age. The proposed automated estimation algorithms will be especially useful in large-scale population studies in which assessment of physical activity and sedentary behavior are linked to longitudinal health risks and disease outcomes.

581 The correlates of three-year change in accelerometer-assessed physical activity for a diverse sample of older urban UK adults'

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Design: Longitudinal cohort study.

Background: Older adults (those over 70 years [y]) (OAs) are the fastest growing, most infirm and least active population group. This group attracts the highest health and social care costs of any sector. Moderate-to-vigorous physical activity (MVPA) can attenuate this cost by bringing a variety of health benefits to OAs. However, little is known about OAs' daily MVPA and whether certain behavioural characteristics are associated with lower MVPA levels. To date, research has focused on cross-sectional designs and defining correlates based on self-reported physical activity (PA). Such measures tend to overestimate MVPA. Accelerometry provides more objective measures that can be reliably repeated.

Purpose: To investigate the associations between sociodemographic, participant characteristics (e.g. physical function) and behavioural (e.g. trips out of the house [trips·wk⁻¹]) variables on changes in OAs' daily MVPA.

Methods: Secondary-analyses were performed on data from 112 participants in Project OPAL (Bristol, UK) (=aged 77.3 ± 5.5y). Interviewer-administered questionnaires provided data on age, body-mass index (BMI), education, gender, self-rated health, number of medications, trips·wk-1 and active pursuits (e.g. walking [out-of-home pursuit], cleaning [in-home pursuit]). The Short Physical Performance Battery (SPPB) was used to assess physical function level. Accelerometry was used to assess PA and reduced to provide MVPA min.·d-1. Factorial-analysis-of-covariance's were used to investigate associations between these variables on two-levels of MVPA (baseline and 3-y follow-up). Variables with significant associations with the dependent variable were then entered into hierarchical forced-entry linear-regression models and fully-adjusted for confounders.

Results: There was a significant ($P<.001$) overall decline of 3.8 MVPA min.·d⁻¹ from baseline to follow-up. There were significant ($P<.05$) time x group interactions in changes in mean MVPA min.·d-1 for: age, ($F_{(3,106)}=8.76$), gender ($F_{(1,107)}=7.95$), BMI ($F_{(2,106)}=3.40$), physical function ($F_{(2,108)}=33.4$), self-rated health ($F_{(2,108)}=33.4$), trips·wk⁻¹ ($F_{(3,106)}=5.6$), and number of medications ($F_{(5,104)}=5.3$). Of these, after adjusting for covariates interactions, baseline-reported age ($\beta=-0.019$ [SE=0.0]) and high function ($\beta=0.434$ [SE=0.1]) significantly ($P<.05$) and independently predicted longitudinal MVPA min.·d⁻¹. In addition, out-of-home active pursuits·wk⁻¹ ($\beta=0.019$ [SE=0.0]) also significantly ($P<.05$) and independently predicted follow-up MVPA min.·d⁻¹.

Conclusion: Increased physical function and higher frequency of out-of-home active pursuits·wk-1 are factors associated with reduced decline in MVPA min.·d⁻¹ in OAs over time. OAs who are of low-to-mid-function and undertake more in-home active pursuits·wk-1 may suffer greater long-term reductions in MVPA longitudinally and therefore may be an appropriate group to target for future intervention.

582 ActiGraph GT3X+ threshold for classifying sitting/lying activity in older adults in free-living environments

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Introduction: Several studies have shown that sedentary behaviour, defined as energy expenditure between 1 and 1.5 METs while sitting or lying, is related to increased risk of cardiovascular disease, cancer and premature mortality. Most of these studies have relied on self-reported sitting-time, but accelerometers (usually used for measuring physical activity) are now increasingly being used for measuring sedentary behaviour. Translating accelerometry counts into sedentary behaviour requires a cut-off value, but little is known about the optimal threshold for measuring sedentary time with tri-axial accelerometers, particularly in older adults. The purpose of this study was to examine the optimal threshold for ActiGraph GT3X+ (ActiGraph LLC, Fort Walton Beach, FL) counts for defining sedentary time in older adults in free-living environments. Sitting/lying measured with activPAL3™ (Pal Technologies Ltd, Glasgow, UK) was used as the reference standard.

Methods: 27 participants (10 male and 17 female, 73.93 ± 1.48 yr old) wore two monitors for 7 consecutive days. These participants had a total of 161,774 minutes of data for both ActiGraph and activPAL™. Each minute was classified as either sitting/lying or standing/walking according to both accelerometers. For activPAL3™, sitting/lying was defined as 1) ≥40 seconds/minute (AP40) or 2) 60 seconds/minute of sitting/lying activity (AP60). For ActiGraph, the following cut-off values were used as the upper threshold for sitting/lying: 0, 25, 50, 75, 100, 125, etc., up to 400. A receiver operating characteristic (ROC) analysis was used to calculate sensitivity, specificity, % misclassified and area under the curve.

Results: For both activPAL™ conditions (i.e. AP40 and AP60), the highest AUCs were obtained for the 200 cut-off value (AUC for AP40=0.827, AUC for AP60=0.839). The sensitivity and specificity for this threshold were 85.62% and 79.81% for the AP40 condition and 88.72% and 78.97% for the AP60 condition, respectively. The percentage correctly classified was approximately 83.5% for both conditions.

Discussion: The current results suggest 200 counts per minute is the optimal threshold for defining sedentary time for older people in free-living environments as measured with ActiGraph GT3X+. This threshold is markedly higher than recommended for uni-axial accelerometers.

583 Tri-axial accelerometer-derived sedentary time and its correlates among community-dwelling older adults in Japan

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Introduction: Amount of daily sedentary time is considered to have an independent deleterious impact on health outcomes. However, there have been few studies reporting sedentary time and its correlates among older adults. Therefore, the purpose of the present study was to demonstrate the amount of sedentary time measured by tri-axial accelerometer and the characteristics of people with greater sedentary time in community-dwelling older adults in Japan.

Methods: As part of a prospective cohort study in a town located in the western part of Japan, 2,043 participants aged 65 years or older (mean 74 years; 42.0% for men) were involved in this study. Participants were asked to wear a tri-axial accelerometer device (HJA-350IT; Omron Healthcare, Inc., Kyoto, Japan) for at least 7 days in order to measure daily activities. Sedentary time was quantified as minutes/day for activities with ≤1.4 METs of intensity, and moderate-to-vigorous intensity physical activity (MVPA) was also quantified as minutes/day for activities with ≥3.0 METs of intensity. Grip strength, leg strength, and gait speed were assessed as indicators of physical fitness. Cognitive status was evaluated using Mini-Mental state examination. Other relevant data were collected from self-report questionnaires.

Results: The average wearing time of the device was 829.0 minutes/day (standard deviation, 101.3). Overall, participants spent 50.5% of their wearing time or 419.0 minutes/day in sedentary behaviors and 5.3% or 44.4 minutes/day in MVPA. Sedentary time was negatively associated with MVPA time (r=-0.40). Sedentary time was greater in men and individuals being older aged, having history of chronic diseases, living alone, being lower physical fitness and being overweight. Conversely, having jobs and hobbies were associated with shorter sedentary time. Educational levels, cognitive status, and whether having regular exercise, engaging in volunteer activities, experiencing falling, feeling anxiety for falling, and being distressed were not associated with the amount of sedentary time.

Discussion: This is the first report to demonstrate the amount of sedentary time measured by tri-axial accelerometer in community-dwelling older adults. Our study also showed that some types of social activities were associated with shorter sedentary time. Future researches should further address the relationships between social factors and daily sedentary time.

584 People with early-onset hip osteoarthritis who demonstrate greater physical function also have improved outcomes of function, pain and quality of life

DJO Global Sponsored Session

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Introduction: Early onset hip osteoarthritis (EOHO) affects adults <50 years, is associated with significant personal and societal burden. Diagnosis of EOHO is difficult, with hip arthroscopy enabling accurate grading of chondropathy in people with this condition. Whilst physiotherapy treatment is often used to reduce pain and improve physical function in EOHO, little is known of the relationship between physical impairment and associated outcomes of pain and functional capacity. Knowledge of this relationship may assist physiotherapists in providing targeted intervention to alter physical impairments and therefore improve patient outcomes in people with EOHO. The aim of this study was to examine the relationship between patient-reported outcomes (pain, symptoms, activity of daily living (ADL), sport and QoL) and physical impairments (range of motion (ROM), strength, functional performance) in people with EOHO who have undergone hip arthroscopy 12-24 months previously.

Methods: 51 hip arthroscopy patients (female=30; age=38±12; height=1.73±9; weight=78±13; BMI=26.6±6.7; waist girth=80±12) were recruited from a single surgeon who had surgery 12–24 months previously and had chondropathy diagnosed as ≥Outerbridge grade I. Participants completed the Hip Dysfunction and Osteoarthritis Outcome Score (HOOS) (five subscales: pain, symptoms and stiffness, ADL, sport and recreation and QoL), and were tested for hip ROM and normalised hip joint peak torque (NPT), and one leg rise (OLR) and side bridge (SB) functional tests. The relationship between the subscales of the HOOS and physical impairments was examined using the Pearson Correlation Coefficient (r) (p<0.05).

Results: Higher scores in the subscales of the HOOS correlated with greater hip flexion (FL) and internal rotation (IR) ROM at 90°hip FL (p<0.05); with greater performance in all measures of hip joint strength (NPT); and greater performance in OLR (p<0.01) and SB (p<0.05). Linear regression analyses revealed hip extension (EX) peak torque was independently associated with HOOS-pain (r^2=0.208; p<0.001) and HOOS-ADL (r^2=0.231; p<0.001), and hip EX and adduction peak torque were associated with HOOS-QoL (r^2=0.279; p=0.038). For the hip ROM measures, lower hip FL range was independently associated with HOOS-pain (r^2=0.408; p<0.001), HOOS-ADL (r^2=0.397; p<0.001) and HOOS-QoL (r^2=0.262; p<0.001).

Discussion: In people with EOHO who are between 12–24 months post hip arthroscopy, greater physical function (hip FL and IR ROM, hip EX strength) was associated with lower pain and higher physical function and QoL. This knowledge may assist physiotherapists in providing targeted rehabilitation programs to address these physical impairments and thus improve pain, function and QoL in people with EOHO.

585 Individuals with PFJ osteoarthritis demonstrate different kinematics but not muscles forces during more demanding ambulation tasks

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Introduction: Patellofemoral joint (PFJ) osteoarthritis (OA) is increasingly recognised as a distinct and common clinical entity encountered in sport and exercise medicine, and is associated with considerable pain, morbidity and impaired quality of life. In contrast to tibiofemoral joint (TFJ) OA, little is known about gait characteristics associated with PFJ OA. Considering that altered foot and ankle biomechanics, namely increased pronation parameters, have been identified in younger adults with PFJ pain, and the proposed link between PFJ pain and PFJ OA, it is timely to investigate whether biomechanical differences also occur in those with PFJ OA. This study investigated whether individuals with PFJ OA demonstrated differences in ankle dorsiflexion and subtalar joint (STJ) eversion kinematics, and gastrocnemius and soleus muscle force during level walking and stair ambulation, when compared to asymptomatic controls.

Methods: A case-control study recruited 17 participants with PFJOA (osteophytes on skyline radiographs, anterior knee pain during activities that load the PFJ e.g. steps or squatting, no TFJ OA on radiographs; 13 females; mean±SD age 55.8±12.4, body mass index (BMI) 26.6±3.4) and 21 asymptomatic controls who had no OA on radiographic examination (13 females; age 56.4±9.2, BMI 24.9±3.8). Gait data was collected during level walking and ascending and descending stairs using a six-camera VICON motion analysis system (Oxford Metrics, Oxford, UK), in conjunction with two AMTI force plates. A customised eight-segment biomechanical model was constructed using OpenSim software (Simbios, Stanford University, CA, USA) and used to compute all joint kinematic and muscle force data. Analysis of covariance was used for between-group comparisons of dorsiflexion and eversion peak angles and total excursion, as well as peak gastrocnemius and soleus muscle forces during stance phase (p=0.05; age, gender and BMI as covariates).

Results: For level walking and stair ascent, there were no significant between-group differences for all kinematic and muscle force variables. The PFJ OA group demonstrated significantly more eversion excursion than controls when descending stairs (mean difference 7.4°, 95% confidence interval 2.3 to 12.5), but no differences in muscle forces were observed.

Discussion: Individuals with PFJ OA demonstrate altered kinematics during a task that maximally loads the PFJ. Findings suggest that during stair descent, utilisation of a larger eversion range may be a compensatory mechanism to reduce PFJ reaction force and associated pain in those with PFJ OA. Further research should explore relationships between PFJ reaction force and knee, ankle and foot kinematics.

586 Femoroacetabular impingement in former high performance male Water Polo players

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Introduction: Symptomatic femoroacetabular impingement (FAI) has been reported in athletes participating in sports such as ice hockey, AFL and martial arts that involve strenuous, repetitive end range hip flexion and internal rotation. The present study involves baseline magnetic resonance (MR) imaging analyses of male Water Polo players to examine the morphology of the femoral head neck region indicative of FAI status (cam lesion) and asymmetry of individual hip muscles.

Methods: Bilateral 3D weDESS MR images of the femoral head neck region using a 3T system were obtained in former male high performance Water Polo players (30+4 years, 16+5 years playing history; N=9; self-reported "hip" or "groin" pain [N=5]). Images were processed in OSIRIX using multiplanar reconstruction (MPR) to visualise the circumference of the femoral head neck junction. Alpha angle (α°) measures were performed on the femoral head neck junction in the superior-posterior, superior, anterior-superior, anterior and antero-inferior regions from the MPR images; α°≥60° was deemed to indicate the presence of cam lesion morphology which was further qualitatively graded as a small (SHNO) or a large (LHNO) reduction in head neck offset.

Results: Overall, 8/9 (89%) of the examined players had α°≥60°consistent with the presence of cam lesion morphology in one or both hips, 5/8 (63%) players had a LHNO grading. The cam lesion deformities were primarily located in the anterosuperior region. All five players with a reported history of "hip" or "groin" pain had MR evidence of cam lesion morphology with 3/5 (60%) having a LHNO in the symptomatic hip/s. In the 4 players not reporting a history of hip or groin pain, 3 had α°≥60° in one or both hips. A number of bilateral volume asymmetries were also identified in muscles such as the tensor fascia latae and gluteus maximus (inferior fibres) in the Water Polo players.

Discussion: It is interesting to speculate that the high prevalence of cam lesions, commonly noted in athletes with symptomatic FAI, in this cohort of former male high performance Water Polo players maybe associated with the strenuous, repetitive hip flexion and internal rotation inherent in the eggbeater kick. The current study provides valuable baseline data for future MR investigations of FAI in Water Polo players.

587 Prevalence of patellofemoral and tibiofemoral radiographic osteoarthritis in people with chronic anterior knee pain: Data from a RCT

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Introduction: Chronic anterior knee pain (AKP), or patellofemoral joint (PFJ) pain, impacts significantly on participation in a physically active lifestyle and may precede PFJ osteoarthritis (OA). However, there is a dearth of evidence regarding the relationship between them. Thus, there is a clear need for studies to quantify the prevalence of radiographic OA in the PFJ, and the tibiofemoral joint (TFJ) in individuals with chronic AKP.

Methods: Individuals with chronic AKP were recruited as part of a randomised clinical trial. Inclusion criteria: i) aged >40 years; ii) AKP aggravated by >2 activities that load the PFJ; and iii) pain during these activities most days of the month. Exclusion criteria: i) concomitant pain from other knee structures; ii) current or previous physiotherapy for knee pain (12 months); and iii) knee or hip arthroplasty or osteotomy. Radiographic severity of TFJOA was assessed from a semiflexed, posteroanterior weight-bearing radiograph (feet externally rotated 10°). Radiographic severity of PFJOA was assessed from weight-bearing skyline radiographs, with 30–40°knee flexion. Severity of radiographic OA was assessed by two examiners (KMC, RSH) from digital images, with meetings to obtain consensus when required. The Kellgren and Lawrence (K/L) score was assigned to the TFJ and to the PFJ Separate gradings were conducted on medial and lateral PFJ components (inter-rater reliability (κ): 0.745–0.843).

Results: 224 individuals with chronic AKP (115 (51%) women, mean±SD: age 54±10 yrs, height: 1.69±0.10 m; weight 79±15 kg) were recruited. 67 (30%) had no radiographic OA, 57 (25%) had isolated PFJOA, 2 (9%) had isolated TFJOA and 98 (44%) had combined PFJ/TFJOA. In those 80 participants who were aged between 40 and 50 yrs (38 (48% women, age 45±3 yrs; height 1.70±0.10 m, weight 79±17 kg), 36 (45%) had no radiographic OA, 21 (37%) had isolated PFJOA, 1 (1%) had isolated TFJOA and 22 (28%) had combined PFJ and TFJOA.

Conclusion: The majority (70%) of people presenting to this trial with chronic AKP had radiographic signs of OA. The prevalence of PFJOA (67%) was greater than the prevalence of TFJOA (51%), and the medial and lateral PFJ appeared to be affected similarly. The prevalence of radiographic OA was still considerable (55%) in individuals aged 40-50 years, with high rates of PFJOA (54%). PFJOA appears to be an important problem in individuals with chronic AKP and future studies need to investigate the link between AKP in individuals less than 40 years and the development of PFJOA.

588 The association between objectively measured physical activity and knee structural change using magnetic resonance imaging (MRI)

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Introduction: There is conflicting evidence regarding the association between physical activity and knee osteoarthritis. Many of the previous studies have used questionnaires to assess physical activity and x-rays to assess osteoarthritis, which provides only a limited view of both physical activity and the disease process. This study describes the longitudinal association between objectively assessed physical activity and knee structural change measured using magnetic resonance imaging (MRI).

Methods: 405 community-dwelling adults aged 51–81 years were *measured at baseline and approximately 2.7 years later.* MRI of the right knee at baseline and follow-up was performed to evaluate bone marrow lesions, meniscal pathology, cartilage defects, and cartilage volume. Physical activity was assessed at baseline as steps/day determined by pedometer. The association between steps/day and knee structural change was determined using multiple linear and logistic regression models. Models were adjusted for age, sex, body mass index, radiographic osteoarthritis, history of knee injury/surgery, and baseline knee structural abnormalities.

Results: Doing ≥10,000 steps/day was associated with bone marrow lesion increases (RR: 1.97, 95% CI 1.19 to 3.27, p=0.009). Participants doing ≥10,000 steps/day had a 1.52 times (95% CI: 1.05 to 2.20, p=0.027) greater risk of increasing meniscal pathology score and this increased to 2.49 (95% CI: CI 1.05 to 3.93, p=0.002) in those with adverse meniscal pathology at baseline. Doing ≥10,000 steps/day was associated with cartilage defect increases in those with prevalent bone marrow lesions at baseline (RR: 1.36, 95% CI 1.03 to 1.69, p=0.013). Steps/day was protective against volume loss in those with more cartilage volume at baseline but led to increased cartilage loss in those with less baseline cartilage volume (p=0.046 for interaction).

Discussion: This study has found that the relationship between physical activity and knee structural change is dependent on the pre-existing state of the knee joint. This novel finding may help to explain the conflicting evidence surrounding physical activity and knee osteoarthritis. Doing ≥10,000 steps/day was deleteriously associated with knee structural change, especially in individuals with pre-existing knee structural abnormalities. These findings have important public health implications as knee abnormalities on MRI may help to identify those likely to have an adverse effect from weight-bearing activity. Alternatives to weight-bearing activity may be needed for these individuals in order to maintain physical activity levels required for other aspects of health.

589 10 year outcome of high tibial osteotomy for medial compartment osteoarthritis of the knee

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Introduction: Management of osteoarthritis in the middle aged recreational athlete presents a challenging management problem. Surgical treatment with knee replacement in young patients is associated with poor survival. This prospective study was established to document the subjective and clinical outcome of high tibial osteotomy for medial compartment osteoarthritis of the knee in a longitudinal study over 10 years.

Methods: Over a 3 year period 100 consecutive patients undergoing high tibial osteotomy by a single surgeon were enrolled in this prospective study. Patients were assessed preoperatively, and at 5 and 10 years after surgery with the KOOS Knee Survey, patient satisfaction scale, Knee Society Score, long leg alignment radiographs and clinical assessment of the knee.

Results: The mean age of the subjects at the time of HTO was 49 years. Of the 100 patients, 16 (16%) proceeded to total knee replacement over 10 years. At 10 year review, 96% of patients reported they were satisfied or enthusiastic about the results of their surgery and 85% of patients would have the same procedure again under the same circumstances. The mean KOOS ADL score improved from 66 out of 100 preoperatively to 86 at both 5 and 10 years (p<0.05). The percentage of patients reporting moderate to severe pain decreased from 59% preoperatively to 19% at 5 years and 27% after 10 years (p<0.05).

Conclusion: The 10 year outcome of this prospective *longitudinal study reveals encouraging results for the middle* aged patient with medial compartment osteoarthritis of the knee. High levels of patient satisfaction and good subjective outcomes are maintained 10 years after high tibial osteotomy.

590 Conservative management of patellofemoral pain syndrome: Integrating the evidence base with physiotherapists' clinical reasoning

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Introduction: Patellofemoral pain syndrome (PFPS) has a multifactorial aetiology with multiple conservative treatment options available. Choosing the most appropriate interventions requires sound clinical reasoning, incorporating the best available evidence and therapist clinical experience. The aims of this study were to establish which conservative interventions demonstrate level 1 evidence for PFPS and explore the degree of, and clinical reasoning employed in, utilisation of this evidence.

Methods: A review of systematic reviews evaluating conservative management for PFPS was completed in January 2012. Each identified systematic review was evaluated for quality and the conclusions of high quality reviews were summarised. Two phases of semi-structured interviews with physiotherapists were conducted to explore clinical reasoning, anecdotal evidence and the degree of formal evidence incorporation for various interventions. Phase one interviews involved eight experienced physiotherapists (9 to 25 years) from the United Kingdom. Phase two interviews (currently being completed) involves physiotherapists considered as international experts in the management of PFPS, with each being actively involved in research evaluating conservative management for PFPS.

Results: Level 1 evidence exists for the provision of multimodal physiotherapy including quadriceps and gluteal strengthening, patellofemoral joint mobilization (PFJ) and taping, and lower limb stretching. Foot orthoses prescription and acupuncture should also be considered. Thematic analysis of phase one interviews showed varying knowledge and incorporation of this evidence, with implementation of specific treatment components by physiotherapists closely dependent on individual patient presentation. Common interventions include vastii retraining, PFJ mobilisation and taping, and lower limb stretching. Gluteal strengthening, foot orthoses prescription, and acupuncture were less frequently considered. A number of barriers inhibiting the use of evidence based practice were identified, including limited knowledge of, and access to current evidence, and limited external validity of available research. Anecdotal evidence was identified for icing, activity modification, footwear advice, and addressing co-existing psychosocial factors.

Discussion: Consistent with current evidence, physiotherapists consider PFPS a multifactorial condition, which requires patient-specific treatment packages. Future research should aim to identify sub-groups most likely to respond to individual interventions to improve external validity; and evaluate the efficacy of icing, activity modification, footwear advice, and addressing psychosocial factors. Addressing the variability found concerning physiotherapists' use of evidence for the treatment of PFPS will require strategies to improve access to published research. To address this, findings from the review of systematic reviews and phase two interviews with international experts will be combined to provide a comprehensive guide for physiotherapists when treating PFPS.

591 A randomised clinical trial of targeted physiotherapy for patellofemoral osteoarthritis

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Introduction: The patellofemoral joint (PFJ) is one compartment of the knee that is frequently affected by osteoarthritis (OA) and is a potent source of symptoms. However, there is a dearth of evidence for compartment-specific treatments for PFJOA. Therefore, this project aimed to evaluate whether a physiotherapy treatment, targeted to the PFJ, resulted in greater improvements in pain and physical function than a physiotherapy education treatment.

Methods: 92 people with PFJOA (PFJ-specific history, signs and symptoms ad radiographic evidence of PFJOA) were recruited from the community. A randomised controlled trial, adhering to CONSORT guidelines evaluated the efficacy of physiotherapy (8 individual sessions over 12 weeks and a home exercise program) compared to a physiotherapy-delivered education program. Primary outcomes, evaluated by a blinded assessor, included: i) patient perceived change in pain and function; ii) pain during aggravating activities on a visual analogue scale; and iii) physical function subscale of the Western Ontario and MacMasters Universities osteoarthritis index (WOMAC) at 3 and 9 months. All analyses were conducted on an intention-to-treat basis, using linear regression models, including age, gender, body mass index, radiographic OA severity and baseline score as co-variates

Results: The two treatment groups were matched at baseline for demographic characteristics. Targeted physiotherapy resulted in greater improvements in the targeted physiotherapy group than the education group for perceived pain (p<0.001) and function (p=0.002) at 3 months. These results were maintained at 9 months for pain (p<0.001) and function (p=0.003). At 3 months, these results were reflected in the between-group differences in pain score (12mm, 95% confidence intervals 0 to 24) and WOMAC physical function (out of 68) (4.1 points; 95% confidence interval 0 to 8.2).

Discussion: A physiotherapy treatment, targeted to the PFJ, resulted in superior outcomes than a physiotherapy-led education treatment for PFJOA. Treatments for knee OA may be enhanced by targeting treatments to the compartment most affected by the disease.

Friday 2 November

592 Effects of menstrual cycle phase on salivary α-amylase activity following 2 hours of cycling exercise in recreationally active eumenorrheic women

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Introduction: Clarifying how the menstrual cycle phase influences various aspects of salivary responses is necessary to provide a comprehensive understanding of human responses to physically and psychologically stressful events in women. The purpose of this study was to determine the effects of menstrual cycle phase on salivary α-amylase activity following 2 h of prolonged cycling exercise in women.

Methods: Twelve recreationally active eumenorrheic women served as the subjects [age: 20.9±0.3 year; height: 160.1±5.6 cm; body weight: 54.7±5.8 kg; Body mass index: 21.3±1.8 kg/m^2; Body fat: 21.9±3.1 %; peak oxygen uptake (VO$_2$peak): 44.4±5.0 ml/kg/min (mean±SD)].

All subjects performed an incremental cycling exercise until volitional exhaustion to determine their peak oxygen uptake. At the 10-min period before and after 2 h of cycling exercise corresponding to constant power output at 60%VO$_2$peak, salivary α-amylase activity was determined with a biosensor qualified by Yamaguchi et al. (*J Int Med Res*, 34: 152–159, 2006). All subjects performed the same exercise protocol during the follicular (F: 5~8 days after the onset of the menses) and luteal (L: 22~25 days after the onset of the menses) phase. During each 2h of exercise protocol, carbohydrate-electrolyte solution (glucose: 62 g/L; Na$^+$: 49 mg/dL; K$^+$: 20 mg/dL; Ca^{2+}: 2 mg/dL; Mg^{2+}: 0.6 mg/dL) were consumed every twenty minutes (2 ml/kg body mass) in order to delay fatigue and prevent hypoglycemia and dehydration.

Results: In terms of the salivary α-amylase activity, two-way (time x phase) analysis of variances (ANOVA) showed significant main effects for time (Pre: 38.6±13.4, Post: 46.5±18.0 for F; Pre: 37.9±8.6, Post: 49.3±27.3 klU/L for L, p<0.05). In contrast, there were no significant main effects for phase or interaction. With regard to the percent increase of salivary α-amylase activity, there was a trend for the luteal phase to be higher than the follicular phase although no menstrual cycle differences were found.

Discussion and Conclusions: Salivary α-amylase activity regulated by the sympathetic-adrenomedullary system and hypothalamic- pituitary-adrenal axis has been suggested as a potential marker for exercise intensity. However, effects of menstrual cycle phase on salivary α-amylase activity following prolonged exercise remained to be elucidated. The findings of the present study indicate that the menstrual cycle phase appears not to influence salivary α-amylase activity following 2 h of cycling exercise equivalent to power output at 60%VO$_2$peak.

593 Modelling heat stress and strain in singles tennis

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Introduction: There is some enthusiasm in sports medicine for rules, policies and recommendations for managing heat stress in sport. The purpose of measuring heat stress, and indices such as the WBGT, is to predict human responses to the stress and thus formulate strategies to minimise the risk of untoward effects. But there is little objective information about the effects on people of sports participation in hot and humid conditions. Thermal stress is a function of six separate environmental factors, while human responses to that stress are a function of the individual and the nature and circumstances of physical activity.

Methods: This paper reports on the statistical analysis of 94 observations of thermal stress and strain obtained on 6 women and 19 men who played 47 games of singles tennis over the course of a year. Air temperatures ranged from 17–38.4°C, vapour pressure (humidity) from 9–28 mb. Physiological responses ranged: skin temperatures: 25.7–36.5°C, sweat rates 0.27–2.42 L/h, rectal temperatures 37.4–39.2°C and heart rate 99–168 bpm. Subjective responses of thermal sensation ranged 'Comfortably cool' to 'Much too hot' and perceived exertion (RPE) ''Very light' to Very hard'. The data were examined by regression analysis. Stepwise multiple regression analysis incorporating the four environmental measures, air temperature, humidity, radiant temperature, air movement, and heart rate (acting as surrogate for metabolic rate), and the players themselves, was used to determine the contribution of each environmental factor and of their combined effect to variance in the players' physiological and subjective responses.

Results: Simple regression analysis revealed that air temperature accounted for about 45% and 50% of variance in sweat rate and skin temperature respectively while radiant temperature, humidity and air movement also influenced these responses significantly but to a lesser extent. Similar associations were found for the subjective responses. There was no association between rectal temperature and air temperature and humidity, but a significant association with heart rate confirming that body core temperature is predominantly associated with metabolic rate. 'Best model' regressions indicated that sweat rate was associated significantly with air temperature, air movement and heart rate but not with humidity, while skin temperature was associated significantly only with air temperature.

Discussion: These results call into question the value of the WBGT as an index of environmental stress for tennis – at least for the conditions studied in this investigation. Further, the regression *equations enable objective* predictions of sweat rate, skin temperature, thermal sensation and perceived exertion in singles tennis.

594 Assessment of training intensity in response to salivary α-amylase activity in female handball players

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Introduction: Assessment of appropriate training volume in female athletes is an important profile to maintain good conditions and prevent injuries. In recent years, the salivary α-amylase level activated by sympathetic-adrenomedullary system and hypothalamic-pituitary-adrenal axis has been suggested as a biomarker to determine exercise intensity in various kinds of training programs. The purpose of this study was to investigate the cumulative effects of the initial stage of training programs on salivary α-amylase activity in female collegiate handball players.

Methods: Twenty one female collegiate handball players served as the subjects [age: 20.1±1.2 year, height: 158.7±4.6 cm, body weight: 56.4±5.1 kg, BMI: 22.4±1.1 kg/m^2, Body fat: 23.6±1.5 % (mean±SD)]. Within the overall annual training period, the initial stage (twelve days) of training was chosen to clarify the cumulative effects of α-amylase activity. Daily handball training program lasted a total of three hours per day and each day of training was consistent. The details of training program consisted of 30 minutes of warm-up exercise (stretching, footwork, passing and shooting) and two hours of skill training and games with 10 minutes of rest, followed by 20 minutes of cooling down exercise. At Days 1 (the beginning of training program), 4, 8 and 12, salivary α-amylase activity was determined with a biosensor qualified by Yamaguchi et al. (*J Int Med Res*, 34: 152–159, 2006) at the 10-min period before and after the daily training. At the same time, ratings of perceived exertion (RPE) were also determined.
Results: Two-way (time x phase) analysis of variances (ANOVA) revealed significant main effects for time (Pre: 46.3±27.8, Post: 114.7±58.1 for Day 1; Pre: 64.1±33.8, Post: 115.9±74.2 for Day 4; Pre: 49.0±20.7, Post: 92.3±47.1 for Day 8; Pre: 55.2±37.1, Post: 91.8±37.9 klU/L for Day 12, $p < 0.05$), but no differences across phase in light of the α-amylase activity. Pearson's product-moment correlation demonstrated a significant relationship between salivary α-amylase activity and RPE.
Discussion and conclusions: Previous studies have shown the increased α-amylase activity following variety kinds of sports events. However, whether habitual training programs in female handball players induce cumulative effects has not yet been clarified. These findings of the present study suggest that there would be no cumulative effects of salivary α-amylase activity on the initial stage (twelve days) of the training regimen. Furthermore, these results concerning salivary α-amylase activity draw attention to its usefulness as a biomarker to assess exercise intensity based on the activation of sympathetic-adrenomedullary system and hypothalamic-pituitary-adrenal axis.

595 Effects of marching band training program on salivary IgA responses following 30 min of performance

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Introduction: A decreased level of salivary IgA has been implicated as a potential marker of the increased susceptibility of elite athletes to upper respiratory tract infection. A better understanding of immune status for well-trained marching band players can maintain an optimal condition of their performance. The purpose of this study was to clarify the cumulative effects of marching band training program on salivary IgA responses during three consecutive days of marching band performance.
Methods: Fifteen male university elite marching band members (age: 19.7±1.5 year; height: 171.8±5.5 cm; body mass: 68.6±15.5 kg; body fat: 16.1±6.4 %; BMI: 23.2±4.9 kg/m^2; served as the subjects. Marching band performance was carried out on three different occasions [Days 1 (at the beginning of the training), 7 and 14] where each performance lasted a total of 30 minutes. Each subject performed at various playing positions (color guard, baryton, snare drum, base drum, tenor drum, trumpet, tuba, mellophone and baritone horn). The content of training was similar for each day and average training volume was 3 hours/day. Unstimulated saliva was obtained at the 10-min period before (Pre) and after (Post) each performance for analysis of salivary IgA and total protein secretion.
Results: In terms of salivary IgA levels, two-way (time x phase) analysis of variances (ANOVA) showed no significant *main effects* for time and phase or interaction (Pre=34.0±31.9, Post=48.6±4.8 for Day 1; Pre=22.1±16.6, Post=41.3±31.2 for Day 7; Pre=22.1±16.6, Post=41.3±31.2 mg/dL for Day 14). Moreover, no main effects for time and phase or interaction were observed for salivary total protein excretion (mg/dL). In addition, one-way ANOVA with repeated measures revealed no significant differences between playing positions at the levels of salivary IgA or total protein.
Discussion and Conclusions: These findings indicate that marching band performance associated with habitual training appears to have no cumulative effects which do not reach the threshold to induce the upper respiratory tract infection. Furthermore, these results concerning salivary IgA responses draw attention to its usefulness as an immune marker based on exercise intensity before and after marching band performance.

596 Catecholamine responses to 6 h extended daily practice of marching band activities as a performing art

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Introduction: A better understanding of "performing arts medicine" can provide the optimal strategies to prevent health problems for collegiate marching band performers. Nowadays, daily practice of marching band activities has been extended. The augmentation of urinary catecholamines has been demonstrated as potential biomarkers to determine exercise intensity. The purpose of this study was to determine the effects of daily practice of marching band activities on urinary catecholamine responses.
Methods: Fifteen male collegiate marching band players (age: 19.7±1.5 year; height: 171.8±5.5 cm; body mass: 68.6±15.5 kg; body fat: 16.1±6.4%; BMI: 23.2±4.9 kg/m^2) served as the subjects. All subjects performed daily practice of marching band activities, which lasted a total of six hours. Each subject performed at various playing positions (color guard, baryton, snare drum, base drum, tenor drum, trumpet, tuba, mellophone and baritone horn). Urinary samples were obtained before (Pre) and after (Post) 6 h daily practice for the later analysis of the urinary catecholamine (epinephrine, norepinephrine and dopamine), urine specific gravity and osmolality. At the same time, ratings of perceived exertion (RPE) were also measured. The urinary catecholamine levels were analyzed by high-performance liquid chromatography. The levels of urine specific gravity and osmolality were determined by a refractrometer and an osmometer, respectively.
Results: A Student's t-test showed a significant elevation at *the levels* of urinary free norepinephrine (Pre: 185.6±64.3; Post: 293.2±100.7 µg/L, $p < 0.05$) and epinephrine (Pre: 19.0±12.8; Post: 54.8±24.7 µg/L , $p < 0.01$) except for dopamine (Pre: 1204.1±1794.0; Post: 1440.0±455.8 µg/L) after daily practice. Significant changes were observed at the levels of urinary total protein after marching band daily practice compared to the baseline (Pre: 8.3±12.0; Post: 18.1±14.9 mg/dL, $p < 0.05$). Furthermore, there was a significant elevation at the levels of urine specific gravity (Pre: 1.021±0.006; Post: 1.027±0.003 g/mL, $p < 0.01$) and osmolality (Pre: 808.5±190.5; Post: 947.3±117.7 mOsm/kg-1H$_2$O , $p < 0.01$) after the daily practice.
Discussion and conclusions: These findings indicate that the degree of relative stress of the prolonged marching band activities appear to be higher, which is dependent on each playing position, taking into account the observed intra- and inter-individual variations of catecholamine secretion and hydration status. Moreover, urinary catecholamine measurements can provide a unique possibility to complement a more comprehensive evaluation of marching band-specific stress responses.

597 Isokinetic strength and blood lipids responses to high- and medium-intensity resistance training in postmenopausal women

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Objective: The purpose of this study was to investigate the effects of 24-week different- intensity resistance training program on C-reactive protein, blood lipids and muscular isokinetic strength in postmenopausal women.
Methods: Thirty-one healthy postmenopausal women(aged 55–68 years) were matched by isokinetic strength then randomly assigned to either the high-intensity (80% 1RM, 8 reps; HI, N=11), medium-intensity (50% 1RM, 13 reps; MI, N=11), and control (C, N=9) groups. The exercise program consisted of using 9 resistance machines under supervised progressive resistance training two sessions per week for 24 weeks. Isokinetic knee (60°/sec) and elbow (45°/sec) extension/flexion exercise using the Biodex System 4 PRO were measured to assess the peak torque, peak torque divided by weight, total work, and average power before and after training. The plasma concentrations of high-sensitive C-reactive protein (hs-CRP), total cholesterol (TChol), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) and triglycerides (TG) were assessed at baseline and after training. The statistical comparisons for the different variables among the three groups were performed by applying one-way ANCOVA.
Result: There were no differences between the three groups in the baseline measures. Compared with control group, both exercise groups showed similar increases of the peak torque in biceps (17–24%), quadriceps (10–14%) , and hamstring (39–43%) ($p < 0.05$), but there was no significant differences between HI and MI groups. However, no significant changes were observed in hs-CRP and blood lipids between three groups.
Conclusion: These findings suggest that high- and medium-intensity resistance training effectively increase muscular isokinetic strength, but not CRP or blood lipids in healthy postmenopausal women

598 The effect of physiological and metabolic strain on females whilst wearing shorts with uncompensable heat stress

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Many sports garments are designed to be breathable and to maximise cooling whilst exercising. Products that may cause a non-steady state of temperature increase whilst exercising have been described as uncompensable. We investigated the impact of a commercially available pair of shorts (EXP) to examine the impact on heat, weight loss and metabolic cost. We hypothesised that there would be significant differences when exercising in these shorts compared to a breathable pair of shorts(CON). Nine females volunteered to take part in the study (mean age 21.2 yr; height 165.2cm; mass 65.2 kg; BMI 21.6 kg.m^2). Subjects carried out 30 min of exercise; on a treadmill at 11km/h for 15 min followed by exercise at 100W on a cycle ergometer for 15 min. Oxygen uptake was measured breath by breath prior to, during and after exercise. Core temp (Tr) and thigh temperature (Tt) along with thermal imaging were measured throughout. Mass was measured before and after exercise. Subjects exercised in the EXP and a control shorts (CON) in a randomised order.
There was a significant increase in Tr (0.93 v 0.73°C) in EXP v CON, Tt and other heat markers from thermal imaging. EXP resulted in a significantly greater decrease in mass (0.75 v 0.17kg) following exercise. The increase in oxygen uptake was significantly greater during and after exercise but not before exercise. The mean oxygen uptake during exercise was 1.98 L.min^{-1} compared to 2.11 L.min^{-1} in EXP a 6.5% increase in energy expenditure. Oxygen uptake remained elevated for 1 hour after exercise. Exercising in EXP shorts resulted in a significantly greater increase in heat production, energy expenditure and overall metabolic strain. Thermal imaging provided regional changes in heat whilst wearing each garment. The shorts may be beneficial where increased sweat rate and energy expenditure is required during and after exercise. Whilst providing an increase in heat production this remained within safe limits in this study.

599 The comparison of two types training on HSP 70 in active female

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Introduction: Excessive exercise will damage in peripheral leukocytes .The moderate stress in form of regular exercise/training may have protective effects against damage. Up-regulation complex regulation of repair systems such as heat shock proteins (HSP70) are seen in response to training and exercise. Modulation of the repair response may be mechanisms by which exercise can beneficially influence our health .The aim of this study was to examine the effect of two types training (endurance and acute) on HSP70 expression.
Methodology: 20 training female taking part in the intervention volunteered to give blood samples. Subjects were divided two groups, endurance training: with mean age of 23.1±1.4 years, height 159±4.13 cm and weight 59±1.3 kg. and acute training: with mean age of 21.4±1.8 years, height 161±1.43 cm and weight 57±3.2 kg. Blood samples were collected from the left hand anticubital vein before and immediately after exercise. Then plasma HSP 70 was analyzed. Data are reported as means±standard error (SE).Student's paired t test and ANOVA was used to assess differences within groups (baseline and after follow-up).
Results: HSP70 expressions were measured before and after one bout endurance and acute training. Endurance and acute training increased significantly HSP70. These findings demonstrate that prolonged and exhaustion training can induce enhancement of HSP70 expression.
Conclusion and discussion: The data presented show that human skeletal muscle responds to the stress of a single period of aerobic and acute exercise by up regulating expression of HSP70. This Proteins are cytoprotective. In addition, an increased content of HSP70 will facilitate any cellular remodeling, which is known to occur after unaccustomed exercise. So the metabolic changes caused by exercise are similar to induce stress protein synthesis. Physical exercise can elevate core temperature and muscle temperatures. It is possible the HSP 70 response to exercise in relation to the tissue assayed (skeletal muscle, lymphocyte, venous, arterial serum).The expression pattern of HSP70 due to training status may be attributed to adaptive mechanisms. The differences observed when HSP70 in the present study may be related to the mode of exercise and the amount of protein damage associated with the exercise.

600   Nutrition: An untapped resource in rehabilitation and injury prevention

INVITED

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Nutrition is an often forgotten aspect of both rehabilitation and injury prevention and has potential for significant improvements. Concentration and coordination can be negatively impacted by dehydration and low range blood glucose levels which can increase injury risk. Exacerbation or healing of soft tissue injuries may be influenced by acute nutrition intake such as post match alcohol consumption or appropriate recovery practices. Surgery or trauma will increase energy and protein requirements at a time when athletes will often restrict intake to avoid weight gain. Optimization of wound healing through nutrition has been studied in the clinical setting but rarely considered for athletes. Physique characteristics are directly influenced by nutrition and anthropometric screening can identify those who are more susceptible to injury and require closer monitoring. Weight management can be critical for an early return to sport and can be challenging for the athlete to manage given rapid shifts in energy requirements and daily routines. Bone characteristics are affected both by nutrient intake and energy availability both of which can be managed through diet. Research into the treatment of injuries through nutrition supplementation is in its infancy however recent studies have linked nutrients such as Vitamin D status, protein, creatine, omega 3 fats and antioxidants with benefits to rehabilitation. Nutrition has the potential to reduce risk of injury and speed rehabilitation and there are many opportunities for research in this field.

601   Physical activity levels and patterns of 19 month old children

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Introduction: It is a commonly held perception that most young children are naturally active. However, there is no scientific evidence available on which to confirm or refute such perceptions. The purpose of this study was to describe the physical activity levels and patterns of Australian toddlers. Methods: Physical activity and demographic data for 295 19-month old children from the Melbourne InFANT Program were measured using accelerometers and parent surveys. Validated cut-points of 192–1672 and >1672 counts per minute (CPM) were used to determine time spent in light (LPA) and moderate-to-vigorous (MVPA) intensity physical activity respectively. To be included in the analyses children were required to have four valid days of accelerometer data to provide an acceptable (>0.70) reliability estimate of LPA and MVPA. Physical activity data for different hourly periods of the day were examined and proportions meeting the Australian recommended levels of physical activity were calculated.
Results: On average, toddlers engaged in 184 minutes of LPA and 47 minutes of MVPA daily. Using the average day method, 90.5% met the current Australian physical activity recommendations for 0–5 year olds (180 mins LMVPA/day) and 42% met the recommendations using the everyday method. Physical activity levels during mid-morning and mid-afternoon were higher than during other periods of the day. Physical activity patterns for boys and girls were similar, though boys engaged in more physical activity during the morning hours, and there was a trend for boys to engage in more MVPA overall than girls.
Discussion: Most children meet the physical activity recommendations when assessed using the average day method, though this dropped substantially when using the everyday method. As the majority of activity undertaken was of light intensity, previous parental reports that children are highly active are likely a reflection of the time spent in LPA rather than MVPA. As there is an emerging trend for boys to engage in more MVPA than girls, increasing MVPA in young girls from a young age may need to be a target of intervention strategies. Based on the hourly data presented, certain periods of the day may hold more promise for intervention implementation than others.

602   How do infants spend their time? Physical activity and restraint in 3, 9 and 19 month old children

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Introduction: Australian physical activity recommendations for 0-5 year olds specify target amounts of physical activity, electronic media use, and time spent restrained (unable to move freely). Yet minimal information exists on time spent in these activities for children under two years of age. This study aimed to describe how young children spend their time and compare this with national recommendations.
Methods: Parent-report questionnaire data were collected from 542 families participating in the Melbourne Infant Feeding Activity and Nutrition Trial (InFANT) Program when their child was 3, 9 and 19 months of age. Parents estimated amount of time on an average day their child spent in a variety of activities and situations where they were active or restrained. Repeated measures ANOVA assessed intervention and time effects. Due to lack of intervention effect, analyses were conducted on the entire sample, adjusting for intervention arm.
Results: With increasing age, children spent more time in active pursuits (e.g. physically active with parent: 58, 75 and 96min/day at 3, 9 and 19 months of age respectively), free to move about (85, 199 and 416min/day), and watching television (37, 36 and 54min/day), and less time in situations where they were restrained (262, 236 and 146min/day). However particular forms of restraint showed non-linear associations with age, for example time in a playpen peaked at 9 months. The proportion of children meeting recommendations for activity (≥3 hours/day) and restraint (minimise; operationalised as <1 hour/day in each situation) increased with age, but meeting recommended levels of television viewing (0 hours/day) decreased with age. Stability of meeting recommendations was evident for television viewing only (Kappa for agreement=0.42 between 3 and 9 months of age, 0.32 between 9 and 19 months, p<0.001 for both). Few sociodemographic differences were observed between those meeting and not meeting recommendations.
Discussion: Commensurable with physical development, over their first two years of life children appear to become more active and spend less time in situations where they are restrained. However, contrary to recommendations, television viewing increases over the early years of life and shows stability so that children who exceed viewing recommendations at an early age continue to do so. This study is the first to document how infants spend their time. It provides useful information for those aiming to promote healthy lifestyles and suggests television viewing in particular may need to be targeted very early in life.

603 Physical activity during full-day and half-day kindergarten

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Introduction: Children who experience full-day kindergarten (FDK) have higher end-of-year academic and social development compared with children in half-day kindergarten (HDK). However, there is virtually no research on the influence of FDK in the physical domain. The Ministry of Education in British Columbia, Canada began phasing in access to FDK in the 2010–11 school year. This study compared the physical activity levels of children during full-day and half-day kindergarten in that first year of implementation.

Methods: Kindergarten children (5–6 years-of-age) were recruited from six schools (3 FDK and 3 HDK) in one school district. Of the 106 consented children, 47 met the minimum wear time criteria. Of these, 22 (girls=50%) attended FDK and 25 (girls=40%) attended HDK. Actigraph GT1M activity monitors were used to quantify physical activity every 15-seconds. We examined rates of physical activity and sedentary behaviour per minute of time at school in both FDK and HDK. We also compared in-school and out-of-school activity for HDK children. A MANOVA was used to examine the dependent measures: light activity, moderate-vigorous physical activity (MVPA, $\geq$4 METs), and sedentary behaviour with kindergarten type as the factor. A second MANOVA was conducted comparing in-school vs out-of-school activity for the HDK students only.

Results: There was a significant overall effect for FDK vs HDK; Wilk's lambda=.833, F(2, 44)=4.396, p=.018. Univariate F tests revealed that compared with half-day students; there was significantly greater rate of participation in light-intensity physical activity (FDK=.72/min, HDK=.68/min, p=.006) and a significantly lower rate of sedentary behaviour (FDK=.27/min, HDK=.32/min, p=.004) among full-day students. Levels of MVPA were low and there was no difference in MVPA between conditions. The second MANOVA revealed that HDK students were less active during the four in-school hours compared with the four out-of-school hours; p=.014. Children had higher rates of light-intensity activity (p=.003) and lower levels of sedentary behaviour (p=.005) out-of-school. There was no difference in MVPA.

Discussion: These findings suggest that in the first year of implementation, children in FDK participated in more physical activity and less sedentary behaviour than children in HDK. As FDK is now available for all five-year-olds in the province, it is important that schools strive to maintain these higher levels of physical activity and increase participation in MVPA, which was also very low.

604 Active couch-potatoes? Combined physical activity–sedentary behaviour associations with weight status in 8–10 year old children

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Introduction: Sedentary behaviour (SED) is now viewed distinctly from physical activity (PA), rather than simply as a surrogate for inactivity or a lack of moderate-to-vigorous PA (MVPA). Hence, it is possible for individuals to be simultaneously classified as both active and sedentary. This study explores multiple ways of defining combined PA-SED categories for a cohort of children at risk of obesity, and assesses weight status within these categories.

Methods: Participants were 537 boys and girls aged 8–10 years with baseline data in the QUebec Adipose and Lifestyle InvesTigation in Youth (QUALITY) study; inclusion criteria included $\geq$1 parent clinically obese. SED and PA were measured by accelerometer over a 1 week period (SED $\leq$100 cpm; MVPA$\geq$2296 cpm; mean min/day), and specific SED behaviours assessed by self-report. Height, weight and waist circumference (WC) were measured, and cardiovascular fitness assessed by maximal bike protocol. Mean BMI and WC and proportion of children overweight/obese and abdominally obese were assessed according to PA-SED categories. Logistic regression determined the odds of overweight/obese and abdominal obesity according to PA-SED.

Results: About 40% of the children were overweight/obese. Depending on categorization method, up to 29% of boys and 26% of girls were simultaneously classified as both Active and Sedentary. Mean BMI and WC, and percent of children overweight/obese or with WC $\geq$90[th] percentile, were highest for inactive/SED groups, lowest for active/non-SED, and intermediate for active/SED and inactive/non-SED (active/SED often 'worse' than inactive/non-SED). The odds of overweight/obese and abdominal obesity were highest in inactive/SED groups, followed by inactive/non-SED; active/SED individuals generally did not differ significantly from active/non-SED individuals. When classifying children according to current Canadian PA ($\geq$60min/day MVPA) and screen time ($\leq$2hr/day) guidelines, proportions of overweight/obese children in the inactive/SED, inactive/non-SED, active/SED and active/non-SED groups were 51%, 39%, 42%, and 14%, and proportions of children with WC $\geq$90th percentile were 40%, 20%, 14%, and 0%, respectively. Corresponding odds (95% CI) of overweight/obese for the first 3 groups were 5.7 (1.9–8.2), 4.0 (2.8–11.6) and 4.4 (2.1–9.6), compared to the active/non-SED group. The associations between PA-SED and obesity were at least partially mediated by cardiovascular fitness.

Discussion: Combined inactivity and sedentariness is strongly associated with overweight/obesity and abdominal obesity. Using current guidelines to classify children indicates that active couch-potatoes are similarly likely to be overweight/obese as inactive children, reinforcing the validity of the guidelines and the importance of promoting both increased PA and reduced screen time among children.

605 Two-year longitudinal changes in screen-time and different elements of physical activity in British youth from 11 to 13 years

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Introduction: The decline in physical activity (PA) from childhood to adolescence is stark and often accompanied by an increase in sedentary behaviours. Preventing or attenuating this decline represents a potential public health intervention strategy. While an overall decline is well-documented, little is known of how different elements of PA change. Using individually-validated items from a standard questionnaire (Physical Activity Questionnaire for Adolescents: PAQ-A) and self-reported screen-time we investigated changes in different elements of PA and sedentary behaviour over two years in participants aged eleven at baseline.

Methods: Participants self-reported screen-time, completed the PAQ-A according to standard instructions and ran the FITNESSGRAM PACERTM test of cardiorespiratory fitness. The PAQ-A is scored from 1–5 (1–least active) but scores cannot be used to ascertain achievement of PA guidelines. We first determined what comprised a meaningful difference in PAQ-A score using baseline values to predict achievement of health related VO$_2$ peak values (slope or regression line: ΔPAQ=-0.13). Two year declines with a lower 95% CI >-.13 were deemed important. We then calculated the mean (95% CI) change in each PA element.

Results: Neither total PA (-.12, 95% CI .9–.16) or PE (-.07, 95% CI .02–.13) declined significantly. There were, however significant declines in PA at Lunch (-.34, 95% CI .27–.40) after-school (-.24, 95% CI .16–.32) during evenings (-.22, 95% CI .15.29) and at weekends (-.26 95% CI .26–.39). 47% reported <2h daily screen-time at baseline, 34% of which increased their screen time to>2h at follow up. Screen-time decreased in only 10% of participants. The effect size for change in all elements of PA (ΔPA) was greater in those reporting increased screen-time. There was an important difference in the magnitude of decline for evening PA in participants reporting stable (Δ=-.17, 95% CI .08-.25) vs increased (Δ=-.38, 95% CI 0.23–.53) screen-time.

Discussion: We found a small drop in overall PA from between 11 and 13 years of age but large and meaningful declines in PA after-school, at evenings and weekends. The largest decline was seen in PA during school lunch break. The prevalence of high screen-time increased by 34% over the study period and an increase in screen-time was associated with a much greater reduction in PA during the evening. Maintaining low (<2h screen-time) and promoting physical activity at school lunch breaks may attenuate declines in PA within this age group.

606 How similar are Australian and New Zealand youth? Trans-Tasman youth time use clusters and correlate profiles

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Introduction: Time use behaviours do not occur in isolation, and research suggests patterns or clusters of behaviours may offer insight into health outcomes. Inter-country comparison may provide the avenue to explore the nature of health-related time use cluster relationships. The aim of this study was to compare Australian and New Zealand youth time use clusters and cluster correlates.

Methods: Secondary analysis of the 2007 Australian National Children's Nutrition and Physical Activity Survey (n=1853 9–16 year olds), and the New Zealand 2008/2009 National Survey of Children and Young People's Physical Activity and Dietary Behaviours (n=679 10–16 year olds). Time use data were collected using the Multimedia Activity Recall for Children and Adults, and collapsed forming 17 age-adjusted activity variables used for sex-specific cluster analysis. Trans-Tasman analyses of cluster type, socio-demographic, anthropometric, health and dietary cluster-correlate profiles were conducted.

Results: Three clusters were identified for each sex in each country. For Australian boys, there was a Social tasker cluster (social interaction and chores), a Techno-studious (video games and study) cluster and a Techno-active cluster (TV and team sport). A similar New Zealand boys' Techno-active cluster was found, in addition to a Social studious cluster (social interaction and study) and a Quiet movers cluster (quiet time and transport). For Australian girls, there was a Social screenie cluster (screen and social interaction), a Quiet actives cluster (quiet time and transport), and a *Techno-studious* cluster (video games and study). For the New Zealand girls, there was a *Social sporty* cluster (social interaction and sport), a *Screenie tasker* cluster (screen and chores), and a *Super studious* cluster (study and school). Both Australian and New Zealand boys shared a *Techno-active* cluster, which objectively were the most similar. The boys also shared a cognitive-based cluster. Between the countries, the socio-demographic and health profiles of the *Techno-active* and cognitive cluster type were similar. In contrast, the strength of similarities between the girls' trans-Tasman clusters were weaker, with the screen-based clusters the most similar. There were only weak similarities between the girls' cluster socio-demographic profiles.

Discussion: The findings suggest time use interventions may need to be not only gender- specific but also country-specific, especially in relation to girls' time use patterns. The past success of youth health-related time use interventions has been generally poor. Any further information regarding the time use patterns, correlates and the socio-cultural differences could inform targeted intervention design and improve youth health.

607 Physical activity patterns and determinants in rural South African adolescents

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Introduction: It is well accepted that physical activity tracks from childhood to adulthood, and is an effective intervention for obesity prevention and treatment in adolescence. The main purpose of this study was to examine patterns, and identify determinants, of physical activity in rural South African adolescents.

Methods: This study was nested within the Agincourt health and socio-demographic surveillance system (AHDSS) and included 381 subjects, stratified into two age groups: 11 and 12-year-olds and 14 and 15-year-olds. Height and weight were measured and pubertal status assessed using the Tanner 5-point pubertal self-rating scale. A questionnaire quantifying total physical activity (PA) for the previous 12 months was administered via interview. Various maternal, household and community data from the prospective AHDSS were linked, including maternal and household head education, and household socio-economic status.

Results: In the 11 and 12-year old group 11% of the girls were identified as overweight and 4.1% as obese, and 3.1% of the boys as overweight and 1% as obese, using the IOTF age- and sex-specific cut-offs. In the 14 and 15-year old group, none of the boys and 17.9% of the girls were identified as overweight, and 2.2% of the boys and 3.2% of the girls were identified as obese. Sedentary activity was significantly higher in the older girls compared to their younger counterparts (p<0.05), and informal activity was lower in the older boys and girls compared to the younger groups (p<0.05). Moderate-vigorous physical activity (MVPA) was lower in the girls compared to the boys, irrespective of age, with the girls only participating in approximately 15 minutes of MVPA/day. Increasing pubertal status was associated with an increase in sedentary activity but the most significant determinant of sedentary activity at the maternal, household and community levels was socio-economic status.

Discussion: Lower socio-economic status at the maternal, household and community level was significantly associated with less sedentary activity, less time spent sleeping, more walking for transport and lower moderate-vigorous physical activity in school and clubs in boys and girls living in a rural community in South Africa.

608 A comparative study of step-determined physical activity among Korean children in Korea and Canada

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Introduction: Though reduced physical activity levels and increased sedentary behaviours have influenced the current epidemic of overweight and obesity in children, little attention has focused on youth physical activity among Asian populations. The purpose of this study was to assess current levels of physical activity among Korean children in Korea (Kor) and Canada (Kor-Can), and to identify possible differences between the levels of physical activity in terms of the two different environments.

Methods: Using a convenience sampling strategy, 84 Kor-Can children (37 boys, 47 girls; Mean age=12.5) were recruited from Korean language schools and churches in Edmonton, Calgary, and Vancouver, and 114 Kor children (56 boys, 58 girls; Mean age=13.5) were recruited from elementary and junior high schools in Seoul and Kyounggi-Do in Korea. Participants were asked to wear a MLS 2505 (Walk4Life, Inc., Plainfield, Illinois) pedometer for 7 consecutive days (five weekdays and two weekend days).

Results: A two-way analysis of variance (ANOVA) was performed to assess the impact of cultural group and gender on physical activity levels as mean steps per day. No interaction between cultural group and gender on daily mean steps was found ($F_{[1, 191]}=0.78$, p=0.38). However, a statistically significant main effect existed for cultural group, $F_{(1, 191)}=15.00$, $p < 0.001$. Specifically, Kor children ($8,772 \pm 3,149$) obtained more daily steps than Kor-Can children ($7,164 \pm 2,996$). Significant differences were also found between boys and girls for mean steps taken daily, $F_{(1, 191)}=10.13$, p=0.002. The mean number of steps per day for boys ($8,821 \pm 3,684$) was higher than that of girls ($7,462 \pm 2,477$) in both Korea and Canada. In addition, both Kor-Can and Kor children accumulated higher steps/day during weekdays ($8,470 \pm 3,050$) than weekends ($7,073 \pm 4,463$). Also, approximately 80% of Kor children walked or rode their bike to school while only 46% of Kor-Can children were likely to walk or bike to school. Kor children were also less engaged in motorized travel than Kor-Can children.

Discussion: Kor children were significantly more active than Kor-Can children in terms of their mean steps taken daily. Active commuting to school and the use of public transit systems may have contributed to differences in physical activity between the two groups. Thus, opportunities in the built environment appear to play an important role in the physical activity of children.

609 Change in objectively measured physical activity during the transition to adolescence: Targets for intervention*

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Introduction: Research shows that physical activity (PA) declines during adolescence but few studies explore change in PA intensities over multiple time points. We objectively assessed sedentary (SED), light (LPA) and moderate and vigorous PA (MVPA) among British children at 3 time points over 4 years.

Methods: Accelerometer-assessed PA data (mins) was obtained at baseline (n=2064) and 1 and 4 years later in the SPEEDY study (baseline Mean±SD: 10.2±0.3 years-old; 42.5% male). Change in SED (<100 counts/minute (cpm)), LPA (101-1999 cpm) and MVPA (≥2000 cpm) was studied using three-level (time, individual, school) mixed effects linear regression including participants with data at ≥2 time points (n=990). Exposures were age and sex. Differences in the effect of age by sex, home location (urban/rural) and weekday/weekend were explored with interactions.

Results: Over 4 years, SED increased by Mean±SD 41.1±71.5 min/day (9.0% of baseline), LPA declined by 42.9±35.7 min/day (23.6% of baseline) and MVPA declined by 12.6±29.2 min/day (16.7% of baseline). The average annual SED increase was 10.6 (95% CI 9.1, 12.2) min/day/year. LPA decreased by 8.9 (7.8, 10.1) min/day/year for boys and 10.5 (9.5, 11.7) min/day/year for girls (interaction p=0.02). Girls did less LPA than boys at all time points (p<0.001). MVPA decreased by 3.9 (3.0, 4.8) min/day/year among boys and 2.0 (1.2, 2.8) min/day/year among girls (interaction p=0.001), but girls had lower MVPA than boys at all time points (p<0.001). LPA declined more steeply with age among urban children (urban: -11.0 (-12.4, -9.6) vs rural: -10.1 (-11.6, -8.6) min/day/year (interaction p=0.015)) whereas MVPA declined more steeply among rural children (urban: -1.3 (-2.3, -0.4) vs rural: -4.4 (-5.3, -3.4) min/day/year (interaction p<0.001)). SED increased on both weekdays and weekend days. There was a greater age-related decline in LPA and MVPA at weekends compared to weekdays (weekday LPA: -8.6 (-9.8, -7.4) vs weekend -10.4 (-11.8, -9.0) min/day/year, interaction p=0.025 and weekday MVPA -2.8 (-3.7, -1.9) vs weekend -6.7 (-8.1, -5.2) min/day/year, interaction p<0.001).

Discussion: Physical activity declines during the transition from childhood to adolescence. Independent from baseline PA, MVPA decreased more among boys and rural children than girls and urban children. Prevention of decline in MVPA throughout adolescence and promotion of MVPA among girls appear to be important public health strategies. Interventions might aim to attenuate the increase in SED among all children, particularly at weekends.

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610 Maintaining participation in physical activity from childhood to young adulthood. Is fluctuating participation the norm?

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Introduction: Maximal health benefits are associated with participation in regular physical activity across the life course. Life stage transitions are considered critical periods for physical activity behaviours. This study used a mixed methods research design to explore patterns of participation in physical activity from childhood to young adulthood.

Methods: Semi-structured interviews were conducted with 24 young people aged 16–25 years (male=10, female=14) from a range of demographic backgrounds. Purposeful sampling ensured interviewees ranged from inactive to highly active and participated in various types of leisure time physical activity. During interviews participants were asked to discuss their experiences of physical activity including past and current involvement in physical activity, childhood competency, future intentions and how being active made them feel. All interviewees completed the International Physical Activity Questionnaire (IPAQ) and were asked to wear a pedometer for one week. Data from interviews underwent an

iterative thematic analysis.

Results: After integrating interview, IPAQ and pedometer data three patterns of participation in physical activity from childhood to the current day were identified; Maintainers (n=17), Increasers (n=4) and Decreasers/Inactive (n=3). Maintainers consisted of two distinct sub-groups (M1 & M2). With one exception all M1 (n=7) reported high childhood sports competency and consistent diverse participation in physical activity since early childhood. Impact on physical activity was a key consideration when planning current and future work and living arrangements for these young people. Physical activity was integral to their sense of self and identity. For M2 (n=10), childhood competency varied from high to below average and social and environmental factors had consistently influenced their past and current participation in physical activity. Future plans for participation were contingent upon work, study and social demands. Despite describing a pattern of physical activity maintenance since childhood, participants in M1 and M2 commonly described short-term fluctuations in participation due to injury, study, work or other commitments.

Discussion: These findings illustrate two distinct pathways to maintaining participation in physical activity into young adulthood.

Short-term fluctuations in participation appear the norm even among those with a pattern of regular participation over the long term. Ensuring a return to participation after periods of decreased activity may be critical for maintaining regular participation over the life course. This may require a reassessment of current interventions aiming to promote physical activity participation.

611 Safety perceptions and physical activity in US adolescents

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Introduction: Safety concerns are often-discussed as barriers to physical activity, but results have not supported hypotheses. To improve understanding of safety correlates of adolescent physical activity (PA), the present study assessed 4 domains of safety, included perceptions of youth and parents, and examined associations with 4 PA outcomes.

Methods: Youth aged 12–16 years (M=14.1, SD=1.4) and one parent/caregiver were recruited from two regions of the U.S. (Seattle-King County, WA and Baltimore-Washington, DC). They lived in areas that met criteria for cells in a 2 X 2 matrix defined by high vs low walkability X high vs low median income. Participants were 467 girls and 459 boys and a caregiver for each. Four safety-related variables were derived from the validated Neighborhood Environment Walkability Scale-Youth as reported by both youth and parents: traffic safety, pedestrian safety, crime risk, stranger danger risk. Four PA outcomes were self-reported by youth: days with 60+ min/day PA, weekly active commuting trips to school, number of sports teams or activity classes outside school, PA in neighborhood. Sex-specific mixed model regressions were conducted adjusting for region, walkability, income, race/ethnicity, youth age, parent education, and clustering within blockgroups.

Results: Adolescent perceptions of neighborhood safety were unrelated to PA (only 1 of 32 models was significant for safety). Parent perceptions of safety were unrelated to boys' PA (only 1 of 16 models was significant for safety). However, 5 of 16 models were significant (p<.05) for parent perceptions of safety and girls' PA. Consistent with hypotheses, active commuting to school was positively related to traffic safety and negatively related to crime risk. Organized teams and classes were negatively related to crime risk and stranger danger risk. Unexpectedly, active commuting was positively related to stranger danger risk.

Discussion: The complex pattern of results suggest certain types of parents' safety perceptions are related to specific types of PA, but only for adolescent girls. It appears that parents' safety concerns could lead to restrictions on girls' active commuting to school and participation in activity teams and classes. The unexpected finding might indicate reverse causation whereby girls who actively commute to school stimulate parent concerns about stranger danger. Alternately, girls may actively commute to school out of necessity in neighborhoods with high stranger danger risk. Perhaps these more-refined measures of safety and PA are uncovering generalizable patterns.

612 A systematic review of the relationship between the built environment and different domains of physical activity in children

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Introduction: The purpose of this systematic review was to determine the relationship between a wide range of physical environmental characteristics and different domains of physical activity in 6- to 12-year-old children.

Methods: A systematic search was conducted in six databases (Pubmed, Web of Science, Cinahl, SportDiscus, TRIS and Cochrane) resulting in 67 papers, eligible for inclusion. Articles were included if they investigated the built neighborhood environment. The investigated physical environmental variables were grouped into six categories: walkability, walk/cycle facilities, aesthetics, safety, recreation facilities, and urbanization. Physical activity (PA) was captured under four categories: active transportation to school, walking/cycling during leisure time, moderate-to-vigorous physical activity (MVPA), and total physical activity.

Results: Most of the studies found no relationships between the built environment and physical activity. There was convincing evidence for a positive relationship between walking/cycling and walkability (in 5/6 of the studies), land use mix accessibility (in 11/17 of the studies); and for a negative relationship with freeway crossings (in 2/3 studies). Evidence was also found for a positive relationship between walking/cycling and density measures (10/23 studies), walk/cycle facilities (4/8 studies). Only the overall environment score (2/4 studies) showed evidence for a possible positive relation with total PA and MVPA. Safety, recreation facilities and aesthetics were neither related to walking/cycling nor to total PA and MVPA.

Discussion: Results were found to be highly dependent on the exact measure and research population. The non-significant relationships might be due to cultural differences, different designs of land uses and different traffic situations across the different countries and continents. As 48 out of 67 studies were conducted in Australia (n=15) or the USA (n=33), there is a lack of studies conducted in other continents. The use of different methodological techniques also urges for using objective and comparable measurement methods in future studies. To evaluate which environmental factors predict positive versus negative changes in physical activity levels, longitudinal studies are needed. The fact that most environmental variables were not related to physical activity emphasizes the need to include social and psychological factors next to environmental factors to explain physical activity behavior in children.

613 Effects of urban renewal on children's movement patterns and physical activity: Study design and baseline data from the When Cities Move Children study

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Introduction: The built environment may play an important role in children's movement patterns and physical activity level as their independent mobility often is confined to their neighborhood. However research findings are mixed and no causal connections are established as the majority of studies in this field are based on cross sectional data. The main purpose of the When Cities Move Children (WCMC) study is to inform evidence on the direct effects of urban renewal on children's movement patterns and physical activity (PA) level based on objective measurements. The purpose of this paper is to describe the design, methods, data processing and characteristics for the baseline participants.

Methods: The WCMC study aims at observing effects of a natural experiment: an urban renewal, on childrens' PA with the intervention being conducted by the Copenhagen municipality in a diverse ethnic community with a high proportion of unemployed adults. All children in grade 5–8 (10–16yrs) from four local schools within and around the intervention area were invited to participate in the study at baseline (spring 2010) and follow up two years later (spring 2012). At both baseline and follow-up the children were asked to wear a GPS and an accelerometer for one week, to complete a questionnaire and fill out a short diary about wear compliance and school hours. Registry data is obtained on ethnicity and socio economic status (SES) of the children's parents as well as weather status (hours of sunlight, mm rain, temperature) during data collection.

Results: At baseline 653 children were invited to participate in the study, 523 participated (80.1%) and 291 (Boys=131) of these fulfilled all of the acceptance criteria (55.6%). Acceptance criteria were for accelerometers a minimum of three valid weekdays and one valid weekend day (8 hours wear time, non-wear: 60 minutes of consecutive zeroes), substantial GPS data on valid days, questionnaire data and that registry data on parents were available. Of the children 64.2% had at least one parent with an ethnic minority background. Mean daily minutes in moderate to vigorous physical activity among boys were 58.3 and 37.4 among girls (p<0.001).

Discussion: Using a natural experiment design makes is possible to evaluate the effects of urban renewal in a scale that is not possible to conduct in a more controlled design. Using combined GPS and accelerometer data has the potential to inform new evidence on how urban renewal affects children's movement patterns and physical activity.

614 Physical activity, urban-rural status and geographic mobility from childhood into adulthood: Is it who we are or where we live?

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Introduction: Understanding how moving from an urban to a rural area or vice versa (geographic mobility) influences physical activity may provide insights into how settings influence behaviour, but few studies have investigated this. This study aimed to explore cross-sectional associations between urban-rural status and physical activity among Australian children and adults, and longitudinal associations between geographic mobility and changes in physical activity from childhood into adulthood.

Methods: In 1985, 2127 9–15 year olds reported transport and leisure activity, and in 2004-6 (via the International Physical Activity Questionnaire) at age 26–36 years. Area of residence was classified as urban or rural using a national index. Cross-sectional analyses involved binary logistic regression to estimate odds ratios (OR) and 95% confidence intervals (CI) for being high versus low active according to urban-rural status, adjusting for covariates (age, sex, language at home, education). Longitudinal analyses involved multinomial logistic regression to estimate OR (95% CI) of becoming active, becoming inactive and staying inactive (compared to staying active) from childhood to adulthood among those who became urban, became rural and stayed rural (compared to those who stayed urban), adjusting for covariates (sex, language at home, education).

Results: Cross-sectionally, rural children reported less transport activity (OR 0.54, 95% CI 0.43–0.67) and more leisure activity (OR 1.26, 95% CI 1.01–1.56) than urban children. Rural adults reported less leisure activity (OR 0.54, 95% CI 0.39-0.73) than urban adults. Longitudinally, for leisure activity, compared to those who stayed in an urban area, those who moved to or remained in a rural area had higher odds of becoming inactive (OR 2.20, 95% CI 1.16–4.20 and OR 2.81, 95% CI 1.51–5.23, respectively), and those who moved to a rural area from childhood into adulthood had higher odds of staying inactive (OR 2.81, 95% CI 1.51–5.23) compared to those staying active. For transport activity, compared to those who remained in an urban area, those who moved to an urban area or remained in a rural area had higher odds of becoming active (OR 1.91, 95% CI 1.35–2.70 and OR 2.47, 95% CI 1.26–4.83, respectively) or staying inactive (OR 1.95, 95% CI 1.38–2.76 and OR 2.86, 95% CI 1.48–5.53, respectively).

Discussion: The findings demonstrate that changes in urban-rural status can influence changes in physical activity, particularly those moving to or remaining in a rural area from childhood into adulthood. This study highlights that geographic transitions may represent an opportunity for intervention.

615 The built environment and children's physical activity – what is 'child friendly'?

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Introduction: Emergent evidence shows that the built environment can enhance child physical activity and has positive impacts on health. Highly walkable neighbourhoods are associated with more walking in adults, however these neighbourhoods often have more traffic which discourages active forms of transport in children. Research is required to develop built environment measures that are specific to children and their environments and that permit examining how the relationship between the built environment and child physical activity varies by age and gender.

Methods: Cross-sectional study of 755 children aged 5–15 years, who completed the 2009 Western Australian Health and Wellbeing CATI Survey. Parents reported child minutes/week of moderate to vigorous physical activity (MVPA) and socio-demographic factors (child and parent). Objective built environment measures included a child-specific walkability index (land use mix, connectivity, residential density and traffic exposure), greenness (Normalized Difference Vegetation Index) and terrain slope. The association between child MVPA and built environment features was examined at varying service areas (200; 400; 800; 1600m) and stratified by child gender and age group: 5–9 years (158 boys, 163 girls) and 10–15 years (231 boys, 203 girls). Linear regression models examined built environment features associated with child MVPA by age group and gender.

Results: Greenness was the most consistent correlate of MVPA across age group and gender, with positive associations for young girls and boys at 200m, 400m and 800m (p<0.1), and for older boys at 800m (p<0.05; β=0.17). Other environmental variables had negative associations with MVPA. For young boys, traffic exposure at 200m and residential density at 1600m were negatively associated with MVPA (p<0.1), and for young girls, land use mix at 1600m was negatively associated with MVPA (p<0.1). In older boys MVPA was negatively associated with connectivity at 800m (p<0.05; β=-2.49) and 1600m (p<0.1). However, for older girls connectivity at 800m was positively associated with MVPA (p<0.05; β=2.52). Terrain slope was also positively associated with MVPA for older girls at 200, 400 and 800m (p<0.1). Relationships will be confirmed using a larger data set (once available). The association between MVPA and the child-specific walkability index will be presented.

Discussion: Associations between the built environment and physical activity vary by child age and gender. These results highlight that measures of the built environment need to be tailored to child physical activity behavior. Policy makers and practitioners should consider the importance of features of the built environment for supporting or discouraging children's physical activity.

616   Locating schoolyard physical activity – Using GPS, accelerometerty and GIS

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Introduction: A number of recent studies have found associations between the characteristics of schoolyards and the level of PA of schoolchildren using the schoolyards. Based on these findings, it seems likely that making schoolyards more attractive will help to increase the total amount of PA among schoolchildren. Before starting our 'Activating Schoolyards' intervention study, we carried out an exploratory study with the objective to describe activity patterns and localize places for physical activity on 6 schoolyards varying in size and content, located in different types of neighborhoods.

Methods: 745 children, 6–16 years old, enrolled at six schools were asked to wear an accelerometer (ActiGraph GT3X) and a GPS (Qstarz BT-Q1000X) for 5 schooldays to determine their level of activity and movement patterns. GPS positions were recorded every 15 seconds and activity levels were recorded every 2 seconds. GPS and accelerometer data were compiled using the Physical Activity Location Measurement System (PALMS), developed by the Center for Wireless and Population Health Systems at the University of California, San Diego. All elements of each of the 6 schoolyards were mapped in detail using a high-precision GPS (Trimble GeoExplorer XT). ArcGIS software was used to combine PALMS output with the schoolyard maps. For each participant, average activity counts per schoolyard element were calculated, and associations between schoolyard elements and average levels of physical activity were calculated.

Results: Multi-courts with an artificial grass or rubber surface, lawn areas, grass slopes and other more natural elements were associated with higher than average levels of physical activity in schoolyards during recess. Playground equipment such as climbing frames, slides or swings, was not associated with higher levels of physical activity. Our results also show age, gender and time differences with different schoolyard elements being popular for different age groups, at different times of the day.

Discussion: In future schoolyard renovations, or when designing new schoolyards, policy-makers and designers should keep our findings in mind. However, the causal relations between these schoolyard elements and higher levels of physical activity will need to be tested in our 'Activating Schoolyards' intervention study, that will commence in 2013. This study will focus on schoolyard characteristics that are likely to influence the least active children.

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617   Promoting physical activity at the preschool playground: The influence of lowering playground density

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Lower play space density is found to relate to higher activitiy levels during recess at preschool. We aimed to examine if lowering playground density during recess, by halving the number of children sharing the playground, is feasible and effective in increasing preschoolers' participation in physical activity and reducing preschoolers' engagement in sedentary behaviour.

Methods: A within subject design was used over one preschool week to study participants' physical activity and sedentary behavior by accelerometry (GT1M ActiGraph) during two conditions: recess periods in the usual format and recess periods with a lower playground density. A sample of 128 preschoolers (69 boys; 5.1±0.6y), recruited from four preschools in Ghent, Belgium, provided accelerometer data during recess, of whom 108 (60 boys; 5.1±0.6y) also provided accelerometer data during the entire week. The principals of the four participating preschools filled in a feasibility questionnaire after the intervention. Two sets of cut points (Van Cauwenberghe (VC) and Evenson (EV)) were used to estimate time in sedentary behaviour and light-to-vigorous physical activity during recess, during the preschool-attending time, and during the entire day. A series of two-level (participants - measurements) linear regression analyses were conducted.

Results: None of the principals found it difficult for the preschool direction and for the preschool teachers to lower playground density. All principals agreed that it was possible to lower playground density in their preschool in the future. During recess periods in the usual format, average playground density was 7.4±1.7 m²/preschooler and average recess duration 23±8 min. During recess periods with lower playground density, this was 16.7±5.1 m²/preschooler and 23±10 min, respectively. According to the VC cut points, lower sedentary behavior levels (mean difference of 1 min; p < 0.001) and higher light-to-vigorous physical activity levels (mean difference of 1 min; p < 0.001) were prevalent during recess periods with a lower playground density compared to usual format recess periods. When using the EV cut points, no significant differences were found. For the preschool-attending time and the entire day, no significant differences were found in sedentary behavior and light-to-vigorous physical activity between both conditions, according to both sets of cut points.

Conclusion: It was feasible to lower playground density during recess periods at preschool, however increases in physical activity and decreases in sedentary behaviour were minimal. This strategy may especially be important for preschools with a very high playground density.

618 Features of public open spaces: Are there differences between urban and rural areas?

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Introduction: Parks are important settings for physical activity. Park features have been shown to be associated with park visitation and physical activity within parks. There is some evidence that children living in rural locations are at an increased risk of overweight and obesity compared with children living in urban areas and this may be a result of decreased opportunities to be physically active such as having fewer facilities in parks. The aim of this study was to examine potential differences in the features and amenities within parks located in urban compared with rural areas. Methods: An audit tool was designed to identify and evaluate features of parks that may be important for children's physical activity including: aesthetics (e.g. landscaping, water features, litter and graffiti), amenities (e.g. toilets, drinking fountains, shade, benches, bike racks), activity areas (e.g. open spaces and basketball courts), playgrounds (e.g. equipment and suitability for different age groups), and the presence of courts/ovals, paths and dog signage. Field observers visited 628 parks across Victoria, Australia during 2009–2010 and completed this paper and pencil audit. Results: Park audits were completed at 434 urban and 194 rural parks. The parks located in rural areas scored significantly highly on aesthetic features (3.5 vs 3.2) and the number of activity areas (0.9 vs 0.7), while urban parks scored higher on playground equipment (8.5 vs 6.8), and the number of courts/ovals (7.1 vs 2.7). A higher percentage of urban parks had walking paths (59% vs 42%) and signage regarding dogs (26% vs 14%). Conclusions: The findings demonstrate differences in park features in urban compared with rural areas. Further research is required to examine whether these differences in park features are associated with park-based physical activity, overall physical activity, or time spent in sedentary behaviours among children in urban and rural areas.

619 Psychological components of the beep test

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Introduction: Anecdotally, there is a common belief that performance on tests of physical endurance is largely psychological. The 20-metre Shuttle Run Test (or "Beep Test") is one of the more commonly used field tests of physical endurance, designed to estimate VO_2max. This study aimed to explore whether psychological factors influence an athlete's performance on the beep test, controlling for their VO_2max measured in a laboratory. Method: Thirteen males (M=18.62 years) from different sports completed a collection of questionnaires followed by both fitness tests. Due to the small sample size and the high correlations between the seven psychological measures, the three measures that accounted for the most variability in beep test scores were entered into a hierarchical multiple regression.
Results: Analyses indicated that including psychological factors significantly improved the prediction of beep test scores (R^2_{change}=.40, p < 0.005), over and above VO_2max. Specifically, better performance on the beep test was associated with higher emotional control (ß=-1.18, p=0.003) and lower social desirability (ß=1.01, p=0.002). Contrary to expectations, confidence was not significantly associated with beep test performance (ß=.285, p=0.166).
Discussion: Due to the small sample size, results should be interpreted with caution. Nevertheless, they suggest that an ability to manage emotions may lead to better performance on endurance tasks. To establish the direction of this effect, experimental research should be conducted to confirm that increasing skills in emotional management leads to improved performance, and not the other way around. The other important predictor of performance was social desirability, such that those who were more concerned about the way they appeared in front of others performed worse than those who were less concerned. This attribute may be associated with higher anxiety in evaluative situations, which may account for unhelpful shifts in attention and poorer performance. Alternatively, the need for approval associated with social desirability may place an emphasis on extrinsic, rather than intrinsic, sources of motivation, which are generally associated with lower persistence and poorer performance. Again, these explanations should be explored through experimental designs with more participants.

620 Body image, eating behaviours and weight management in DanceSport competitors

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As a physical pursuit, DanceSport combines elements of dance performance and elements of sporting competition where, much like aesthetic sports (such as gymnastics, diving, and figure skating), competitors seek not only to be technically superior to their competitors, but also to present a particular 'ideal' look while they compete. Research has shown that in both areas individually, dance and aesthetic sports, participants are at an increased risk of developing unhealthy attitudes and behaviours regarding body image, eating patterns and weight management strategies compared to general populations. DanceSport competitors may be at equal or even greater risk of developing body image disturbance and disorders of eating and weight management than has been previously seen in dancers or athletes in aesthetic sports, however, no research (prior to this study) had yet to examine these issues in a DanceSport population. The current research explored physical self-perceptions and patterns of eating and weight control behaviours of male and female ballroom dancers competing at the elite levels of DanceSport. In addition the current research examined factors inherent in the DanceSport environment that may increase the risk for competitors developing body image distortion, disordered eating, and eating disorders. In study 1, a quantitative questionnaire package comprising the Eating Attitudes Test (EAT-26), the Eating Disorder Inventory (EDI-2), the Physical Self-Description Questionnaire (PSDQ), and a demographics and weight management strategies survey (designed specifically for this study) was distributed to DanceSport competitors (completions: females n=20, males n=6) currently competing in Australia. Subscale scores were calculated for the EAT-26, EDI-2 and PDSQ. Demographic data and weight management strategies were analyzed using summary statistics. Appropriate t tests were undertaken and effect sizes calculated to compare male and female dancers. On the basis of participant responses in the questionnaires, 4 dancers (2 male, and 2 female)

were invited to participate in study 2, which consisted of follow-up semi-structured interviews to explore in greater detail their eating and weight management behaviours and to examine the influence of the competitive DanceSport environment on dancers' physical self-perceptions and related behaviours. Analysis of the data revealed three key findings: DanceSport competitors, particularly females, are at risk of developing body image concerns, unhealthy attitudes regarding eating and engaging in problematic weight management behaviours; elements of the DanceSport environment (training, competition and social) contribute to the risk for competitors; and DanceSport competitors exhibit similar personal qualities (such as perfectionism, high motivation) typically seen in eating disordered populations.

621 Social disadvantage and physical activity promotion: A European perspective

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Introduction: More than half of the European region's population is insufficiently active to achieve a health benefit. Inequalities between and within countries are rising. Socially disadvantaged groups are often most at risk for physical inactivity, yet are underrepresented in physical activity (PA) intervention studies. A joint EC/WHO project is underway to develop good practice elements and guidance to promote PA in socially disadvantaged groups.
Methods: In the context of this review, social disadvantage relates to socioeconomic aspects (income, socioeconomic status (SES), education and employment), age and social determinants such as gender, ethnicity, culture, religion, location, living conditions and material conditions. A search of the European published and grey literature on PA and disadvantage produced data from all EU Member States but one. Sports participation data were included for countries where PA studies were not located. A total of 89 studies were included, with additional data from 6 review studies. Primary data were collected in 56 of the studies (63%) and the remainder relied on secondary analysis of data. The majority of studies were in adults (n=56; 63%), and 37% were conducted with adolescents or children. A review of case studies targeting disadvantaged groups yielded 91 eligible projects and an in-depth review and analysis of 29 case studies from 9 member states was conducted. Good practice elements and recommendations for PA promotion were identified.
Results: There *is* consistent evidence of disparities in PA across different social class groups and ethnic groups within countries in Europe. Regardless of the measure of SES used, European adults in low SES groups are *generally* less active during leisure time than those of high SES. The relationship between SES and PA is *less* consistent amongst youth. Ethnic minority groups are generally less active than the general population. There is evidence that social and environmental barriers are important but limited European research has been conducted on the possible mechanisms behind social class differentials in PA. There was wide disparity in the quality and depth of evaluation in the case study review. Partnership working was the norm, but funding was generally short term. Good practice elements have been identified across studies.
Discussion: Promoting PA with disadvantaged groups presents particular challenges but can result in multiple outcomes of interest to multiple agencies including PA, social inclusion, and equal opportunities. Valuable lessons can be learned from reviewing current practice. Acknowledgment: This project is co-funded by the European Union in the framework of the Health Programme 2008–2013. The views expressed herein can in no way be taken to reflect the official opinion of the European Union.

622 The impact of a sport-for-development programme on the physical activity levels of young adolescent boys in Gulu, Northern Uganda

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Introduction: Physical inactivity is thought to be contributing to the emergence of the double burden of disease in low- and middle-income countries (LMICs). Behavioural, environmental and socio-economic characteristics of post-conflict settings may expedite this epidemiological transition. The sport-for-development (SfD) sector is rapidly expanding and claims to positively influence participation in PA in this context. This study examined the impact of a SfD programme on PA levels of young adolescents in Gulu, Uganda.
Methods: Voluntary male registrants for a SfD programme in Gulu aged 11–14 years were randomly allocated into an intervention (T) or wait-list control (W) group. The intervention comprised 9-weeks of activities (1x40 minute football match and at least 1x1.5 hour training per week). Actigraph accelerometer measurements were taken for 7 days from randomly selected boys in group T (n=32) and group W (n=31) during the intervention. The data were interpreted using a .NET programme that validated wear-time and translated the accelerometer counts into volumes of moderate-vigorous PA (MVPA) and vigorous PA (VPA). The results were compared to global PA recommendations. Contrasts between group T and W were completed using an independent t-test. MVPA and VPA for each subject were also presented as a "heat map" depicting the patterns and intensity of PA behaviour.
Results: Adolescent boys in Gulu that registered for the SfD programme averaged high volumes of MVPA (minutes/day: T=116.48, W=114.09). However, only a limited proportion of this appeared to be of vigorous intensity (minutes/day: T=6.19, W=4.32). There was no significant difference between the groups average MVPA [p=0.789] or VPA [p=0.377]. Similar results were observed during the after-school training times for both MVPA [p=0.296] and VPA [p=0.549]. Despite a trend suggesting that T was more active on match days, the differences were statistically insignificant for MVPA [p=0.135] and VPA [p=0.143]. It was not possible to identify a "dose" of the intervention by observing the patterns of PA behaviour using the accelerometer "heat maps".
Discussion: Although the study was underpowered, the results suggest that participation in the SfD intervention may have increased PA compared to the wait-listed subjects. Playing in a structured football match appeared to have the greatest influence on PA levels. The impact on VPA may be of particular clinical importance when considering the low volumes observed in the self-selected study sample which was biased towards higher fitness levels. Further investigation is warranted with a larger sample size that examines both genders and identifies PA type.

623 The healthy lifestyle capacity building project for the remote physical activity workforce in Aborginal communties across the Northern Territory, Australia

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The Heart Foundation has coordinated, designed and delivered a number of workshops to the remote and very remote physical activity workforce in the Northern Territory, conducted as part of the Close the Gap initiative, funded by the Department of Health and Ageing. This project aimed to increase the reach of key health messages to widely dispersed Aboriginal populations and to promote local level appropriate action to support healthy lifestyles in remote communities. The initial workshops set the scene and had a strong focus on engaging the target groups. The project activities, in particular the workshops, were informed by the outcomes of ongoing consultation. Outputs included a series of collaborative planning forums and a showcasing Champions Forum. The primary target for this project was the remote physical activity workforce of the Northern Territory Shires. The secondary targets were Shire Managers and community members. Evaluation consisted of three components: pre and post workshop surveys of participants and a post practice survey. Semi-structured interviews were conducted with Shire supervisors/managers during the Champions Forum.
The evaluation focused on health awareness, knowledge and understanding of resources and messages relating to nutrition, tobacco, physical activity, and adult health checks. Pre survey results of the nutrition component have been consistent with the resources available for nutrition education in the NT over a sustained period of time versus a limited amount of resources available for tobacco. That is, participants felt more confident in their knowledge of food and nutrition and would be more likely to undertake implementing a community physical activity event or program based on their knowledge of nutrition than they would for tobacco cessation. Workers self reported knowledge in nutrition and tobacco, however, does not fit with the views of the managers/supervisors group who believe that more knowledge and community level action is needed in nutrition to combat the lack of healthy food in communities or high availability of junk food, high prices or lack of income. This is the first time an in-depth evaluation has been carried out on this remote and very remote workforce of the NT. The Heart Foundation will continue to support this workforce by producing key planning resources and continue working with remote Shires to influence policy changes that will trickle down to this workforce, ensuring a more supportive healthy working environment.

624 The provision of 'fly-in-fly-out' physical activity programs to Indigenous Cape York communities

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The health outcomes for Indigenous peoples are well publicised as being poorer than that of the rest of the Australian population. The importance of physical activity as part of a balanced approach to health and wellbeing are well documented. Physical inactivity is a significant risk factor for many preventable diseases that many non-Indigenous, but specifically more Indigenous peoples die from. A recent report on Indigenous health indicated that only 23% of adults living in remote and very remote areas, such as Cape York, participated in regular physical activity. Physical activity initiatives in remote Indigenous communities on Cape York are commonly delivered by external agencies that 'fly in and fly out'. While members of Indigenous communities may engage with the initiatives while they are being provided once the external agencies leave some of the benefits made may be quickly lost. There is no current published literature on the variety, prevalence and outcomes of 'fly-in fly-out' physical activity programs, or on the agencies that provide them. An understanding of these factors would facilitate a better understanding of the opportunities available to Indigenous communities on Cape York and provide important foregrounding to an investigation of community capacity for physical activity. The purpose of this study was to investigate the range of physical activity programs being offered by external agencies to Indigenous Cape York communities.
Methods: Five physical activity agencies that routinely engaged with Indigenous communities on Cape York were interviewed. The semi-structured interviews focussed on what activities were being conducted; by whom; when; and their concomitant outcomes. Interviews were recorded and professionally transcribed. Transcriptions were then analysed using content analysis to identify themes.
Results: Each physical activity agency had a variety of ways of engaging with each community. The key initial focus point for each provider was the local school. Contacts within the school and opportunities to provide workshop opportunities for the students then facilitated wider community engagement.
Discussion: There were limited opportunities for these agencies to build community capacity to maintain their physical activities due to a variety of reasons that included: resources (both human and material); transient populations and an entrenched culture of 'having things done to' rather than *with* Indigenous people. In order to improve the physical activity outcomes of Indigenous people on Cape York community's strategies that engage and empower the local population to take control of their needs should be employed.

625 Correlates of physical activity among Indigenous and non-indigenous adolescents

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Introduction: In Australia, life expectancy of people of Indigenous descent is 16-17 years lower than their non-Indigenous counterparts. Physical inactivity is the third leading cause of the burden disease for Indigenous adults. However, in children the situation is more positive with almost three quarters (74%) of Indigenous children aged 4–14 years meeting national physical activity recommendations. Adolescence is typically a period where physical activity declines and is an important target point for interventions. This study describes frequency and duration of out-of-school physical activity in a sample of Indigenous and non-Indigenous Australian adolescents and explores relationships between physical activity participation and demographic, health and lifestyle factors.
Methods: The Health and Lifestyle of NSW School Students Survey was developed using established measures from surveys conducted in adolescents from similar populations. The survey was completed by 348 Indigenous and 633 non-Indigenous students aged 13–17 years residing in rural New South Wales (NSW). The survey included questions on frequency and duration of physical activity out of school. These items were combined to establish whether national physical activity recommendations were being achieved. Bivariate analyses stratified by Indigenous status identified demographic, health and lifestyle behaviours statistically related to meeting physical activity recommendations. These variables were included in multiple binary logistic regression models conducting including the total sample and stratified by Indigenous status.

Results: Indigenous adolescents were less likely to meet physical activity recommendations through out of school activity than non-Indigenous adolescents (21% versus 28%; p=0.010). In the stratified regression analyses, Indigenous females had a higher odds of meeting physical activity recommendations than males (OR=0.39, 95% CI 0.20–0.77) after adjusting for age, membership of a sports team, parental employment status, feeling confident and community involvement. In the non-Indigenous model, adolescents involved in a sports team had higher odds of meeting physical activity recommendations than those not involved in a team (OR=2.41, 95% CI 1.58–3.67), after adjusting for age, gender, time spent watching television, maternal employment status, alcohol behavior, feeling lonely, feeling confident and community involvement.

Discussion: These results provide an indication of physical activity levels in rural Indigenous and non-Indigenous adolescents outside of the school setting where less than a quarter of this sample were meeting physical activity recommendations. Indigenous adolescents, particularly girls, are a specific target group for intervention. Increased policy and practical efforts to reverse the decline in physical activity during adolescence is essential to reduce population disparities in chronic disease risk in adulthood among Indigenous Australians.

626   Physical activity intervention research in the Pacific – What works?

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Introduction: The South Pacific region has recently undergone rapid urbanisation and lifestyle changes leading to high rates of chronic diseases. Physical inactivity has been identified as a major risk factor for such chronic diseases, and well evaluated programs showing success in promoting physical activity are needed in the region. We developed a 12-week physical activity program targeting female civil servants in Port Vila, Vanuatu. The program presents a robust evaluation approach consisting of formative, outcome and process evaluation.

Methods: A structured step count challenge was implemented over a 12-week period (N~200). Pre and post health screening outcomes measured the health effect of the PA intervention. Pedometers objectively measured physical activity behaviour. The step count challenge was evaluated via both qualitative (open-ended questions) and quantitative (Likert scale) approaches.

Findings: The program was successful in increasing participants' PA levels. A daily mean step increase of 2100 steps in all participants was detected. Desegregated by age groups we found that the older population (46-65 yrs) experienced the highest step number increase (3565 steps). Health indicators improved over the course of the program: whilst overweight levels increased from 32.8% to 38.4%, obesity levels decreased (pre: 45.6%; post 37.6%). The most significant positive health change was a drop in waist circumference from 96.0 cm to 92.1 cm. Process evaluation findings indicate that almost all participants rate most elements of the program positively. A thematic analysis elicited a considerable change in eating behaviour, though the program's major focus was to increase physical activity levels. Findings uncovered areas for continuous program improvements.

Discussion: Findings suggest that our program contains essential elements that contributed to lifestyle changes. Gender separation issues need further investigation for future Pacific health program design: whilst previous research indicates that pedometer-based health interventions have a greater effect if restricted to women only, this finding might not be culturally relevant to individuals in the Pacific region. Participants' feedback highlights the true value of this program. Life-changing experiences were cited by a number of participants and continued commitment demonstrates that independent long-term lifestyle change is realistic. Process evaluation outcome shows that we were successful in developing and delivering a healthy lifestyle program that was culturally meaningful and had utility for the target group. Future work may detect men's perception about healthy lifestyle behaviour, which may be used for future program design.

627   Results from a community-led intervention aimed at reducing health inequalities in Stoke-on-Trent, UK

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Introduction: There is growing recognition that a sedentary lifestyle is being driven by environmental factors that affect individuals' physical activity choices and health behaviours. Recently, more environmentally-based approaches for understanding and altering the wider determinants of health behaviours have become more popular. This project "My Health Matters' aimed to develop and evaluate a 2-year community-led intervention to reduce health inequalities by increasing physical activity and promoting healthier eating as defined by community members themselves in three deprived areas of Stoke-on-Trent. The project was undertaken in four phases; 1) Baseline mapping of the built environment using Geographical Information Systems (GIS) integrated with a community survey. 2) Partnership development between key stakeholders in the health economy and community members. 3) Collaborative identification, prioritisation and design of interventions to address environmental disparities related to physical inactivity and healthy eating. 4) Piloting of interventions to assess process, implementation and the impact of this approach.

Methods: A case-study, pre-post intervention design using GIS mapping and a community survey was employed. GIS mapping of selected residential addresses (n=4,787) measured proximity of physical activity spaces neighbourhood connectivity and walkability, land-use-mix and population density, traffic, safety and crime, and food outlets. The community survey measured environmental characteristics relating to physical activity (Neighbourhood Environment Walkability Scale-Abbreviated), perceived health status (SF12v2), social capital, fruit and vegetable consumption and levels of physical activity (IPAQ). The survey yielded a response rate of 12.3% (n=343) at baseline and 13.5% (n=375) at follow-up.

Results: Survey findings indicate, statistically significant (α-level 0.05), positive changes from baseline to follow-up in physical activity, perceptions of crime and anti-social behavior, including issues with teenagers and vandalism and traffic hazards. Positive changes were also observed for fruit and vegetable consumption and perceived health status (SF12v2), although these were non-significant.

Discussion: This project demonstrates that implementation of a community-led approach has the potential to positively influence health-related behaviours and address the wider determinants of health. This approach focuses on supporting communities to take ownership and control of their own lives by promoting community empowerment and building community capacity. This project highlights the important role of supporting residents in identifying and targeting health-related issues linked to facilitating physical activity and healthier eating as defined by community members themselves.

628   Physical activity promotion in adults of low socioeconomic level: Preliminary results of environment active project

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Introduction: Physical activity promotion is a public health challenge, mainly in populations living in low socioeconomic areas. The "environment active project" is a group of evaluation studies of interventions in physical activity promotion inside the primary health care system in Brazil, focusing a population living in low socioeconomic areas (www.each.usp.br/ambienteativo). The aim of this study was to present preliminary results comparing two of these interventions (supervised exercise and health education programs) after six months.

Methods: This was an intervention study with a sample composed by 152 healthy adults, inactive in leisure time, that lived in the east zone of São Paulo city (Brazil), and were served by the Health Family Strategy (Brazilian primary health care public system). The supervised exercise program (aerobics and strength training) was performed three sessions of 60 minutes per week in groups (n=53). The health education program (n=50) included group meetings for lifestyle change and individual phone calls about physical activity and nutrition. This intervention had participation of a multidisciplinary team. A third group (n=49) was used as control and did not receive any intervention. Leisure-time physical activity (LTPA) was evaluated using the long version of the International Physical Activity Questionnaire (IPAQ). Statistical analysis were performed using Kruskal-Wallis' test.

Results: All groups had similar values of LTPA at baseline (mean and sd=0.0 minutes per week). Supervised exercise program had higher mean of minutes per week of LTPA (mean=80.6, sd=103.0) than health education program (mean=70.9, sd=134.0, p<0.001) and control group (mean=14.8, sd=46.5, p=0.048). In addition, the health education program had higher mean of LTPA than control group (p=0.012).

Discussion: Preliminary evaluation of interventions applied in the primary health care system showed that supervised exercise program was more effective for promote leisure-time physical activity in adults than the health education program. However, the health education program also was effective in comparison with control group. Both interventions can be applied as strategies for people living in low socioeconomic areas served by primary health care public system.

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629   Physical activity and mental wellbeing in deprived neighbourhoods: A potential outcome of urban regeneration

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Introduction: Raising levels of mental wellbeing and physical activity are concerns of urban regeneration policy in the UK. Although the links between them are well established they have rarely been studied in deprived populations with high levels of ill-health.

Method: Using a novel combination of measures of mental wellbeing (WEMWBS) and physical activity (IPAQ), and taking a multilevel modelling approach, we examined the associations of positive mental wellbeing with the following: physical activity; aspects of the home and neighbourhood, plus area deprivation; and sociodemographic characteristics, long-term ill-health and personal deprivation. This was done using a cross-sectional sample of 3,854 adults from 30 neighbourhoods in Glasgow, UK.

Results: There was a significantly positive dose-response relationship between low/null, medium and high levels of physical activity and mental wellbeing scores (the medium and high level groups scored 1.3 and 2.8 points higher than the low/null group, respectively), and there was evidence that potential mental wellbeing gains from physical activity may be greater in neighbourhoods with relatively low average mental wellbeing. Satisfaction with the home and neighbourhood, though not area deprivation, also predicted higher mental wellbeing (1.2- and 1.5-point higher scores, on average, respectively). In relation to personal characteristics, as might be expected, poor long-term physical and mental health were linked to lower mental wellbeing. The most striking of these was for residents who reported having suffered from stress, anxiety or depression in the previous year, whose wellbeing score was 6.2 points lower. Greater personal deprivation, measured as not having regular access to a car, was associated with a 1.3-point lower wellbeing score.

Discussion: There are potential benefits from incorporating physical activity support interventions within regeneration programmes that already provide many of the social and environmental improvements required to enable increased physical activity and improved mental wellbeing, especially in neighbourhoods with particularly low general levels of mental wellbeing. Our results indicate that the potential improvement in mental wellbeing would be at least three times the 0.4-point annual increment considered to represent an improvement in mental wellbeing in Scotland.

630   National policy on physical activity: The development of a policy audit tool (PAT) and demonstration in seven European Countries

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Background: Supportive national policy is a recommended core component of a comprehensive, population-based approach to increasing levels of physical activity (PA). There is increasing interest in what policies different countries have got and the process of policy development. Although several papers have been published on the content of physical activity policy, there is still much to learn about the breadth of policies within and beyond the health sector and the implementation process at national and local levels. This paper reports on a seven country case study project that aimed to: 1) develop a policy appraisal tool; 2) demonstrate its use in a set of countries recruited from Europe, and 3) conduct a comparative critique of policy development and implementation.

Methods: A policy appraisal tool [PAT] was drafted, piloted and revised. Items were derived from a review of previous policy analyses and reflect key aspects of the Global Strategy for Diet, Physical Activity and Health. Seven countries completed the full policy appraisal: Finland, Italy, The Netherlands, Norway, Portugal, Slovenia and Switzerland. Completion was coordinated by a lead person in collaboration with colleagues with appropriate knowledge

of the history and national developments.

Results: The final instrument [PAT] consists of 26 items across four sections: Government structure and key documents; Policy development process and content; Experience of implementation; and Completion of the policy tool. Each country completed the appraisal using different approaches and experienced varying levels of success in capturing the relevant information. Although most questions were completed well, the level of detail varied and revealed gaps. Key result include: most countries has some policy in health, education, sport, transport and the environment; the targeted settings and population groups varied in number and breadth; all countries reported PA recommendations and had undertaken national physical activity surveys (several had included objective measurement); 3 countries did not have clear targets only broad statements of intent; some countries had additional, PA-related targets; leadership, implementation and coordination between national and local levels varied between countries.

Discussion: PAT provides a standardised template for collecting information on the current policy context related to physical activity. This study can inform how to identify and engage relevant stakeholders and how to select relevant information for inclusion. Undertaking the policy appraisal captured the breadth of current policies related to PA in each country, often for the first time. The findings can inform future research and policy development.

631 Active Canada 20/20 – Past, present and future

K. Murumets[1]* ▪ C. Costas-Bradstreet[1] ▪ J. Down[2] ▪ M. Duggan[3] ▪ F. Gabbani[4] ▪ A. Grantham[5] ▪ S. Grundy[6] ▪ J. Spence[7] ▪ M. Tremblay[8]

[1]ParticipACTION ▪ [2]Alberta Centre for Active Living ▪ [3]Canadian Association for Exercise Physiology ▪ [4]Nova Scotia Department of Health and Wellness
[5]Physical and Health Education Canada ▪ [6]Life Unplugged ▪ [7]University of Alberta, Canada ▪ [8]Children's Hospital of Eastern Ontario

Introduction to Active Canada 20/20: "Active Canada 20/20, A Physical Activity Strategy and Change Agenda for Canada" is the response of the Canadian physical activity sector to an urgent national need to increase physical activity and reduce sedentary living. Active Canada 20/20 provides a vision for an active Canada; establishes measurable goals for the nation; focuses on priority actions and needed investments based on evidence; builds on current strengths; identifies strategies to address gaps; and provides focus and opportunity for coordinated action in order to increase physical activity and reduce sedentary behaviour.

Development of Active Canada 20/20 (Past): Facilitated by ParticipACTION, key national stakeholders in physical activity, recreation, health, and sport, created Active Canada 20/20. An initial "consultation document" was used to support an online survey and a series of in-person consultations from September 2011 to January 2012. The online survey was completed by over 1,300 respondents and included both quantitative and qualitative feedback. Respondents were from every province and territory in Canada. Face-to-face consultations included participants from every province and two of three territories. In total, approximately 1,700 stakeholders participated in the consultations and provided feedback.

Results (Present): Feedback from the consultations informed the current version of Active Canada 20/20 which will be presented to Federal/ Provincial/Territorial Ministers responsible for Sport, Physical Activity and Recreation in June 2012. Active Canada 20/20 has been developed around a framework consisting of four Areas of Focus (Policy Development, Change and Implementation; Targeted Information and Public Education; High Quality, Accessible Programs and Services; and Community Design), three Foundations for Change (Evidence and Knowledge Exchange; Strategic Investments; and Mobilization) and a series of Strategic and Priority Actions that are mutually reinforcing of the Active Canada 20/20 Goal. Currently, the Active Canada 20/20 Steering Committee is working towards the development of a Business Case; a Communications Strategy; an Implementation Strategy; an aligned approach with the Canadian Sport Policy renewal process and the development of a new Recreation Statement and Strategy; and an Evaluation Strategy.

Discussion (Future): Active Canada 20/20 will provide a basis for a coordinated approach to physical activity promotion in Canada, from the local to national level and involving traditional and non-traditional sectors. Past efforts have been fragmented and have lacked the coordination and strategic approach needed for population-wide intervention success. The document will guide and support the work of all stakeholders to increase physical activity in their specific jurisdiction

632 Using transport policy to increase physical activity

R. Mackett[1]* ▪ B. Brown[1] ▪ [1]University College London

The objective of this presentation is to propose a transport policy strategy to increase physical activity that will be cost effective and acceptable to the public based on a project carried out for the UK Department for Transport to consider the available evidence on the role of transport in increasing levels of physical activity. It was found that individual behaviour interventions have had some impact on physical activity, but that on-going support was necessary in the long-term. Modifications to the built environment to increase walking and cycling are only effective when supported by other measures. It was found that the key relationship is between car use and physical activity. In order to increase levels of physical activity, it is necessary to reduce use of the car. For many people the car is the mode of choice: for many trips it is cheaper, quicker and more convenient to use the car sitting outside the house than to make the effort of walking, cycling or using public transport. The economics of car use mean that a large expenditure is made to purchase the car and then each trip is relatively cheap. Because so many households have adopted lifestyles that revolve around the use of the car, it is important to recognise that any policies to reduce car use must provide as much, or close to as much, accessibility as the car does. This can be done by shifting the method of accessing cars from individual household ownership to a more flexible system of hiring or sharing cars rather than owning them. This would involve the whole range of emerging schemes such as car clubs, neighbourhood car rental, and car sharing. With smartcard technology, the internet and GPS technology a whole range of flexible options have opened up in recent years. Two key aspects of using this approach are that the opportunities can be supplied commercially and that they can be presented as increasing choice rather than less appealing messages about health. There is evidence that people who use car clubs etc are more active physically than those who own cars. The role of government would be to facilitate the behaviour change through bringing relevant parties together and encouraging the provision of information to people at key stages in their lives when they consider their car needs such as after having baby. Supporting transport and land use policies would assist the process.

633 Development of the Czech national physical activity promotion strategy: Methodological issues

M. Kalman[1]* ▪ Z. Hamrik[1] ▪ J. Pavelka[1] ▪ [1]Faculty of Physical Culture, Palacky University, Olomouc, Czech Republic

Introduction: In the Czech Republic so far, there has been no national physical activity promotion strategy. The aim of the study is to introduce methodological aspects of developing the Czech national physical activity promotion strategy and thus introduce one of possible concepts for public *policy* making in this area.

Methods: The basis for our research was a policy analysis approach, while the primary principles and methods are based on qualitative research. Data content analysis (strategies, public policies, documents, public administration records; n=26) and individual interviews with experts from the UK, USA, Canada, Australia, Switzerland, Finland and Germany (n=10) were used. The data was analyzed using ATLAS.ti software.

Results: The results include descriptions of the methods used for developing the Czech national physical promotion strategy and put forward recommended approaches for public policy makers in the field of physical activity promotion. The results describe the key principles, main problems, duration of development, role of main stakeholders, responsibility, content of strategy, target groups and regional, culture and historical differences.

Conclusions: Described methods and procedures dealing with the development of the Czech national physical activity promotion strategy may be successfully used for developing policies aimed at PA promotion in the Central and Eastern European region.

634 The development of a statewide physical activity plan in the US

E. Elliott[1]* ▪ S. Bulger[1] ▪ E. Jones[1] ▪ W. Neal[1] ▪ [1]West Virginia University

Introduction: West Virginia most commonly ranks as one of the worst states in the US in many health indices, including the risks associated with physical inactivity, such as obesity, heart disease, diabetes, and stroke. Compared to the national average, WV spends thirteen percent (13%) more per person on health care. In 2009, WV ranked 2nd in the nation in physical inactivity. The National Physical Activity Plan is the leading force in the US in promoting physical activity and provides an evidence-informed roadmap for states to develop context-specific plans focusing on policy and environmental changes. The aim of the WV Physical Activity Plan (WVPAP) is to create a statewide culture that facilitates physically active lifestyles where our citizens live, work, and play.

Methods: The WV Physical Activity Symposium was conceptualized as the first step in the development of an effective statewide plan that will facilitate collaboration, and guide policy and practice. Networking and capacity-building with government agencies and other key stakeholders followed over the next year. Plan developers facilitated a group decision-making process in the summer of 2011 to establish a conceptual framework for the plan, and webinars were held to inform and garner support from the public. Sector teams (8) were established and met to finalize the sector-specific strategies/tactics and call to actions. The Plan was distributed for public comment in November 2011. After revisions, the Plan was officially launched at the state capitol on January 19, 2012.

Results and Discussion: The Symposium brought together a diverse collection of over 250 practitioners, organizations, agencies, and policy makers to share ideas about increasing opportunities for regular PA in communities. Several themes emerged across working sessions that proved critical in identifying the steps for plan development and the common barriers to PA in WV. The Symposium also identified key individuals, programs, and organizations as important contributors in plan development and implementation. Capacity-building efforts led to the acquisition of additional funding to support plan development and marketing. State government officials' and health policy leaders' demonstrated support brought statewide attention to the Plan, including proclaiming the Plan launch day as WV Physical Activity Day. Currently, the Plan is being implemented across the state. The key ingredients to the development of a successful plan include a dedicated central coordination team, organizational leadership from partners, support from policy makers and stakeholders, and input from local citizens across all regions of the state.

635 Physical activity interventions in Brazil: A descriptive study of the countrywide network of the Ministry of Health

P. Hallal[1]* ▪ T. Amorim[1] ▪ A. Knuth[1] ▪ D. Cruz[2] ▪ D. Malta[2] ▪ R. Reis[3] ▪ [1]Universidade Federal De Pelotas ▪ [2]Ministério da Saúde ▪ [3]Universidade Federal do Paraná

From 2005 the Brazilian Ministry of Health has been funding cities for the development of health promotion interventions. Out of 1,374 cities funded in 2009, 3/4 conduct physical activity interventions. The aim of this study was to describe these interventions. We interviews 1,000 coordinators of health promotion interventions throughout the country. In the Mid-West, Northeast and Southeast regions, around 15% of the cities are funded; this proportion is below 10% in cities from the South and North regions. Only 8.2% of the interventions achieve 500 participants or more. Communication and information actions are the most frequent ones (87.4%), followed by behavioral and social actions (75.5%) and environment and policy actions (30.1%). Oriented walking is the most frequent activity offered (80.5%). Parks and squares are the public space more frequently used (55.6%). Physical Education teachers are present in 72.3% of the interventions. There are no reports in the literature of such a governmental investment on physical activity promotion.

636 What can be learned from what has been done? Policy diffusion and a web-based tool supporting Canadian obesity prevention policy development

D. Keen[1]* ▪ [1]Canadian Partnership Against Cancer

Introduction: Obesity prevention policy development includes policies focused on nutrition, physical activity and the built environment. Policy diffusion, where policymakers learn about policy solutions and adopt policies from other places, is important for policy development. In Canada, the Prevention Policies Directory, a web-based tool to support policy diffusion and evidence-informed prevention policy development has been implemented and can be found at www.cancerview.ca/preventionpolicies.

Methods: The importance of policy diffusion in the development of prevention policies has been demonstrated in tobacco control efforts and the lessons learned can be applied to obesity prevention. With the advice from an expert group of research, practice and policy specialists, the Prevention Policies Directory was created in 2010 with custom web search software to regularly scan over 250 websites in Canada for prevention policy development and changes at the national, provincial and, more recently, municipal levels. This free, regularly updated repository indexes Canadian policy documents related to key modifiable risk factors including: physical activity, nutrition, built environment, alcohol, tobacco, occupational and environmental exposures, infectious agents, and UV radiation.

Results: There are presently 466 Canadian policies in the Directory for nutrition, physical activity and the built environment including such policies as the Federal Fitness Tax Credit, Provincial Daily Physical Activity Requirements and the City of Calgary Land Use Bylaw. The Directory is cited in national, provincial and municipal documents as a data source for policy information in Canada and web-based training has been implemented to provide support and guidance on using the web based tool.

Discussion: Professionals working in policy development often face challenges in finding the time and resources to access evidence, including existing policies, to inform policy development in their jurisdiction. To address these challenges and promote evidence-informed policy development, the Canadian Partnership Against Cancer created the Directory. It remains the only regularly updated source for Canadian prevention policies which can be used to inform policy development for obesity prevention. In addition, public health professionals require access to information on the effectiveness of obesity prevention policies to inform decision-making, an area for future development within the Directory, as the policy effectiveness landscape is better understood.

637 A systematic overview of institutions and bodies active in physical activity promotion in Europe

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[9]HEPA Europe Steering Committee

Introduction: Over the past few years, the rapidly growing interest of public health and policy makers in physical activity has led to the development of a number of organizations, networks and associations, covering the range from grass-root to professional and academic institutions. We aimed at developing a systematic overview of institutions active in the field in Europe in order to maximize relevance and effectiveness of work undertaken by HEPA Europe, the European network for the promotion of health-enhancing physical activity.

Methods: systematic, purposive weblink-search complemented by expert input and subsequent classification by institutional type, main activity and synergy with goals of HEPA Europe.

Results: Of 127 identified institutions, 42 met the criteria of being European and active in physical activity promotion. Nineteen institutions (45.3%) were NGO/associations, while 14 (33.3%) were networks, 5 (11.9%) WHO units or platforms, and 4 (9.5%) bodies of the European Commission (EC). Sport was the main topic of 12 (28.6%) institutions, health promotion was represented with 9 bodies (21.4%), physical activity promotion and transport/environment with 8 each (19.0%), disease prevention with 3 (7.2%), and nutrition with 2 (4.8%). 7 institutions had a high synergy to HEPA Europe's goals.

Discussion: The search revealed the existence of many institutions, which displays an increasing capacity to address this important topic on a European scale and also emphasizes the importance of avoiding duplication of efforts while at the same time creating a "critical mass" of knowledge and advocacy power to push forward the agenda into clearer and synergetic directions. For HEPA Europe, the approach confirmed its scope to be appropriate and unique in Europe, with no other institution positioned identically. Systematically mapping key players is a useful tool for institutions active in an environment with a multitude of actors to ensure that activities provide added value, to avoid duplication and to promote partnership and efficient use of resources.

638 Streets for people – Reclaiming our streets for better health

J. Carr[1] ▪ W. Keech[1] ▪ R. Martin[1]* ▪ [1]Heart Foundation South Australia Division

Being active is good for the health of South Australians, our economy and our environment. But the reality of our modern lives is that many struggle to reach healthy levels of daily physical activity. There is growing recognition by built environment professionals and health practitioners that urban form and street design can play a role in increasing physical activity to prevent chronic disease and enhance health and wellbeing. The South Australian Active Living Coalition consists of key government departments and other agencies whose core business includes fulfilling targets relating to improving the health and wellbeing of South Australians. The Coalition has recognised the need to support a South Australian practice of designing people-friendly streets to catalyse urban regeneration that promote active and healthy lifestyles. The Coalition wants to reclaim streets as not solely the domain of motor vehicles but also for pedestrians and cyclists and as public spaces for social and commercial interaction. The 'Streets for People – Compendium for South Australian Practice' provides information and guidance on designing people-friendly streets that promote cycling and walking. Developed as collaboration between the Heart Foundation, Department of Transport Planning and Infrastructure, the Urban Renewal Authority and SA Health, the Compendium aims to make the design and approval of innovative pedestrian and cycling-friendly streets easier and desirable. A broad community of practitioners in South Australia has been engaged in developing the Compendium and testing guiding principles on a variety of street schemes. Since the release of draft principles, it has already influenced design outcomes in emerging street design schemes within South Australia.

This Compendium will be used by a wide group of professionals including policy makers, transport planners, traffic engineers, civil engineers, urban designers, landscape architects, town/urban planners and developers. It may also be useful to general members of the public interested in street design and best practice. The Compendium is due for release in April 2012.

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FRIDAY 2 NOVEMBER POSTERS AT A GLANCE

Please note: The scientific poster session 2 will be held from 1705 – 1830 in the Bayside Gallery

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639 Space for active play, designing play spaces for older children (8–12 years)

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Introduction: The national recommendation for physical activity for children in Australia is a minimum of one hour and up to several hours of moderate to vigorous activity per day. This project focused on play space for children aged 8–12 years and asked whether providing enticing, attractive play spaces would result in more children getting active outdoors. The Space for active play project featured children's voices briefing the designers of four play spaces in metropolitan Melbourne. Three of the play spaces developed were then evaluated to see if they did in fact attract the target audience identified.
Methods: A four method children's consultation exercise involving experiential learning, reflective notebooks, photography and discussion was developed. The results of this consultation were then validated by classroom based children of the same age, community members and a range of professionals. Once design was completed a pre-construction site evaluation was developed and undertaken in three of the sites, involving the Most Significant Change (MSC) methodology with a small group of children, a classroom based survey, a parents survey and park observation. Following completion of the construction phase follow up evaluation was done in all three sites.
Results: The children provided an abundance of ideas and activities that they would like to see and do in their local park. Their ideas went well beyond the traditional play equipment and sports opportunities offered in many municipal parks. These ideas influenced the play space designers in their approach to designing the new play spaces. The evaluation of the actual sites will be completed in June 2012, with early analysis of results suggesting that increased physical activity and outdoor play has been achieved.
Discussion: This project has recorded what older children want of their play spaces, and it reveals a strong appetite for a much broader range of play experience than is currently on offer. This information has been documented in order to influence planners and designers of park space and others about older children's needs. This paper will provide insights into what the children desire in a play space and to what extent the resulting play spaces were successful in attracting older children to engage in active outdoor play.
The Space for active play project is an initiative of the Heart Foundation in partnership with Brimbank, Frankston and Moonee Valley city councils and Parks Victoria, with funding from Parks Victoria and VicHealth.

640 Evaluation of a mural painting contest on stair use in college students

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Background: Increasing stair use in college students may be an effective strategy for preventing the decline in physical activity (PA) that occurs during the college years.
Purpose: This study evaluated the effectiveness of a mural painting contest on promoting stair use in a college residential hall.
Methods: As part of an initiative designed to increase the PA levels of college students, each residential college within the hall was asked to design and paint a mural in a designated staircase on a specified night during the fall semester. The residents were supposed to identify and vote for their favorite mural during the week immediately following the painting of the murals and a prize was to be awarded to the residential college whose mural received the most votes. A quasi-experimental design with one baseline (week 0) and multiple post-tests (weeks 1, 2, 4 and 6) was used to evaluate the effects of the mural painting contest. The mean number of individuals exiting from the hall's two busiest stairwells (Southwest (SW) and Northwest (NW) per half hour was the primary outcome and was obtained via observation. Repeated measures analysis of variance (ANOVA) with two within-subject effects (gender and staircase) were used to evaluate effects.
Results: Nearly, 14% of hall residents (n=148) and 20 of 24 residential colleges participated in the mural paintings. Over the six weeks, a total of 2,883 individuals were observed exiting the two stairwells (SW staircase n=2,143 (74%); NW staircase: n=740 (26%); female: n=1955 (68%); male: n=928 (32%). There was a significant time effect (F=7.512, p=0.000) and a significant interaction between staircase and time (F=7.518, p=0.000) on stair use. Within staircase repeated measures ANOVAs indicated that there was an effect of time on stair use only in the SW staircase. Post-hoc pairwise comparisons of means demonstrated a significant decline in stair use between baseline and Week 2 and between baseline and Week 4. There was also a significant increase in stair use between Weeks 2 and Week 6. Process evaluation revealed that the students were not provided the opportunity to vote on their favorite painting, and no prizes were awarded.
Conclusions: Solely having residents of a residential hall paint murals in stairwells was insufficient for increasing stair use. A mural painting contest may be a viable approach if properly planned and implemented.

641 Perceptions of the neighborhood environment vary by socio-demographic and health variables

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Introduction: Neighborhood perceptions are important influences on physical activity (PA). However, little research has explored how perceptions of neighborhood features differ across population sub-groups. We examined 1) the association between perceived neighborhood environment and PA, 2) socio-demographic and health variables associated with overall neighborhood perceptions, and 3) socio-demographic and health variables associated with perceptions of specific neighborhood attributes.

Methods: An online survey assessed age, sex, race, ethnicity, income, education, marital status, and self-reported height and weight. The International Physical Activity Questionnaire Environment Module (IPAQ-E) measured perceptions of neighborhood environment and the Leisure-Time Exercise Questionnaire assessed whether participants met PA recommendations (75+ min/week vigorous or 150+ min/week moderate/vigorous PA). Using a series of logistic regressions, we examined 1) if people with higher (above the median) neighborhood perceptions were more likely to meet PA recommendations, 2) socio-demographic/health variables associated with perceiving a positive overall neighborhood environment, and 3) socio-demographic/health variables associated with perceiving a positive neighborhood environment for each of the IPAQ-E's 10 specific neighborhood attributes.

Results: Participants (n=1698) were mostly female (64.3%), White (88.9%), married/cohabitating (67.3%), college-educated (86.2%), earned at least $50,000/yr (77.5%), with a mean age of 44.3 years. Participants with more positive neighborhood perceptions were more likely to meet PA recommendations (OR=1.47, 95% CI=1.21–1.79). Overall neighborhood perceptions were more favorable among healthy weight (OR=1.38, CI=1.05–1.84) and overweight (OR=1.58, 95% CI=1.22–2.06) compared to obese respondents; among: younger (<30) compared to older (>50) people (OR=1.33, CI=1.07–1.67); college-educated versus less educated persons (OR=1.60, CI=1.19–2.15); and non-married/cohabitating versus married/cohabitating individuals (OR=1.28, CI=1.03–1.60). Regarding specific neighborhood attributes, middle-aged adults (30–50 yrs) were more likely than older adults (>50 yrs) to report shops, transit stops, sidewalks, and bike facilities (ORs≥2.00). Healthy weight and overweight adults were more likely than obese adults to report shops ($OR_{healthy}$=1.57, $OR_{overweight}$=1.79) and seeing others active ($OR_{healthy}$=1.47, $OR_{overweight}$=1.53). Non-cohabitating adults were more likely than cohabitating adults to report transit stops (OR=1.95) and sidewalks (OR=1.50), but also more likely to report crime (OR=1.70) and traffic (OR=1.75). College-educated adults were more likely than less-educated adults to report access to free/low cost facilities (OR=1.78) and safe parks (OR=1.48), and less likely to report crime (OR=0.68).

Discussion: These findings reinforce positive associations between perceived neighborhood environment and PA, and show that overall neighborhood perceptions and perceptions of specific neighborhood attributes vary across population sub-groups. This study provides valuable information to city planners and health professionals advocating for and implementing environmental changes to increase PA.

642 The 'choice transition' in relation to physical activity behavior: Need for a new model from the Global South perspective

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Introduction: Eighty percent of all deaths due to non-communicable diseases occur in lower-and-middle-income countries. Socio-economic development, industrialisation and urbanisation, have brought about decreased levels of physical activity (PA). The epidemiological transition involves the "transformation of social, economic and demographic structures" resulting in the co-existence of both infectious and non-communicable diseases, and competing demands for the prevention and management of both.

Purpose: In this theoretical paper, we introduce 'choice transition or disability'. The mutability of lifestyle behaviors, and the extent to which they are shaped by, for example, the 'childhood memory of hunger' have to a large extent, not informed our approaches to health promotion.

Methods: We provide specific examples of 'choice transition or disability' in relation to health behaviors from the Global South, where large disparities in wealth further marginalise the disadvantaged. The data on self-report PA behavior and the environmental correlates to PA behavior were extracted from 2 data sources, as part of PhD dissertations (Tshabangu and Naidoo). Together, they represent a convenience sample of 517 (men, N=210, mean age 42+11 yrs, BMI=24.6+5.0 kg/m^2 and women, N=317, mean age 44+11 yrs, BMI=32.7+7.8 kg/m^2). The 7 core items of the IPAQ Environmental module were administered including housing and perception of neighborhood crime, destinations, access to transport, recreational facilities, pavements, and cycle paths.

Results: Typical environmental barriers to PA such as perception of crime or traffic have little impact on the incidental or transport-related activity of individuals. Self–reported moderate-to-vigorous (MV) PA was highest in this convenience sample of urban-dwelling South Africans, in men, and lowest in employed, well-educated South African women. However, the proportion of time spent in discretionary PA was significantly greater in both men and women with higher educational attainment (and employment) (P<0.05). Self-reported leisure time MVPA was significantly higher in those persons living in neighborhoods in which crime was not perceived to be a problem, and where there were fewer destinations within walking distance (P<0.05). In addition, walking PA was significantly higher in persons from communities in which there were no pavements (P<0.03). The more affluent suburbs have the lowest density of housing and the highest area of green space per capita. These are examples of environmental injustice.

Conclusion: We require new models for health promotion, which recognise that health messaging and strategies for PA behavior change that may differ across this 'choice' transition.

643   The implications of children's travel behaviour for their physical activity

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Walking and cycling by children have decreased over time in many countries. Children have less choice than adults about where they go and often they are not allowed to travel unescorted by an older person. The factors that influence children's travel behaviour have changed in recent years, with the development of car-oriented lifestyles, increased numbers of mothers in employment, and changes in attitudes towards children's independent mobility. The purpose of this presentation is to examine the nature of children's travel behaviour in Britain and its implications for their volumes of physical activity. Evidence from other countries in Europe will be used to show that similar trends are occurring elsewhere. After considering the nature of children's travel behaviour and the factors that influence it including policy on the choice of school and perceptions of risk, the effects of children's travel behaviour on their volumes of physical activity will be discussed drawing on research in the CAPABLE study (Children's Activity, Perceptions and Behaviour in the Local Environment), in which children were fitted with activity monitors and asked to keep travel and activity diaries so that the contribution of the various elements of their day to physical activity could be calculated. Some measures being adopted in Britain including physical measures, campaigns and funding measures, to reverse the adverse trends will be described, with attention drawn to the lack of evaluation exercises associated with these schemes. Wider measures to reverse the dependency of households on the car will be examined. Conclusions will be drawn in terms of the policy implications and possible ways forward.

644   Influence of social and environmental variables in declining physical activity during transition to adulthood

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Introduction: The transition to adulthood is characterized by a decrease in physical activity level. However, to our knowledge, there are no studies that examined the role of environmental and social variables in the decline of physical activity during transition to adulthood. The main purposes of the study were to determine the changes in physical activity level and the influence of sociodemographic and environmental variables on those physical activity levels during transition to adulthood.
Methods: A one-year follow-up study was carried out in a sample of 244 last-year high school students (58.6% female). First data collection was performed in the final year of high school. Variables measured were sociodemographics, body mass index, distance to the educational centre, environmental perceptions (ALPHA questionnaire), barriers to walking and cycling, total physical activity levels, leisure-time physical activity, active commuting and, family and friend support . One year later the same variables were measured.
Results: Results indicated a significant decrease in physical activity levels (p<0.05). Equally, leisure-time physical activity was also reduced. However, work-related physical activity increased. Family and friend support was positively associated to physical activity levels as well as environmental variables such as distance to the educational centre.
Discussion: The transition to adulthood is a crucial time of life to strengthen and lead to healthy and active lifestyles. Social and environmental factors play a key role in the decline of physical activity during the transition to adulthood.

645   Built environment interventions to stimulate leisure-time physical activity – evaluating the planning and implementation process in 3 Danish municipalities

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Introduction: The study is a part of a mixed-methods analysis consisting of both quantitative and qualitative methods to evaluate the process and the effect of a built environment intervention to promote physical activity in 9 Danish municipalities. The interventions were developed by a group of municipal employees from three different departments (Health, Building, and Culture & Leisure). The main objective of the process analysis was to evaluate the planning and implementation of new facilities for leisure-time physical activity. Special attention was given to the different mindsets and procedures in each of the three involved municipal departments, as well as during their cooperation. The knowledge gained will help understand how to optimize development of physical interventions to promote physical activity.
Methods: Six focus group interviews with the three different groups of municipal employees were carried out in three of the nine municipalities. Three interviews took place during the planning of the intervention, and three more took place in the same three municipalities when the intervention was implemented.
Results: The process analysis showed that the groups of municipal employees found it necessary to work across departments to develop facilities for leisure-time physical activity and that the groups were motivated to cooperate. But there were some challenging tasks related to their work: political conservatism, bureaucracy, financing of interdisciplinary interventions, and to get the management's acceptance to fully participate in the interdisciplinary group work. After having implemented the interventions, we found an increased motivation to develop new built environment interventions to promote physical activity at both the political and the management level in the three municipalities. Furthermore, they realized the necessity of using different skills from different department to implement such interventions.
Discussion: The municipalities in this study displayed an unexploited potential to develop facilities for leisure-time physical activity. This suggests that more opportunities for new interventions could be stimulated by establishing a culture in the municipalities which makes it possible to work cross-departmental, in particular, increasing the possibilities for cross-departmental funding. There is a lack of studies investigating processes related to planning and implementation of municipal, cross-departmental built environment interventions for leisure-time physical activity. More studies are needed to see if the findings in this study are a typical tendency in cross-departmental built environment interventions.
Support: The study was supported by Realdania and The Danish Foundation for Culture and Sport Facilities

646 Perceived neighborhood environment and physical activity in central European older adults

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Environmental determinants in relation to physical activity may be accentuated among older adults due to combinations of physical mobility and mental decline associated with age, reduction in social networks and social support, and increased fragility. Research on neighborhood's influence on older adult's physical activity is limited in the Central European countries. Therefore, the aim of this study was to examine physical activity in Central European older adults living in different walkable neighborhoods. This study was cross-sectional using data of 447 Czech, Slovak and Polish ambulatory older adults aged 60 to 86 years (BMI=26.5±3.8 kg/m²). The self-administrated long version of the International Physical Activity Questionnaire (IPAQ) was used to assess physical activity. Perceived environment was assessed using abbreviated version of the Neighborhood Environment Walkability Scale (ANEWS). The respondents were divided into three groups (low, medium and high walkable neighborhoods) counted from residential density, land-use mix, street connectivity, walking/cycling facilities, aesthetics, and safety factors. Kruskal-Wallis test was used to test whether there are differences in physical activity among three groups living in different walkable areas. Mann-Whitney U-test was used to identify the differences between two groups. Based on the job, transport-related, domestic and leisure-time domain classification, the statistically significant difference was found only in transport-related domain (H=14.12, p=0.001). The residents living in high walkable neighborhoods reported on average 593 METminutes/week of active transport more than residents in low walkable areas. There were not found any differences between groups in vigorous (H=2.66, p=0.26) and moderate (H=1.74, p=0.42) physical activity. The significant differences between residents from different walkable neighborhoods were found in METminutes/week spent walking (H=14.61, p=0.001). Residents from high walkable neighborhood walked significantly more (M=3090±2000 METminutes/week) than residents from medium (M=2506±1889 METminutes/week) and low walkable neighborhood (M=2246±1924 METminutes/week).

The results of this study suggest that high walkable neighborhoods are related to higher physical activity, mainly walking and walking for transport, in older adults in the Central Europe. These findings can inform the development policies and strategies how to support improvement in environmental and urban settings to promote safe and physical activity friendly neighborhood for older adults.

647 Built environment and dog walking behavior among Japanese dog owners

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Introduction: Because of the relatively high level of dog ownership in many industrialized countries (20–40%), there has been a growing interest in dog walking as a unique and marketable resource to provide physical activity for many individuals in the community. Despite growing interest in the environmental correlates of physical activity, there appears to be a few studies that investigated the effect of the built environment on walking with their dog among dog owners. Thus, the present study examined the association between the objectively-measured built environment and dog owners walking with their dog.

Methods: Participants were community-dwelling Japanese dog owners aged 40 to 70 years who responded to a population-based cross-sectional mail survey (n=213, 19.8%). Physical activity, dog ownership, dog walking, and socio-demographic attributes [sex, age, educational attainment, marital status, employment status, living with family or other cohabiters, body mass index (BMI), and self-efficacy and social support for physical activity] were self-reported. Residential density, land use mix, access to public transport (number), sidewalk coverage (total distance) and access to public parks (number) within a 1.6 km network buffer around residential addresses were measured using geographic information systems. Univarited logistic regression models adjusted for all socio-demographic variables, BMI, and self-efficacy and social support for physical activity were used.

Results: Overall, 70.8% (n=150) of Japanese dog owners were reported that they walked with their dog for an average of 208.3±197.2 minutes/week. Sidewalk coverage (OR=2.02, 95% CI: 1.02–3.00, p=0.044) and access to public parks (OR=2.34 95% CI: 1.17–4.70, p=0.017) were positively associated with dog walking. However, other three of the objective measures of the built environment—including residential density (OR=1.72, 95% CI: 0.84–3.51, p=0.135), land use mix (OR=1.69, 95% CI: 0.84–3.41, p=0.138), and access to public transport (OR=1.72 95% CI: 0.87–3.38, p=0.117) —were not significantly associated with owners walking with their dog.

Discussion: The present study indicates that supportive built environment is important for encouraging dog owners to walk with their dog. In particular, dog owners may be more encouraged to walk with their dog if they have more sidewalks and accessible parks within their neighborhood. Also, the results of the present study indicate that features of supportive objectively-measured built environment for dog walking would be relatively similar with those for not transport-related walking, but rather recreational walking. Thus, creating a supportive neighborhood environment for recreational walking would be a first fundamental step in promoting dog walking.

648 Transport physical activity and its correlates in the Brazilian population

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Little is known on transportation patterns of the Brazilian population. We evaluated the prevalence of active transportation and its correlates in a representative sample of the Brazilian adult population. A countrywide household-based cross sectional study was carried out including separate samples of adults and elderly individuals from 23 states in Brazil selected through a multistage approach. Physical activity as a means of transport was assessed using the International Physical Activity Questionnaire. A cut-off point of 150 minutes per week was used. 12,116 adult and 6,506 elderly individuals were interviewed in 100 Brazilian cities. The proportion of individuals insufficiently active in the transport was 66.6% (95% CI 65.7–67.4) among the adults and 73.9% (95% CI 72.8–75.0) among elderly individuals. Active transportation was more frequent among men than women, and was inversely related to age and schooling. Among older adults only, older age was related to physical inactivity in transportation. High rates of insufficiently active individuals in the transport were found in Brazil suggesting the need of action on transport systems.

649 A study using walk-along interviews to explore the environmental factors related to older adults' walking for transportation

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Background: Current knowledge on the relationship between the physical environment and older adults' walking for transportation is limited. Qualitative research can provide valuable information and inform further research. However, qualitative studies are scarce and fail to include neighborhood outings necessary to study participants' experiences and perceptions while interacting with and interpreting the local social and physical environment. The current study sought to uncover the perceived environmental influences on Flemish older adults' walking for transportation. To get detailed and context-sensitive environmental information, it used walk-along interviews.
Methods: Purposeful convenience sampling was used to recruit 57 older adults residing in urban or semi-urban areas. Walk-along interviews to and from a destination (e.g. a shop) located within a 15 minutes' walk from the participants' home were conducted. Content analysis was performed using NVivo 9 software (QSR International). An inductive approach was used to derive categories and subcategories from the data.
Results: Data were categorized in the following categories and subcategories: access to facilities (shops & services, public transit, connectivity), walking facilities (sidewalk quality, crossings, legibility, benches), traffic safety (busy traffic, behavior of other road users), familiarity, safety from crime (physical factors, other persons), social contacts, aesthetics (buildings, natural elements, noise & smell, openness, decay) and weather.
Discussion: The findings indicate that to promote walking for transportation a neighborhood should provide good access to shops and services, well-maintained walking facilities, aesthetically appealing places, streets with little traffic and places for social interaction. In addition, the neighborhood environment should evoke feelings of familiarity and safety from crime. Future quantitative studies should investigate if (changes in) these environmental factors relate to (changes in) older adults' walking for transportation.

650 Work-related travel behaviours: What roles do neighbourhood type and preference play?

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Introduction: Although the neighbourhoods and health field is well established, the relationships between neighbourhood selection, neighbourhood preference, work-related travel behaviours, and transport infrastructure have not been fully explored. It is likely that understanding these complex relationships more fully will inform urban policy development, and planning for neighbourhoods that support health behaviours. Accordingly, the objective of this study was to identify associations between these variables in a sample of employed adults.
Methods: Self-reported demographic, work-related transport behaviours, and neighbourhood preference data were collected from 1,616 employed adults recruited from 48 neighbourhoods located across four New Zealand cities, as part of the wider IPEN study. Neighbourhood built environment measures were generated using geographical information systems. Demographics and work-related travel behaviours were measured by self-report.
Results: Those living in more suburban neighbourhoods had significantly longer work commute distances and lower density of public transport stops available within the neighbourhood when compared with those who lived in more urban neighbourhoods. Those preferring a suburban style neighbourhood commuted approximately 1.5 km further to work when compared with participants preferring urban settings. Respondents who preferred a suburban style neighbourhood were less likely to take public or active transport to/from work when compared with those who preferred an urban style setting, irrespective of whether they actually lived in a more urban or suburban neighbourhood.
Discussion: Although it is unlikely that constructing more walkable environments will result in work-related travel behaviour change for all, providing additional highly walkable environments will reinforce positive health behaviours, and support those amenable to change to engage in higher levels of work-related public and active transport.

651 Using a reliable taxonomy to code the content of walking and cycling interventions: Challenges and recommendations for future reporting

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Introduction: Recent reviews of physical activity interventions have identified that the reporting of intervention content varies significantly. A reliable 26-item taxonomy of standardised behaviour change techniques (BCTs) has been developed to aid consistent intervention reporting. In developing an evidence-based intervention for the iConnect project (www.iconnect.ac.uk), this study aimed to code the content of walking and cycling interventions, and make recommendations for future reporting of intervention content.

Methods: Controlled, individual-level walking and/or cycling intervention studies involving adults were systematically sourced. Following taxonomy instructions, reviewers familiarised themselves with BCT definitions prior to coding each manuscript. Two reviewers independently coded BCTs from the abstract, introduction or methods section of each manuscript. Relevant text was extracted and tabulated for evidence. BCTs were not coded if not explicitly stated in the text. After coding each manuscript, reviewers checked their coding against manuscript text to confirm interpretation and identify missed BCTs. Quality control of coding was implemented with 20% of interventions randomly selected and coded by two additional reviewers. Coding discrepancies were discussed and agreed.

Results: Forty one walking and/or cycling studies met the inclusion criteria; four studies evaluated multiple interventions meaning that 46 distinct interventions were coded. The number of BCTs coded per intervention ranged from 0 to 12, with an average of 4.18 (SD=2.84). Substantial heterogeneity was observed in vocabulary used to describe intervention content. Kappa calculations revealed that inter-rater agreement of independent coding was moderate-to-good (kappa=0.58), while average percentage disagreement was 16%.

Discussion: Heterogeneity in intervention vocabulary resulted in difficulty coding intervention text according to taxonomy definitions thus increasing the possibility of imprecise coding and drawing misleading conclusions. For example, while several manuscripts referred to "goal-setting", it could not be included as a BCT code because a specific definition was not provided (e.g. frequency or context). If text referred to "goal-setting" alone, "prompt intention formation" was coded instead. Group discussion to resolve coding discrepancies was essential. BCTs utilised in the design of walking and cycling interventions specifically may not have been captured by this taxonomy, as it is not an exhaustive list. To help overcome challenges in coding the content of walking and cycling interventions, future studies should use standardised vocabulary to report intervention content. This should improve understanding of the ways walking and cycling intervention content relates to intervention efficacy.

652 Active transport: Youths and adults in different types of built environment in Czech Republic

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Introduction: Previous studies have confirmed both the positive and negative influence of built environment on physical activity and active transport (walking and bicycling to school and work). Active transport is a regular physical activity of individuals that may significantly influence the total weekly physical activity (PA). Therefore the main aim of this study was to find out the relationship between objectively measured built environment and individually assessed time spent in active transportation.

Methods: Geographic information system (GIS) was used to identify the main urban factors of residential areas in selected cities Olomouc and Hradec Kralove. High 'walkable' areas are represented by higher population density, street connectivity and mixed land use. The city area is also divided into four basic types of built environment; the city centre, traditional urban area, area of prefabricated block of flats and suburban area. Active transport data were obtained from the national census, aggregated by administrative districts. The main questions for our study were what type of vehicle (car, public transport, bike and no-vehicle) inhabitants use, duration and frequency of active transportation. Binary logistic regressions in software SPSS 17.0 were used to determine the effect of different types of built environment on active transport.

Results: From the sample (n=17,098) of 6–15 years old youths there were 66.1% using active transportation regularly. In adult population sample (n=66,020) aged 19–64 years only 36.2% reported active transportation as preferred type of commuting. Analyses showed that youths living in high 'walkable' areas are more likely to be involved in active transport. For youths living in areas of prefabricated block of flats we also found high prevalence of active transport (76,9%), although this type of neighbourhood should be characterized as low 'walkable' area. This association between built environments and active transport was not confirmed in adults.

Discussion: This study suggests that different types of built environment might be an important determinant of active transport in youths; however there was not found any influence of environmental settings on active transport in adults. The results are made in cooperation with the municipality of both cities and will serve as a recommendation to the communal policy in the field of preventive, health and urban decisions.

653 Electrical assisted cycling: A new mode for meeting the physical activity guidelines?

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Introduction: In recent years, the number of electrical assisted bicycles (EABs or pedelecs) in the Netherlands has been growing considerably. So far, insight in the potential health benefits of this new mode of active transport is lacking. An important question is to what extend the growing use of electric bicycles can contribute to an increased number of subjects meeting the physical activity guidelines.

Methods: Several studies were performed in the Netherlands to gain insight in the current and potential future use of EABs, the imago and willingness to purchase an EAB among commuters, the intensity of cycling on an EAB, and the effect of long term use of EAB on meeting the physical activity guidelines.

Results: It is expected that the use of EABs in the Netherlands will increase substantially in the next decade. The popularity among older adults is already high and ccampaigns focusing on short time use of an EAB result in a better image and a higher willingness to buy an EAB among commuters.

Results of small scale studies show that the energy expenditure during cycling on an EAB is sufficiently high to contribute to the physical activity guidelines for moderate intensity physical activity for adults. Data of an online survey (n=1400), focusing on EAB use and physical activity behavior, showed that the potential gain in meeting the physical activity guidelines in the Dutch population can be about 1% as a result of increased EAB use. Employees participating in a long term project, where they received an EAB at the start of the campaign as a reward for their future EAB use during commuting, show during and after a year a considerable increase in meeting the physical activity guidelines.

Discussion: Studies show that stimulating EAB use in the Netherlands can have a positive effect on the amount of subjects meeting the physical activity guidelines, which may result in health benefits for the Dutch population. However, several drawbacks of EAB use should also be taken into account, such as the (unexpected) higher speed of the EAB and the relative silentness of the EAB, which both can result in higher accident rates.

654 Associations between a walkability index and bicycle use in Denmark

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Introduction: Evidence for a positive correlation between physical activity and health has been around for some years, yet still up to 30% of the world's population are physically inactive (from 17–50% across countries) Commuter cycling has the potential to meet the physical activity recommendations of 30–60 min/day, and important health benefits can accrue from regular commuting cycling. Studies have shown a positive correlation between walkability attributes of neighborhood environments (street connectivity, land use mix, residential density, retail floor area ratio) and cycling.

Results from Australia/Belgium show associations between measures of walkability and bicycle use for transport and the present study focuses on exploring whether these findings can be applied to a Danish setting where cycling culture differs and bicycle share is much higher (17% of all trips are by bicycle).

Methods: The Walkability Index (z-score Residential Density + z-score Land Use Mix + (2*z-score Intersection Density) + z-score Retail Floor Area Ratio) was calculated using ArcGIS and associated with data from the Danish National Transportation Survey (TU). A Walkability Index was calculated for 123 TU zones in the 3 largest Danish cities, Copenhagen, Aarhus and Odense, and the walkability scores were combined with data from 10,846 TU interviews in a 5 years period.

Results: Data showed a positive relationship between the calculated Walkability Index and both walking and bicycling. The relationship was significant for both the daily mean kilometers cycled as well as the number of cycle trips. Logistic regression on cycling/not cycling with Walkability Index scores as predictor showed that the odds ratios in Copenhagen, Aarhus and Odense were: 1.11 (p<.0001); 1.08 (p<0.001) and 1.05 (p>0.05) respectively. This shows that the association of the Walkability Index is less in Odense than in the other two cities despite Odense showing the highest cycle mode share (approximately 30% of all trips)

Discussion: Before starting this study, we speculated that the strong Danish cycle culture might reduce the potential correlations with environmental factors. This was not the case, but differences in transport behavior did exist across cities and TU zones. The City of Odense had lower Walkability Scores than Copenhagen but a higher cycle mode share which suggests that other factors are related to the high cycle share in Odense.

Conclusion: Build environment factors related to walking are also associated with cycling in Denmark and initiatives in the build environment to promote walking could affect cycling as well.

655 Using public transport to travel to work. How can we increase this?

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Introduction: The use of public transport (PT) potentially has both environmental and personal health benefits. In urban Malaysia the public transport system is well developed but used by only a low proportion of the population.

Purpose: Profile Malaysian government employees who use PT. Identify ways to increase PT usage.

Method: 159 government employees working in an area with good PT were surveyed. As part of a larger study of physical activity levels (6 day pedometer use) the employees completed a questionnaire requesting information about forms of transport to work and environmental barriers (based on the work site environment questionnaire of Blunt, 2006).

Results: 83 males, 76 females completed the questionnaire, assessment of physical activity levels (pedometer) and height/weight measurements. Only 14% (6% males, 24% females) reported any use of PT to work in the previous week and of those, 78% reported 3+days of use (60% males, 91% females). Due to the insufficient number of males who regularly used PT data analyses were only conducted on females (19 regular users of PT – PTU, 59 non-users – NU). There were no significant differences in age or BMI status between the two groups. The PTU group completed significantly more steps/day on weekdays (p<.05), PTU-9769(SD 4251); than NU-7799(3093), no significant differences during weekends (PTU-5868(2865); NU-5049(2672)), but a significant difference in weekly steps/day, PTU-8654(3543); NU-7013(2526). With respect to the impact of the work environment the NU group were significantly more likely than the PTU to consider there was too much crime in the work environment (71% vs 41%); and also reported less encouragement by co-workers to be physically active (47% vs 76%).

Discussion: Strategies to improve the use of PT must be planned in the existing environment where: 94% of males do not use PT; the average daily temperatures are ~32 degrees C (~80% humidity); a lack of covered walkways; footpaths becoming car parks for motorbikes and cars; a cultural expectation that public transport is for those who cannot afford cars; and overcoming safety perceptions.

Conclusions: Use of PT to work is very low, particularly for males. Regular female users of PT have significantly higher levels of weekday steps and weekly average steps/day. Females who did not use PT were more concerned about crime and reported less encouragement by co-workers to be active. Developing strategies to increase use of PT provides many challenges.

656 Drivers of active travel in two Irish towns – qualitative and political perspectives

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Introduction: Recent 'Smarter Travel' funding and Department of Transport policy documents are driving a move towards more active travel in Ireland. Rates of walking and cycling for transport are low when compared to other European countries. There is limited infrastructural support for walking and cycling for transport, a large portion of the population live in rural locations and the public transport systems within towns is largely inadequate. The attitudes of key stakeholders of 'Smarter Travel' and the political environment which is mediating change was analysed in two towns shortlisted in a national competition for funding (one funded).

Methods: A detailed inventory of infrastructural provision, public awareness, media coverage, and promotion activities is underway. Interviews (n=7) have been conducted with community advocates of active travel, traders and key policy makers to understand the drivers of change. Focus groups (n=4) have also been conducted with junior and senior cycle girls to understand the barriers and enablers to active travel.

Results: In one town 'Smarter Travel' has had a high media profile, due in part to public backlash to radical infrastructural change in a medieval setting, and the perception of poor consultation. From the traders' perspective, the term has become synonymous with reducing accessibility and fears of reduced footfall against a backdrop of economic recession. Community advocates for 'smarter travel' suggested that the challenges experienced by local authorities were due to a flawed implementation process. This conflict between the key stakeholders has, however, changed the process of engagement and failure to secure national funding has led to shared cooperative approaches. Neither junior nor senior cycle girls cited safety or infrastructure as being important factors. Senior cycle girls were concerned by factors such as being mocked, their appearance and carrying heavy bags. In contrast, junior cycle girls were more concerned with the opportunities to socialise with friends.

Discussion: Multiple factors influence young people's travel modes. The processes of change to more active travel are different in the towns investigated. The main lesson learned is that radical change cannot work if the community doesn't understand the concept of smarter travel. Communities need to be convinced of the merits and motives of smarter travel before change happens. Smarter travel should start in settings such as schools, workplaces before radical change is introduced to business districts. Infrastructural change should be introduced in small steps alongside social marketing.

657 Neighbourhood typology and the choice for active transport; results from the AVENUE project

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Introduction: Policies promoting a shift from passive to active transport could be more effective when they would focus on frequent car users. This explorative study examines the neighbourhood characteristics related to short-distance trips made by car, bicycle or walking in order to identify target groups.

Methods: Data were derived from 'Mobility Research Netherlands (2004–2009; MON)', a dataset including information regarding trips made by members of households (n=± 23,500 households per year). Using the four-digit postal codes of household addresses, data from MON was enriched with data on neighbourhood typologies. A distinction in 5 neighbourhood typologies was made: 1) urban-centre, 2) urban-outside centre, 3) urban-green, 4) suburban and 5) rural. Analyses focused on trips up to 7.5 kilometres made with the purposes of commuting, education, taking/bringing persons, hobby, sport, touring, services/personal care or shopping. A total of 373,876 short-distance trips made by 122,342 persons were included in the analysis. Multilevel logistic modelling was used to model use of active transport versus car use. In all analyses shopping was used as reference category.

Results: All trips, except for trips made for services/personal care (OR=0.93), were most likely to be made by active transport modes. Persons living in neighbourhoods classified as 'urban-centre' (OR=2.39) were more likely to use active transport modes than persons living in other neighbourhood typologies. Stratification for neighbourhood typology showed that persons living in rural areas were less likely to use active transport modes for trips made for commuting (OR=1.79) than persons living in other neighbourhood typologies (OR range other: 2.23–3.54). Trips made with purpose of shopping (OR=3.75 vs. OR range other: 1.65–2.16) and services/personal care (OR=2.80 vs. OR range other: 1.40–1.80) were most likely to be made by active transport by persons living in neighbourhoods classified as urban-centre. Trips made with the purpose of going to hobby (OR=1.28 vs. OR range other: 1.67–2.35) or sport facilities (OR=1.58 vs. OR range other: 1.95–2.28) were less likely to be made by active transport by persons living in urban-green neigbourhoods.

Conclusion: Policy makers should take into account the impact of neighbourhood typology when developing policy measures to stimulate a shift from passive to active transport. In the future, additional quantitatively and qualitatively data collection linked to these kinds of studies will give more detailed information for tailoring policy measures involving sustainable transport.

658 Socio-cultural forces that impact on cycling behaviour in car-dominant societies: A survey of the UK population

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Introduction: In this paper we investigate whether socio-cultural norms, and the link of these constructs to self-image, have an adverse effect on behavioural levels of cycling in the UK. We make the case that the UK is an example of a culturally 'car-dominant' society. Our perspective is that of social marketers. Hence, the purpose of the work would be to design communications that are designed to question the prevailing cultural norm, and ultimately to replace with a more positive cultural environment.

Methods: The authors commissioned a large UK based market research agency, YouGov, to generate a stratified random sample from their on-line panel (over 275,000 people). 3,885 people in GB aged 16–64 were interviewed by means of an online questionnaire and were nationally representative in terms of gender, age, socio-economic grade (SEG), working status and standard regions. We used factor analysis to simplify the data. 45 items from the questionnaire were subjected to principal component analysis (PCA) using IBM PASW Statistics 18. Negatively worded items were reversed prior to PCA. Prior to performing PCA, the suitability of the data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of .3 and above. The Kaiser-Meyer-Olkin value was .928, exceeding the recommended value of .6 and Bartlett's Test of Sphericity also reached statistical significance.

Results: Principal components analysis revealed the presence of 9 components with eigenvalues exceeding 1, explaining 22.8%, 8.4%, 6.8%, 3.9%, 2.9%, 2.6%, 2.6%, 2.5%, 2.4% respectively. An inspection of the screeplot revealed a clear break after the seventh component. Using Catell's scree test, it was decided to retain seven components for further investigation. The seven component solution explained a total of 55% of the variance, Cronbach Alphas for these factors were generally reasonable, ranging from .811 to .663.

The factors were given names that reflected the nature of the scale items. These were: 'car vs cycling', 'disposition to cycle', 'cycling role models', 'cycling is normal and cool', 'motoring myths', 'self image and cycling', and 'cyclist user image'.

Discussion: The UKs car dominance has created some attitude clusters which coalesce to form anti-cycling cultures amongst some non-cyclists. There are also mis-matches of self-image and cyclist-image, leading to in-group and out-group effects. There were also positive signals of new, pro-cycling cultures emerging. Social marketing communications were commissioned accordingly.

659 | Built environment factors and active transport in Belgium: What about adults and adolescents living in the same neighborhoods?

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Introduction: In adults, a strong evidence base shows that objectively-assessed walkability is consistently positively associated with physical activity, and mainly with active transportation. However, in adolescents the relationship between objective neighborhood walkability and physical activity is less straightforward. In a previous study examining adults and adolescents living in the same neighborhoods, we found objective neighborhood walkability to be associated with active transportation in adults, but not in adolescents.

With the present study, we wanted to examine whether differences in environmental perceptions between these adults and adolescents can serve as an underlying mechanism of the age-specific associations between objective neighborhood walkability and physical activity. Therefore, the purpose was to examine if adults and adolescents living in the same high- and low-walkable neighborhoods had different environmental perceptions and if this would be reflected in distinct associations between environmental perceptions and active transportation.

Methods: In Ghent, Belgium, 24 neighborhoods were selected, stratified on objectively-assessed walkability and matched on neighborhood income. This resulted in four walkability/income quadrants, each consisting of six neighborhoods. In total, 1,166 adults (20–65 years, 52.1% women) and 477 adolescents (13–15 years, 49.7% girls) living in the 24 neighborhoods participated in the study. All participants completed a socio-demographic questionnaire, the International (adults) or Flemish (adolescents) Physical Activity Questionnaire and the Neighborhood Environment Walkability Scale (environmental perceptions). The data were analyzed using two-level (participant-neighborhood) moderated regression models, using MLwiN 2.23.

Results: Contrary to the expectations, both adults and adolescents living in objective high-walkable neighborhoods perceived their environment as more activity-friendly (higher scores for perceived residential density, land use mix, connectivity, availability and quality of walking/cycling infrastructures, aesthetics and crime safety) than their low-walkable counterparts. Overall, adolescents perceived their environment as more activity-friendly than adults, independent of neighborhood walkability. Despite the fact that the variance in environmental perceptions was not smaller in adolescents than in adults, environmental perceptions (residential density, land use mix, safety for cycling and overall walkability) were only associated with active transportation in adults, and not in adolescents.

Discussion: The present results suggest that different environmental intervention strategies should probably be used to increase active transportation in Belgian adults and adolescents living in the same neighborhoods. In adults, changing the walkability of neighborhoods or perceptions adults have about the activity-friendliness of their environment might be effective. However, in adolescents, the current environmental focus should probably be changed towards multi-dimensional research, examining the interplay between socio-demographic, psychosocial and environmental attributes.

660 | The relationship between waist circumference and abdominal and total body fat in children and adolescents: Sex and race differences

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Introduction: Total body fat mass (FM), abdominal subcutaneous (SAT) and visceral (VAT) adipose tissue can be precisely and reliably measured using imaging techniques. The relationship between these assessments and the usual clinical measurements obtained, especially in children and adolescents, is unclear. The purpose of this study was to determine if waist circumference (WC) is a good predictor of FM, SAT, and VAT in African American (AA) and Caucasian boys and girls.

Methods: The sample included 84 AA and 96 Caucasian boys, and 118 AA and 84 Caucasian girls aged 5–18 years. WC was measured midway between the iliac crest and the lowest rib, FM was assessed using dual energy x-ray absorptiometry, and VAT and SAT were assessed using magnetic resonance imaging. Regression was used to examine the relationship between WC and adipose tissue, along with potential sex, race, and age interactions.

Results: WC was a strong predictor of FM, SAT, and VAT, with R2 values of 0.93, 0.93, and 0.72, respectively. Age played a role in the relationship between WC and all adiposity measures. For a given WC, boys had lower FM than girls, and this difference increased as WC increased. The AA girls had higher FM than Caucasian girls as WC increased. For a given WC, AA also had higher SAT than Caucasian, and this difference was magnified as WC increased. For a given WC, AA had lower VAT than Caucasians, boys had higher VAT than girls, and those differences were magnified at higher WCs.

Discussion: WC is excellent predictor of FM and SAT and a good predictor of VAT in AA and Caucasian children and adolescents. Significant age, race, and sex differentials exist in the VAT distribution for any given WC. Age, race, and sex influenced the relationship between WC and FM and WC and SAT.

661   Associations between physical activity and sedentary behaviour in children: A systematic review

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Background: The study of sedentary behaviour in children is burgeoning and health outcomes of sedentary behaviour are thought to operate somewhat independently of physical activity. There is a need to better understand the extent to which sedentary behaviour and physical activity are associated. Methods: Published English language studies were located from computerized literature searches, biographies of primary studies and reviews, and manual searches of personal archives. Included studies presented empirical associations between at least one measure of sedentary behaviour and one measure of physical activity among samples of children aged <11 years.

Results: 65 studies, published between 1993 and 2011, were eligible for inclusion. 57 studies were cross-sectional and 10 were prospective in design. Sample sizes ranged from 36 to 12,538, the majority of studies included children aged 5–11 years (n=52), and 13 included children under 5 years. Sedentary behaviour was mainly assessed using questionnaires (n=29 parent report and n=25 self report), with 7 utilising objective measures and 4 using direct observation. Physical activity was measured using accelerometers (n=21), direct observation (n=6), self-report questionnaires (n=22) and parent report questionnaires (n=16). Most studies examined associations between television viewing (n=29) or screen time (n=23) and physical activity levels (n=35). Sedentary behaviour was negatively associated with physical activity in 32 studies. Strength of associations were mostly small (n=18), with 13 showing moderate, and 4 showing large associations. 21 studies showed non-significant associations and 12 showed unclear associations. Conclusions: Physical activity has a variable association with sedentary behaviour in children and suggests that research should continue to assess both constructs but to control for physical activity levels when analysing associations between sedentary behaviour and health outcomes. Whether associations between physical activity and sedentary behaviour reflect true displacement is unclear because most studies are not time-stamped. Moreover, research has focussed mainly on screen-based sedentary behaviours and therefore it is less clear how other types of sedentary behaviour, such as motorised transport or homework, are associated with physical activity.

662   Is there a relationship between parental physical activity behaviors and their pre-school aged children's activity levels?

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Introduction: To date the relationship between parental physical activity behaviours and their pre-school aged children's activity levels is not well understood. It is presumed that parents who are active will raise active children. However, all parents desire their children to be healthy and active. It is possible that children of inactive parents are just as active as children of active parents. This research explores this proposition using a mixed-method approach. Methods: Participants were 18 families (N=36), with at least one child aged 3–5. Most parents were predominantly born in Australia (81%) and had a university or higher degree (83%). Half of the families did not meet the Australian National Physical Activity (PA) Guidelines of 30 minutes of moderate of vigorous activity per day and the other half were above 30 minutes or more above the daily activity guidelines. Using semi-structured interviews and photographs of the family's activity adventures parental role modeling of physical activity was explored. Content analysis was used to identify themes of family and parental physical activity behaviours. All parents (N=36) filled out a short questionnaire pack on their current PA and demographic details. Both parents and their child wore an accelerometer (Actigraph) for 5 consecutive days to ascertain their activity levels objectively. Results: Parental physical activity patterns did not correlate with their pre-school aged child's physical activity levels. Therefore, from this data it appears that between the ages of 3–5, parents' own physical activity does not influence their children's. At this early age it is difficult to distinguish between the natural tendencies of the child for activity and parental influences. However, there were differences between active and inactive parents role modeling behaviours. Inactive parents were more likely to facilitate their child's activity by 'buying' into activity opportunities (e.g. toddler clubs), as oppose to active parents who preferred direct involvement, provided more opportunities for structured and play activities, gave more positive feedback and were keen to establish activity routines for their family.

663   Understanding the relationship between dog ownership and children's physical activity and sedentary behaviour

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Introduction: While evidence of the relationship between dog ownership and physical activity in adults is emerging, the nature of this relationship in children requires further investigation. Given 60–80% of Australian and US households with children have a dog, dog-facilitated physical activity may be an effective way to increase physical activity and decrease child obesity. The study aims were to: 1) examine the individual and environment factors associated with dog ownership and 2) after adjusting for significant individual and environment factors, examine the association between dog ownership and physical activity, walking and sedentary behaviour.

Methods: Cross-sectional data from the Western Australian TRavel, Environment, and Kids project (TREK) were analyzed for 1218 children aged 10–12 years. Individual socio-demographic, intrapersonal, social and physical environment factors, child physical activity (walking; physical activity outside of school) and sedentary behavior (screen use) and dog ownership status was collected from child and parent questionnaires. Children's weekly pedometer steps, height and weight were measured. Regression models progressively adjusted for significant socio-demographic, intrapersonal and environment factors.

Results: Approximately 60% of children had a family dog. Dog ownership was associated with, on average, 29 more minutes of walking and 142 more minutes of physical activity/week (p≤.01). After adjustment, children who had a dog were 49% more likely to be sufficiently active (420mins) and 32% more likely to have walked in their neighborhood in the last week, compared with non-dog owners (p≤.05). Boy, but not girl, dog owners walked more minutes/week and were more likely to walk in their neighbourhood than non-dog owners (p≤.05). Girl, but not boy, dog owners were more likely to be sufficiently active and did more minutes of physical activity than non-dog owners (p≤.05). Dog ownership was not associated with screen use, pedometer steps or weight status.

Discussion: These results highlight the potential for dog ownership to significantly impact children's physical activity levels. It is likely that the nature of the relationship and interaction that boys and girls have with their dog may influence physical activity measures differently. Further research is needed to examine how the relationship between (self-report and objective) measures of physical activity and dog ownership and dog walking varies by child age and gender. To optimize the benefits of dog ownership in terms of increased physical activity, there is a need to encourage children (and their parents) to walk with and actively play with their dogs.

664 Promoting active kids: Investigating mothers' decisions about their young child's physical activity and screen time behaviours

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Introduction: Adequate physical activity (PA) and limited sedentary behaviours are important weight control measures to avoid overweight and obesity which are serious health concerns in Australia and are associated with an increased risk to cancers and other chronic diseases. Given increasing trends of obesity are being noted from early in life and that active lifestyles track across time, it is important that children at a young age be active to combat a foundation of unhealthy behaviours forming. During infancy, toddlerhood, and pre-school years, children are highly dependent on the lifestyle behaviours that their parents enforce and adopt; however, there is a paucity of research investigating the motivations underlying parents' decisions for their child's PA and sedentary-related behaviours.

Methods: Adopting a prospective design using on-line and paper-based methods, this study investigated, within a theory of planned behaviour (TPB) framework, factors which influence mothers' decisions about their child's 1) adequate PA and 2) limited screen time behaviours. The target behaviours of PA and screen time were defined according to the current guidelines outlined by the Australian Institute of Health and Ageing. Mothers (N=162) of children aged 4 and 5 years completed a Time 1 questionnaire either on-line or paper-based which comprised the standard TPB items of attitude, subjective norms, and perceived behavioural control, in addition to measures of planning and past behaviour as well as demographic variables.
One week later, consenting mothers completed a Time 2 follow-up telephone questionnaire which assessed the decisions they had made regarding their child's PA and screen time behaviours during the previous week.

Results: Attitude, subjective norms, and past behaviour predicted intention and intention predicted behaviour for both target behaviours.
Past behaviour also predicted screen time behaviour. Furthermore, perceived behavioural control in PA behaviour and planning in screen time behaviour predicted intention.

Discussion: Identifying the socio-cognitive determinants that guide mothers' decisions for their young child's PA and screen time behaviours is integral to developing strategies that increase Australian children's activity levels in a nation with the one of the world's highest rates of obesity. These findings provide an understanding of those processes involved for mothers to ensure their child engages in these important health behaviours. Encouraging mothers to ensure their child engages in an active lifestyle is imperative given that the high rates of obesity are evident in Australia from an early age and that patterns of unhealthy childhood behaviours often lead to lifetime habits.

665 Screen-based activity among school-aged children in context of health-related behaviors in Czech and Slovak Republic

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Introduction: The level of screen-based activity in school-aged children play a crucial role in future health outcomes. Thus the aim of this study was to explore the effects of screen-based activity on health-related behaviours in school-aged children.

Methods: We collected data on 11–15-year-old elementary school pupils (N=9014; mean age=13.59) who participated in the Health Behaviour in School aged Children 2009/2010 study in Czech and Slovak Republic. The association of screen-based activity with risky behaviour, aggressive behaviour, eating habits, and school-related outcomes adjusted for gender and country was explored using logistic regression.

Results: Screen-based activity negatively affected all of the examined health-related behaviors (smoking, lifetime drunkenness, breakfast, vegetable and fruit consumption, sweets and soft drinks consumption, academic achievement, liking for school, school pressure, bullying others and fighting) with only some country and gender differences.

Conclusions: Negative effects of screen-based activity on school-aged children health-related behaviors is of high importance for preventive programmes, health promotion policies and future research as well.

666 Patterns of physical activity outside of school time among Japanese junior high school students

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Introduction: Existing studies about youths' physical activity patterns mostly focused on the participation in overall physical activity and duration of intensities of activity within a day or week. The assessment of context-specific physical activity participation and possible gender and grade differences in it were limited, which is important to help identifying the most appropriate context(s) for implementation of physical activity intervention. Moreover, physical activity patterns of Japanese adolescents were relatively unknown. Therefore, the present study aimed to describe patterns of context-specific physical activity and identify gender and grade differences among them.

Methods: The cross-sectional data were collected in Oct–Nov 2010. Participants were 714 students aged 12–15 years old (boys n=372, girls n=342) from a public junior high school in Japan. The frequency (days/week) and average duration on each day (min/day) of context-specific physical activities in a usual week were measured through a five-item questionnaire. There were lunch-time physical activity at school, inside-school and outside-school physical activity during after school hours, home-based and total leisure time physical activity. To assess gender and grade differences within contexts, independent t-test and ANOVAs was conducted, respectively.

Results: The present study showed 70.4% of participants accumulated less than 420 min of physical activity per week during leisure time. Boys were significantly more active than girls in each context (p<.05). A polarized trend towards never or daily engagement in physical activity was observed in all contexts among both genders. Moreover, grade differences in each context-specific physical activity were observed, significantly in the contexts of inside-school and total leisure time for both genders, outside-school for boys, and home-based for girls (p<.05), in which students at third grade were found to be less active than lower grade students.

Discussion: Findings of this study implied that developing effective interventions would be required to promote physical activity. Time spent in each context declined across adolescent period indicating that each context should and can be intervened in to promote overall physical activity among adolescents. Comprehensively considering that Japanese adolescents were inactive during lunch time across three grades, time spent in inside-school context decreased significantly for both genders with advancing grade, and grade 3 students were less active at school than outside school and home, understanding of contributing factors impact physical activity in the school should be given priority. For increasing physical activity levels among Japanese youth, implementation of after-school programs or environmental modification developed within the school setting could be effective strategies.

667 Impact of socio-economic status on the physical activity of secondary school children

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Introduction: Physical activity during childhood and adolescence provides many short and long-term health benefits. The aim of present cross-sectional study was to assess the energy expenditure of Chandigarh secondary school children with respect to their socio-economic status.

Method: For this study Initially 60 subjects were selected for study out of which 53 subject respond positively, total 53 children from two different type (residential (N=32)and non residential (N=21)) schools were selected from the Chandigarh city(India), The age of subjects range from 13 to 16 years, with mean age (15) years. Saxsena,. (2008). Manual for socio- economic status index and Bouchard, C., A.Tremblay, C. (1983) A method to assess energy expenditure in children and adults were used to collect relevant data on socio demographic information.

Result: Children were classified according to(socio-economic status)SES out of 53 subjects 49% of students were from low SES, 35% were from average SES and 13% were from high SES it indicated that the majority of were from low SES. Energy expenditure of students ranges from 2649 to 1319kc. Data was analysed, ANOVA 2X3 were applied. Low socio-economic status children reported greater levels of average daily energy expenditure (1956.15kc) but difference is not as much to be significant as compare to other groups, this may be due their family background to work hard to earn bread and butter.

Conclusion: It was concluded that the neither socio-economic status nor type of school affect on the energy expenditure/physical activity as no significant difference was found.

Key words: socio-economic, physical activity, energy expenditure.

668 Age and gender differences in physical activity and health indicators among Korean adolescents

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Introduction: According to the Korean National Health and Nutrition Examination Survey (KNHANES) in 2001, 71.9% of South Korean adolescents aged between 12 and 19 did not engage in a sufficient level of physical activity. Meanwhile, the prevalence of childhood obesity has doubled over the last decade and is a major public health concern. Physical activity is associated with a decreased risk of obesity, chronic diseases, and mental health issues among adolescents. To develop effective physical activity interventions for Korean adolescents, research addressing age and gender differences of physical activity and the associated health indicators is warranted.

Methods: The current study examined physical activity levels and health indicators (i.e. self-rated health, body image, stress, depressive symptoms) among 2,373 Korean adolescents aged 12 to 19 years (47.8% of female) who participated in the KNHANES from 2007 to 2009.

Results: Only 17.2% (N=408) engaged in moderate (10.6%) and vigorous (6.6%) physical activity regularly. Statistically significant gender differences (p>.05) were found in body image, stress levels and depressive symptoms, and moderate and vigorous physical activity but not in self-rated health. Significant age differences (p>.05) were found in self-rated health, stress levels, depressive symptoms and vigorous physical activity but not in body image and moderate physical activity. Significant difference (p>.001) in vigorous physical activity and increase in stress and depressive symptoms were found between 12-year-olds and 17-year-olds in both sexes. Also, declines in moderate and vigorous physical activity, poorer body image, and higher levels of stress and depressive symptoms were observed for both boys (at 14–15 years) and girls (at 12–13 years).

Discussion: The transition into adolescence appears to pose barriers to physical activity participation among Korean youth. For instance, vigorous physical activity declined remarkably between 14 and 16 years of age in both sexes. Particularly, decreases in physical activity and negative changes in health indicators between 12 to 13 years in girls and 14 to 15 years in boys suggest that biological maturation may play a role in adolescents' physical and psychological health. In general, girls reported lower level of moderate and vigorous physical activity, poorer body image, higher levels of stress and depressive symptoms than boys. Social pressures with growing age may lead to gender differences in physical activity and health indicators. Future research is needed to elucidate the effect of biological and socio-cultural factors on physical activity and health indicators among Korean adolescents.

669 Physical activities of adolescents after the 2011 Great Eastern Japan earthquake affected damaged and minimally damaged areas

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Introduction: The 2011 Great Eastern Japan Earthquake had a significant effect on the Japanese lifestyle. It can be speculated that, in particular, physical activities of victims in the submerged coastal areas have reduced. The purpose of this cross-sectional study was to compare the amount of physical activity among adolescents in Onagawa (n=187), Higashi-Matsushima (n=374), and Aomori (n=399). The percentage ratio of decrease in population because of death in the Earthquake was 10%, 3%, and 0% in Onagawa, Higashi-Matsushima, and Aomori, respectively.
Methods: A total of 960 adolescents (aged 12–15 years) reported their personal and demographic characteristics and physical activities toward the end of July and October 2011. The physical activities were measured by the Health Behavior in School-Aged Children (HBSC) survey, and the time spent in a sedentary state (TS) during weekdays and weekends was reported. Only the participants in Onagawa measured their steps by an accelerometer.
Results: No difference was observed in the characteristics of all participants according to Pearson's chi-square test and one-way ANOVA. The results of Pearson's chi-square test revealed that there was no significant difference in the ratio of activity measured by HBSC survey. However, one-way ANOVA revealed that there were significant differences in the TS during weekdays (p<0.001) and weekends (p<0.001). In a post-hoc test, the adolescents of Onagawa demonstrated higher TS during weekdays (634±296 min/day) and weekends (650±276 min/day) compared with the adolescents of Higashi-Matsushima (weekdays, 553±249 min/day; weekends, 591±264 min/day) and Aomori (weekdays, 459±304 min/day; weekends, 552±305 min/day). Compared with adolescents of Aomori, those of Higashi-Matsushima had higher TS during weekdays only. The average number of steps per day during weekdays and weekends among the adolescents of Onagawa was 9747±4429 and 7647±5143, respectively. Furthermore, using Spearman's correlation coefficient, significant correlations were observed during weekdays and weekends between the TS and the number of steps (weekdays, r=−0.23, p<0.01; weekends, r=−0.23, p<0.05).
Discussion: Our findings indicate that TS during weekdays and weekends by adolescents in damaged areas such as Onagawa and Higashi-Matsushima possibly increased as a consequence of the 2011 Great Eastern Japan Earthquake. These affected adolescents may need a source of physical activity for improving their mental and physical health.

670 Individual and school level correlates and predictors of physical inactivity among adolescents from low socioeconomic backgrounds

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Introduction: Epidemiological research has indicated that the socioeconomic environment beyond the family may influence children's physical activity. We examined the influence of the school environment (economic deprivation, social fragmentation, and school climate) on students' level of physical activity.
Methods: Data are from an evaluation of the New Approaches, New Solutions (NANS) intervention strategy, which was designed to improve student success in disadvantaged areas. Questionnaires were administered every year between 2002 and 2008 among students aged 12 to 18 from a sample of 70 schools. Data on physical activity were available in the last two years. Cross-sectional and follow-up analyses were conducted. Multilevel modeling was utilized to account for the clustering of students within schools. School-level economic deprivation is a collective measure of average socioeconomic status of student populations. Rather than capturing poverty, social fragmentation relates to instability, characterized by rapid population turnover, which can be applied to the school environment. School climate has been defined as how students, teachers, principals and other staff relate with each other within a school. Schools were categorized as being low, moderate and high economic deprivation and social fragmentation.
Results: At baseline, adolescents attending a high economically deprived school (OR=1.33, 95% CI=0.95,1.89) and a high socially fragmented school (OR=1.54, 95% CI=1.17,2.03) were more likely to be sedentary in comparison to those from schools that were low economically deprived and socially fragmented. Conversely, students attending schools with a favorable climate were less likely to be sedentary (OR=0.81, 95% CI=0.65,1.00). Among those who were active at baseline, students who attended schools with favorable climates were less likely to become sedentary (OR=0.61, 95% CI=0.38,0.98).
Discussion: Schools with high economic deprivation and social fragmentation may have an adverse influence on physical activity behavior of adolescents. Schools where students, teachers, and staff interact positively may help promote physical activity. Following children beyond two years may be necessary to determine if these environments have a lasting effect on sedentary behavior. Offering opportunities for physical activity may not be sufficient to increase activity levels. Creating stable and supportive environments may be needed to encourage children to participate in physical activity.

671 Children physical activity correlates and parent physical activity do not have a strong association with physical activity amongst adolescents

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Background: Physical activity is a key modifiable behavior impacting a number of important health outcomes. The path to developing chronic diseases commonly commences with lifestyle patterns developed during childhood and adolescence. This study examined whether parent physical activity and other factors correlated with physical activity amongst children are associated with self-reported physical activity in adolescents.

Methods: A total of 115 adolescents (aged 12–14) and their parents completed questionnaire assessments. Self-reported physical activity was measured amongst adolescents and their parents using the International Physical Activity Questionnaire for Adolescents (IPAQ-A), and the International Physical Activity Questionnaire (IPAQ) respectively. Adolescents also completed the Children's Physical Activity Correlates (CPAC), which measured factors that have previously demonstrated association with physical activity amongst children. To examine whether parent physical activity or items from the CPAC were associated with self-reported adolescent physical activity, backward step-wise regression was undertaken. One item was removed at each step in descending order of significance (until two tailed item alpha=0.05 was achieved).

Results: A total of 93 (80.9%) adolescents and their parents had complete data sets and were included in the analysis. Independent variables were removed in the order: perceptions of parental role modeling; importance of exercise; perceptions of parental encouragement; peer acceptance; fun of physical exertion; perceived competence; parent physical activity; self-esteem; liking of exercise; and parental influence. The only variable remaining in the model was 'liking of games and sport' (p=0.003, adjusted r-squared=0.085).

Discussion: These findings indicate that factors associated with self-reported physical activity in adolescents are not necessarily the same as younger children (aged 8–11). While 'liking of games and sport' was included in the final model, the r-squared value did not indicate a strong association. Interestingly, parent self-reported physical activity was not included in the final model. It is likely that adolescent physical activity may be influenced by a variety of direct and indirect forms of socialization. These findings do support the view that intrinsically motivated themes such as the liking of games and sport take precedence over outside influences, like those presented by parents, in determining youth physical activity behaviors. These findings do not suggest that parents have no influence on adolescent physical activity patterns, but rather, the influence is likely to be more complex than physical activity behavior modeling perceived by the adolescent. Further research in this field is warranted in order to better understand potential contributors to successful physical activity promotion interventions amongst young adolescents.

672 Objectively measured physical activity in the 1993 Pelotas (Brazil) Birth Cohort

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Introduction: Data on physical activity levels of adolescents are mostly derived from self-reported instruments, and the vast majority of studies using objective measures are from high-income countries. The aim of this study was to describe the patterns of objectively measured physical activity in Brazilian adolescents.

Methods: In 2004–05 (mean age of 13.3years), a subsample of the 1993 Pelotas (Brazil) Birth Cohort with data on all previous visits was approached. Physical activity was measured using the Actigraph GT1M accelerometer. Adolescents wore the device from Wednesday to Sunday. The following thresholds of counts per minute were used: 0 to 100 cpm–sedentary activities; 101 to 2000cpm–light activities; 2001 to 5000cpm–moderate-intensity activities; >5000cpm–vigorous-intensity activities. Demographic and other variables were assessed by self-report.

Results: A total of 457 individuals (52% boys) provided valid data on objectively measured physical activity (response rate=89.4%). The mean registered time of accelerometer data was 922min/day (sd=91.7). Mean times (in minutes) spent in sedentary, light, moderate and vigorous activities were 660 (sd=80), 189 (sd=45), 63 (sd=27) and 9 (sd=7) min/day, respectively. Over 60% of the adolescents accumulated ≥60min/day of moderate-to-vigorous physical activity (MVPA). Total physical activity (counts per minute) and the prevalence of accumulating ≥60min/day of MVPA were higher among boys and in those who walked or cycled to school. The prevalence of accumulating >60 min/day was 50% higher in those from lower economic levels compared to higher economic levels (p<0.001).

Discussion: Our results differ from previous observations in this cohort when physical activity was assessed by self-report and more adolescents were classified as inactive. Studies in USA and European countries found higher levels of total physical activity expressed as counts/min than those observed in our study. Altogether, these results suggest that Brazilian adolescents have a lower level of physical activity than both American and European adolescents. Our data show that objectively measured physical activity level of Brazilian adolescents are higher than those that have been reported using self report instruments, yet a large proportion of adolescents do not achieve current guidelines of health related physical activity. Active commuting to school may be a target for interventions aimed at increasing physical activity.

673   Sleep-wake habits: Associations with weight status, physical activity and screen-time in British 11–16 year olds

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Introduction: Hectic modern schedules create chronic low-level sleep deprivation which is associated with lower physical activity and an increased risk of obesity. Sleep duration's link with adiposity is well established but recent data highlight an association between sleep timing (sleep-wake habits) and health in children. The aim of this study was to determine whether habitual bed-time and habitual rise-time were associated with physical activity, daily screen-time and BMI in British 11–16 year olds.

Methods: We measured physical activity (PA) using the Physical Activity Questionnaire for Adolescents, screen-time (daily hours) and BMI (z-score) in 1344 (54% male) schoolchildren (11–16 years). Participants were classed as physically active by median split, having high/low screen-time ($>/\leq$2h·day-1) and as normal weight vs. overweight or obese. Sleep-wake habits were assessed by self-report and categorised as follows: Early-bed/Early-Rise (Referent), Early-bed/Late-rise, Late-bed/Early-rise or Late-bed/Late-rise. Odds ratios were calculated as unadjusted estimates, then after adjusting for: age, sex, deprivation, rural/urban dwelling and (where applicable) weight status.

Results: Compared with the Early-bed/Early-Rise group, the odds of being overweight/obese were lower in the Early-bed/Late-rise group. (Adjusted OR=.43, 95% CI: .19–.96). There were no significant differences in the likelihood of low PA between sleep groups. Compared with the Early-bed/Early-Rise group, the odds of high screen-time were significantly higher in the Late-bed/Early-Rise (OR=1.64, 95% CI:1.25–2.16) and Late-bed/Late-Rise (OR=2.30, 95% CI:1.62–3.27) groups. These odds remained significant in the Late-bed/Late-Rise group after adjusting for age, sex, deprivation, rural/urban dwelling and weight status (OR=1.61, 95% CI:1.04–2.49).

Discussion: Adequate sleep duration is positively associated with several health indicators, simple measures of sleep duration may represent a somewhat simplistic metric of this important behaviour. While we found participants reporting the greatest sleep duration (Early-bed/Late rise) were least likely to be overweight, there were no associations between sleep-wake habits and the likelihood of low PA. Screen-time habits were more strongly related to bedtimes than to rising times. Participants reporting late bedtimes were more likely to exceed daily screen-time recommendations even when accounting for overall sleep-duration.

As well as adequate sleep duration, it seems that the time at which schoolchildren go to sleep (bed-time) is important. Further research is needed to establish the relative importance of sleep-wake habits and overall sleep duration on health.

674   Movement of children bodies in sport: An ethnographic study about gender behavior

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The concerns to discipline the movement of children bodies in sport are clearly evident and produced differentiation between boys and girls. The experience in the context of school physical education demand a public demonstration of physical competences that in turn exposes the body to the gender perceptions of the others. Gender is a recent issue in the physical education. The present study adopts an ethnographical perspective in seeking to understand the gender behavior and the schooling bodies. It explores the social regulation of bodies in physical education and the constant monitoring of skills, behaviors, performances of boys and girls. A qualitative approach, employing direct observation and group interviews were used to elicit gender perceptions amongst a group of 28 children (16 girls and 12 boys with 10 years old) that study in a Portuguese school. Content analysis technique and interpretation was applied, after data being processed by the program qsrnvivo7. The results showed: i) in physical education classes, the way children were grouped had effects on the behavior and performance of boys and girls in sport. Boys devalued the female performance. In some activities such football and basketball games, girls were noticeably fewer opportunities to participate; ii) the teacher let the children choose their teams and we observed girls exclusion. All these aspects combine to a standardization of cultural aspects in the learning of gender identity. The superiority of boys in sports performance is accepted by all as natural and expected and participation of girls is difficult and undervalued. Children identify and reproduce gender behaviors, reflected in the way they interact and act in class. but schools, such other cultural, political and social institutions (the family, the media) may be involved in the reconfiguration of gender inequalities.

675   Social support and adolescents' physical activity participation: The mediating effect of self-efficacy.

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Introduction: Research has consistently supported the important role that self-efficacy has on youth physical activity suggesting that positive effects of a behavioral intervention were mediated by changes in self-efficacy. The present study was designed to investigate whether social and interpersonal variables and individual variables were associated with adolescent activity behavior. The primary purpose of this study was to examine the mediating effect of self-efficacy on relations of adolescents' perceptions of physical activity enjoyment, social norms and physical activity levels.

Methods: Participants were 766 adolescents, (15 to 19 years-old, 53.9% females), from a large Portuguese city. A questionnaire was used to assess physical activity participation during the last week and social and interpersonal variables. Structural equations modelling to verify the possible relationships between social support, self-efficacy, physical activity enjoyment, social norms and physical activity level in adolescents.

Results: There was a significant and direct association between social support (ß 0.51, p0 .01) and self-efficacy (ß 0.21, p0 .01) with physical activity level among adolescents. Some of the possible effects of social support on physical activity were mediated by self-efficacy (ß 0.41, p0 .01). The perception of physical activity enjoyment was not associated directly with the physical activity level, but had effects mediated by self-efficacy perception (ß 0.35, p0 .001). The variables that composed the final model explained 35% of the variations physical activity among adolescents.

Discussion: These findings should increase the confidence of public health officials that physical activity intervention must develop actions to increase social support, perception of self-efficacy and physical activity enjoyment. These variables were factors that have the potential to positively alter the physical activity behavior of adolescents.

676 Differences in distribution of daily stepping between genders and seasons in 11–13 year olds

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Background: Total volumes of physical activity may be used to characterize an individual's or a population's engagement with health giving behaviors. However, there are potentially large variations in the distribution of this physical activity throughout the day that might be masked by simple daily totals. To aid intervention planning it is important to know which periods of the day are susceptible to behavior change. To do this it is necessary to have a detailed description of the patterns of activity. There is limited evidence of the distribution of stepping activity during the day in adolescents. However, with current activity monitoring tools it is possible to record detailed activity against a time line. The aim of this study was to investigate the differences in physical activity between genders and seasons in 11–13 year old school children. The purpose of this investigation was to provide insight into times during the day when behavior change might be promoted.

Methods: Thirty three (18M/15F) Scottish adolescents (baseline age 12.2±0.3y) wore the activPAL™ activity monitor on two occasions: November/December (winter) and May/June (summer). The activity monitor provides a time stamped record of steps taken, allowing examination of stepping activity across specified time periods. Four full week days (from 00:00–23:59) at both measurement points were used for analysis. The average step count for each hour of the day, across the 4 days was calculated using customized software.

Results: Steps/day were higher in summer (Mdn=12,879) than winter (Mdn=10,512), p<.001. Broken into hourly analysis, steps were significantly higher in the summer compared to winter for all hours between 1700 and 2100 (p<. 044). Boys and girls mean steps/day were not significantly different at either time point (p>.05). However, when broken down into hours, boys had significantly higher step counts in summer between the hours of 1300–1400 (p=.023) (including school lunch break), 1900–2100 (p<.032), but not in winter.

Discussion: Description of physical activity in terms of total steps/day masked differences that existed between boys and girls within specific hours of the day, particularly evening times. This information on distribution of stepping activity builds on existing evidence reinforcing the need to consider the detail of activity distribution. Planning of interventions can then be targeted at periods of reduced activity within one gender, or at developing interventions targeting seasonal inactivity.

677 Teaching our children to sit or be active? Sedentary behavior, light activity and moderate/vigorous activity at and away from school

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Introduction: Sedentary behavior in children is associated with poor health whilst moderate/vigorous activity is associated with better health. The school setting may be an opportunity to reduce sedentariness and enhance physical activity, yet concerns have been raised that children may be more sedentary at school. This paper examined activity patterns, including both sedentary time and time in health enhancing physical activity, in children across their typical week.

Methods: Sixty-six 10–12 year old children were recruited from 48 schools in the Perth metropolitan area as part of a randomized controlled study (Australia and New Zealand Clinical Trials Registry ACTRN 12609000279224) investigating the effects of electronic games on physical activity. The data for this paper come from their baseline assessment, which all occurred during school term time. Children wore an Actical accelerometer on their hip for one week. Time spent in sedentary, light, moderate and vigorous physical activity was assessed. School day and weekend day activity patterns were examined along with activity patterns both in (school time) and out of school (non-school-time) on school days.

Results: Valid (at least 4 days) accelerometer data were available on 53 children (28 girls). The average time of accelerometer recording per day was 822±71 minutes (13.7 hours). Accumulated time in sedentary behavior was similar on school days and weekend days (mean [SD]: 64.4%[5.3] vs 64.9%[9.0], p=0.686). Children were more likely to reach physical activity guidelines on school days than at the weekend (47.7% v 22.2%, p<0.001) and spend more time in brief – less than 5 minutes – bursts of activity of any intensity (35.3%[5.1] vs 32.6%[6.9], p=0.002). However, children spent a higher proportion of time in sedentary behavior (66.8%[7.3] vs 62.4%[5.2], p<0.001), and significantly more time in extended sedentariness – sedentary for more than thirty minutes or more (75.6mins[45.8] vs 45.0 mins[26.8], p<0.002) – within school time compared to non-school time.

Discussion: Children spent a considerable proportion of their school or non-school day in sedentary behavior, and routinely spent over two hours of each day in extended sedentary behavior. School should be a place where children learn healthful habits, and whilst it appears to be associated with better moderate/vigorous physical activity exposure it was associated with poorer extended sedentary exposure. Increasing moderate/vigorous physical activity and reducing time spent in sedentary behavior both in and out of school remains an important challenge.

678 Physical activity and health-related quality of life of children in disaster areas

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The environment related to physical activity in children was dramatically changed by The Great East Japan Earthquake in 2011. Physical activity appears to improve health-related quality of life (HRQL) by enhancing psychological well-being. The purpose of this study was to clarify the present state of physical activity and HRQL in Japanese children living in a town affected by the earthquake and tsunami in 2011. The participants were 195 children aged 9–11 (94 boys, and 101 girls) in the town of Onagawa (where housing damage affected 60% of participants). The survey was performed in September, 2011. Survey items included time spent on physical activity (min/wk), HRQL (the 23-item Pediatric Quality of Life Inventory Version

4.0 Generic Core Scales). The results of a chi-square test showed that there was a significant difference in the rate of time spent category (less than 60min/wk, from 60 to less than 420 min/wk, more than 420min/wk) between boys and girls. Also, the rate of less than 60 min/wk in both groups showed higher percentages than in the general population (MEXT national survey, 2011) in Japanese children (This study: boys 12.5%; girls 45.4%, general population: boys 9.3%; girls 31.1%). The results of an unpaired t-test indicated that there was no significant difference in HRQL total score between boys (82.5+/-14.5) and girls (80.3+/-13.7). However, these averages of total score tended to be lower than previous study (Japanese children: 84.4+/-10.9, Kamibeppu et al., 2007). The average HRQL total score for the group of more than 420 min/wk (84.1+/-15.0) was statistically high compared to the group of less than 420 min/wk (79.5+/-13.5). These findings might suggest the following: 1) the physical activity and the HRQL level of children living in disaster areas is decreased by a tsunami and earthquake hit, 2) physical activity of more than 420 min/wk might affect maintenance of HRQL for children living in disaster areas.

679   Is disinclination to physical activity related to the actual behaviour among adolescent girls?

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Introduction: Children and adolescents are recommended to achieve 60 minutes of moderate to vigorous-intensity physical activity (MVPA) daily. What psychosocial factors determine physical activity behaviour of youngsters is insufficiently known. The purpose of this study was to investigate the relationship of psychosocial factors with objectively measured daily physical activity among adolescent girls.

Methods: We asked 206 girls at the age of 13.5±0.9 years living in the city of Graz (73%) and in the rural surroundings to wear an accelerometer, to fill in an activity logbook for seven days, and to complete a questionnaire focusing on potential psychosocial determinants of physical activity in general and on disinclination towards activity in particular. One hundred and ninety two (93%) girls wore the accelerometer for at least four days. We calculated the average minutes of MVPA per day from the accelerometer data, and the average minutes of cycling/inline skating/scooter driving per day based on the logbook. Disinclination was measured with the Girls' Disinclination scale (GDS), of which 33 items clustered into four factors (competence, appearance, availability, and identity) in our study group. Multiple linear regression analysis with the average daily minutes of MVPA as the dependent variable was used to examine the relationship with the following variables: age, puberty, residence, social support/modelling, enjoyment of physical activity, and disinclination to be physically active.

Results: Based on the combined accelerometer and logbook data 35% of the girls achieved at least 60 minutes of MVPA per day. Without the logbook data less than a quarter of the girls would have reached the recommended activity. Controlled for age and puberty, urban residence, enjoyment of physical activity, and social support/modelling were positively related with daily minutes of MVPA, but none of the four factors or the single items of GDS showed significant relationship.

Discussion: In order to obtain a more complete insight into adolescents' physical activity behaviour accelerometer data needs to be supported by other methods accounting for the non-weight bearing activities. Possible reasons for the lower MVPA among rural compared to urban girls could be the longer distances to school and the less developed walking/cycling infrastructure. While the observed relations between psychosocial factors and physical activity were consistent with those found among adults, our findings did not indicate the assumed relation of disinclination towards physical activity with the actual behaviour. This may be partly due to the complex wording of the GDS's items.

680   How do master athletes do it? The role of self-regulation in the long-term maintenance of physical activity

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Introduction: Regular physical activity offers a range of physical, psychological, and social benefits which may ultimately enable maintained independence and quality of life. However, many older adults in the Western world are insufficiently active. Master athletes, competitors past the age of peak performance, defy this trend and are often referred to as the physical and functional elite of their age. This qualitative study investigated both how and why master athletes successfully overcome the barriers associated with maintaining regular physical activity in later life.

Methods: Participants were 10 master athletes (9 males and 1 female) aged between 60–80 years old. Participation was open to master athletes who had competed within the past year and had intentions to compete in the following year. Semi-structured interviews were conducted in accordance with the tenets of Interpretative Phenomenological Analysis (IPA). IPA offers insights into how a given person makes sense of the world, and the meanings that certain experiences hold for them (in this study experience of being a highly active older adult).

Results: The narratives of master athletes emphasised being physically active as a way of life. The activity itself was considered highly enjoyable and for most it was a social experience. Engaging in regular physical activity was also seen as an outlet, a way of interacting with the environment, and a means of coping with every day tensions. While some master athletes noted challenges in engaging in physical activity in later life (e.g. injury/fatigue, or a less than optimal exercise environment), they were able to persevere, plan and pace themselves to overcome the barriers. Establishing a routine and ongoing social support was often important. In several narratives being active and vigorous was seen to provide invaluable personal, physical, and mental challenges. Pushing themselves to face physical and psychological tests was considered a means of development which facilitated a deep understanding of their body and the changes associated with ageing. Master athletes were acutely aware of their limitations and had pride and confidence in their body and abilities.

Discussion: It appears that being active throughout one's life is associated with self-regulatory skills, including the ability to plan, and seek solutions to physical, mental and social obstacles. Interventions teaching self-regulatory skills may not only help sedentary individuals overcome potential barriers to regular physical activity, but as well as and cope more successfully with ageing.

681 Physical activity from the perspectives of individuals from diverse language and cultural backgrounds

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Introduction: The number of immigrant families living in Australia is growing and diversifying at a rapid rate. For a variety of genetic and environmental reasons, many of these populations face a higher risk of chronic health problems. This study qualitatively investigated how individuals from culturally diverse backgrounds plan for physical activity, motivate themselves to engage in activity and the specific barriers they face as immigrants.
Methods: Semi- structured interviews (n=21; 12 female) were conducted with individuals from various cultural backgrounds to further discuss participants' exercise experiences and the strategies they employed to improve their general health and fitness. The majority (71%) of participants did not meet the Australian National Physical Activity (PA) Guidelines of 30 minutes of moderate-vigorous exercise per day, with the average exercise amongst participants reported to be 1–2 days per week of light-moderate physical activity. All interviews were conducted in English, requiring participants to have basic English language skills. Time in Australia ranged from 5 years to 25 years.
Results: Several themes emerged from the interview data regarding the self-regulation of exercise. Integrating physical activity with social or child care activities was a primary strategy used by many individuals to increase the number of opportunities they had for exercise. Seeking information and paperwork before formal exercise opportunities was a significant facilitator of exercise as individuals with poorer language skills could spend time understanding written information in the home. Social support and having a friend or relative attend formal exercise opportunities also facilitated exercise amongst the individuals interviewed. Planning and seeking spousal/ family support were strategies employed by individuals who successfully exercised on most days and an element of routine was also important for adhering to exercise plans.
Conclusion: The individuals interviewed appeared to succeed in their exercise goals and achieve recommended amounts of physical activity when they had the support and co-participation of friends and/or family. Language and a lack of understanding of Australian exercise norms posed a barrier to exercise for some individuals. Successful exercisers discussed how language barriers could be overcome by planning their exercise programs in advance, attending with a friend and having a routine fitness program. By implementing and recommending the strategies employed by these successfully exercising immigrants, health and fitness services may be more inclusive and accommodating of the needs of culturally and linguistically diverse communities.

682 "Free-living" standing, sitting and lying times among sedentary adults in different BMI categories

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Introduction: Sedentary behaviour is significantly associated with poor health outcomes. A number of recent studies have shown positive correlations exist between body mass index (BMI) and various measures of sedentary behavior, including TV viewing and occupational sitting time. Measuring sedentary behavior is challenging, especially during free-living activities. New generations of accelerometers, such as the ActiGraph GT3X, include an inclinometer that quantifies time spent in different sedentary postures and distinguishes between standing, sitting and lying. The purpose of this study was to examine differences between BMI categories in terms of the time spent in GT3X-determined standing, sitting and lying postures.
Methods: Participants included 22 sedentary adults (14 men, eight women) (mean age 26.5±4.1 years). All were administered the International Physical Activity Questionnaire to capture sitting time. Participants were included if they spent eight or more hours per day sitting. Sedentary postures were determined with the GT3X. With the exception of water-based activities, participants wore the GT3X positioned over the right hip for a period of seven consecutive days during free-living activities, including sleeping. Height and weight were measured and BMI was calculated according to ISAK protocols. BMI was categorized as: 18.5 to <25 kg/m^2 – normal, 25 to <30 kg/m^2 – overweight and >30 kg/m^2 – obese.
Results: Mean BMI was 26.9 kg/m^2 (range 18 – 44.6). Ten participants were classified as normally weighted, six as overweight and six as obese. There was a significant difference between some BMI categories in average daily time spent standing ($F_{(2,151)}$=17.7, p<.001). Participants in normal and overweight groups spent more time standing (6.6 and 7.3 hours respectively) than those in the obese group (5.5 hours). Tukey analyses revealed differences in standing time between normal and overweight groups (p<.05) and between normal and obese groups (p<.001). For sitting time, a significant difference ($F_{(2,151)}$=3.96, p<.05) existed between the overweight (6.9 hours) and obese groups (8.0 hours). Differences were not significant among groups for lying time.
Discussion: Obese participants, on daily average, stood for less time and spent more time sitting and lying down than either the normally weighted or overweight groups. Standing caloric expenditure is double that of sitting and lying, thus, when working with overweight and obese individuals, an approach that includes increasing daily standing time as well as reducing daily sitting and lying time may contribute to achieving a more normal weight.

683 An examination of the association between a mother's parenting practices relating to physical activity and their daughter's physical activity levels

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Introduction: Given the well recognised low physical activity (PA) levels of girls, there is a need to develop strategies that encourage girls to be more active. While it is well established that parents play a key role in providing physical activity opportunities for their children, mothers may be particularly influential as their attitudes, parenting practices and behaviours may influence their daughters' PA behaviours. The aim of this study was to examine the associations between a mother's parenting practices relating to PA and their daughter's PA levels.
Methods: Baseline data from an RCT involving 40 mothers (mean [sd] age=39.1 [4.8] years) and their eldest primary school aged (5–12yrs) daughter in the study were analysed. Measures were taken for objectively measured PA of daughters (7 days accelerometry including mean counts per minute (CPM), % time in moderate PA (%MPA), % time in moderate-to-vigorous PA (%MVPA)) and a number of PA parenting variables sourced and adapted from a number of validated scales including mothers parenting self efficacy, PA role modeling, beliefs about the importance of PA for their daughters and support provided to be active.

Results: In general, mothers were relatively confident that they could influence their daughter's PA levels (mean=3.7/5, sd=0.8). Mothers also had strong beliefs about the importance of PA for their daughters (mean=3.5/4, sd=0.4) and reported relatively strong support for their daughters PA (mean=3.3/4, sd=0.6). Mothers were also somewhat likely to role model PA (mean=2.7/4, sd=0.6). Significant associations were found for mothers beliefs about the importance of physical activity for their daughter and daughters mean CPM (r=0.34, p=0.03), %MPA (r=0.35, p=0.03) and %MVPA (r=0.36, p=0.02). Significant associations were also found for mothers level of support for daughters PA and daughters mean CPM (r=0.36, p=0.02), %MPA (r=0.39, p=0.01), and %MVPA (r=0.34, p=0.03).

Discussion: Our findings suggest that strategies need to be considered to improve mother's beliefs about the importance of PA for their daughters and encourage mothers to provide support and encouragement for their daughters to be physically active. However, these associations need to be tested in experimental studies as potential strategies to increase PA among girls.

684 Fetal growth and leisure-time physical activity during pregnancy

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Introduction: Leisure-time physical activity during pregnancy (PAP) is recommended to healthy future mothers, as evidence grows showing the benefits to mother and fetus. However, most women are not engaged in regular exercise while pregnant. Early studies have associated mainly occupational activities to low birth weight and preterm birth. Recent studies, especially those focused on leisure activities, either failed to prove such association or showed an advantage to active mothers. This study aimed at evaluating the influence of leisure-time PAP on intra-uterine growth restriction (IUGR).

Methods: a cross-sectional study included all mothers who delivered in Pelotas (Brazil) from January 1st to December 31st, and were enrolled in the 2004 Pelotas Birth Cohort Study. Mothers were interviewed and children were measured soon after birth. IUGR was based on the Williams criterion. Leisure-time PAP was measured retrospectively by an instrument developed for the research. Eight PA-related variables were generated according to weekly amount of physical activity and trimester of gestation. Besides, information about family income, skin color, schooling, marital status, mother's age, parity, pre-gestational body mass index, smoking, hypertension and occupational physical activities was also collected. Only singleton live births were included in the analysis.

Results: A total of 4147 children were enrolled and 12.6% presented IUGR. Only 13.3% of women were involved in PAP. All Prevalence rates (PR) during crude analysis were in favor of active women. Women who were active throughout the whole gestation were less likely to present IUGR [PR=0.58 (95% CI 0.34–0.98)], and PAP during first [PR=0.73 (95% CI 0.54–1.00)] and second [PR=0.71 (95% CI 0.51–1.00)] trimester presented borderline results. After controlling for confounders, all results remain in favor of active women (PR's ranged from 0.64 to 0.95), however with no statistical significance. An alternative analysis included only active women (n=553) and no control for confounder was made because among active women only PAP variables were associated to IUGR. In active women, five PAP-related variables were significantly protective against IUGR: PAP in three trimesters, PAP above 90min/week in second trimester, any PAP in second trimester (p=0.04); amount of PAP in terciles (p=0.03); and any PAP in first trimester (p=0.02).

Conclusion: Leisure-time PAP does not increase the chance of IUGR. Although not statistically significant, the effect of leisure-time PAP seems to be protective in the whole population. Among active women only, the measured effect of exercise is more pronounced and apparently higher amounts of PA decrease the chance of IUGR.

685 Determinants of physical activity levels of adults in South Korea: A preliminary study

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Introduction: Even though participating in physical activity (PA) is an important factor to maintain and enhance individual's health, there are lacks of evidences how much PA is good for health for Korean due to lacks of the valid PA measures and unknown daily PA levels. The purpose of this study was to examine the accuracy of the PA measures in free-living and to investigate the determinants of PA levels for Korean adults.

Methods: A total of 42 adults were participated in this study, which were including 23 males (23.26±2.72yrs & BMI 23.30±3.23) and 19 females (20.74±2.10yrs & BMI 19.88±1.96). To measure PA levels in free-living, an accelerometer (Actigraph GT3X, USA) and a pedometer (Omron Pedometer HJ-720ITC, Japan) were worn for 7 consecutive days. Subjective self-reports were employed to collect the sedentary activities (TV viewing hours & hours of computer) and the perceived PA (one item: are you physically active? Rating scale: 1 to 5, 1=very low vs. 5=very high). Frequent determinants of the PA from the precious studies were included, such as BMI, monthly house income, and perceived health. Descriptive analysis was applied, and Pearson and Spearman correlation coefficients were calculated depending on the measurement scale using SPSS 19.0.

Results: Participants were participating in moderate intensity of PA for 45.42(±.21.35) minutes per day, and the total step taken per day was 8528.42(±3057.19). The moderate intensity of PA from the accelerometer was moderately correlated with walking steps (r=.647) in free-living. TV viewing and computer use were negatively correlated with vigorous PA (r=-.234 & -.294, respectively), but not with moderate PA (r<-.101). The house income, perceived health, and perceived PA showed relatively higher correlation with the moderate intensity of PA (ρ=.434, .484, & .451, respectively) compared to other variables. Similarly, walking steps was moderately correlated with house income, perceived health, and perceive PA (ρ=.356, .420, & .408, respectively).

Discussion: House income and perceived health were critical determinates of participating in moderate intensity PA and walking steps for Korean adults. The less sedentary behavior (watching TV and using computer) showed higher level of vigorous PA, but not moderate PA. Wider range of age groups with a larger sample size should be considered to investigate the determinants of the PA for Korean adults in the further study.

686 Association of self-reported physical activity patterns and socio-demographic factors among normal-weight and overweight Japanese men

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Introduction: In designing relevant policies and effective interventions for obesity epidemic, a better understanding of the patterns and socio-demographic correlates of physical activity (PA) among overweight or obese groups is critical because this information could help in targeting socio-demographic subgroups that are less likely to engage in sufficient PA. However, it is still not known whether overweight men have different patterns and socio-demographic correlates of self-reported PA compared with normal-weight men. Thus, this study examined the perceived PA patterns and associated socio-demographic factors among normal-weight and overweight Japanese men.

Methods: Data were analyzed for 1,420 men (aged 44.4±8.3 years) who responded to an Internet-based cross-sectional survey relating to socio-demographic variables (age, marital status, educational level, job status, household income), BMI status (participants with a BMI ≥25 kg/m^2 were defined as overweight), and a short version of the International Physical Activity Questionnaire (IPAQ-SV). Three outcome variables in the IPAQ-SV were calculated: 1) total PA; 2) walking; 3) moderate-to-vigorous PA (MVPA) excluding walking. Mann–Whitney, chi-square, and binary logistic regression analyses were employed.

Results: Normal-weight men were significantly more likely to attain 150 minutes per week of MVPA than overweight men (26.6% vs. 21.3%; p=0.035), whereas there were no significant proportional differences in total PA and walking between the two BMI subgroups. With PA outcomes, a significant interaction was observed between BMI status and household income (p=0.004 for total PA; p=0.02 for walking). In the subgroup analyses, having a lower household income (odds ratio, 0.63; 95% CI, 0.41–0.96) was negatively associated with attaining 150 minutes of walking per week among normal-weight men. No significant associations between household income and attaining 150 minutes per week of total PA and walking were found among overweight men.

Discussion: Based on the findings of the present study, it may be more difficult for overweight men to engage in MVPA (e.g. leisure-time PA, sports, and vigorous types of recreational activities) compared with walking. Therefore, encouraging overweight men to engage in walking could be considered a gateway for them to achieve health-enhancing levels of PA. The results also revealed that patterns and socio-demographic correlates of self-reported PA in overweight men are different from those in normal-weight men. This finding suggests the necessity of developing specific strategies for PA intervention among overweight men. Socio-demographic correlates of PA may be more important for normal-weight than overweight men.

687 The internet and postpartum women: Roles, patterns of usage and opportunities for intervention delivery

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Introduction: The internet has become embedded in daily life, and computer use is becoming an increasingly significant sedentary behaviour, with important health consequences. Postpartum women form an important demographic group whose activity patterns change dramatically in response to their changed life roles. This project explored 1) how post-partum women used the internet in their daily lives, and 2) whether the internet/ social networking could be harnessed to enhance physical activity.

Methods: Women up to 12-months postpartum took part in this qualitative study. Women from diverse socio-demographic backgrounds were purposively recruited and snowball sampling used to increase sample size. Eighteen participants undertook a single 20–50 min telephone interview. The role of the internet and women's opinions regarding physical activity and future online physical activity interventions were explored using semi-structured questions, which were audio-recorded and transcribed verbatim. A pragmatic analysis approach was used, with the written transcripts analysed using data immersion, and key topics given descriptive labels (codes). Following member checking to ensure accuracy of transcription and coding, codes were examined and collapsed to form key themes. Internet usage data were collected using fully-structured questions and analysed descriptively.

Results: Participants reported using the internet to enhance social relationships, seek support from others, find health information, buy groceries, clothes and gifts, and undertake household tasks (e.g. bill payment). Participants described motherhood as a potentially isolating experience, and reported that the internet provided key means of connecting with the outside world. Other advantages of the internet were convenience and immediacy of obtaining information/advice. Negative experiences primarily related to advice/opinions on parenting forums perceived to be overzealous by participants. Participants typically reported using the internet for 1–3 hours/d, most commonly from a smartphone or laptop. The most popular website accessed by far was Facebook, which all 18 participants reported using regularly, typically several times each day. Many participants expressed a desire to be more physically active. Women reported that an intervention delivered via Facebook would be appealing to them. They suggested that the public nature of social networking websites would enhance their motivation to adhere to a physical activity program. Desired features were an ability to participate with existing friends, the option to meet new people to be physically active with and flexibility to accommodate carer responsibilities.

Conclusion: The internet plays a predominantly positive role in many facets of post-partum women's lives. An online social-networking-based physical activity intervention appears to be appealing to this population.

688 Safest exercise hours in Tehran based on air quality index values

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Introduction: Regarding the problem of air pollution in Tehran, we performed this study to find the major air pollutants in Tehran City, determine the trend of their hourly changes, and to determine cleanest and the most polluted hours in various parts of Tehran city and Tehran totally.

Methods: Getting data from 7 air pollutant monitoring stations, the hourly means of air pollutant concentrations from 2004 to 2008 in places of stations were measured and converted to Air Quality index (AQI) values. To find the cleanest and the most polluted hours in exercise places (parks and stadiums), map of Tehran air pollution using data from monitoring stations and Arc GIS software was created.

Results: Fine particles less than 10 micrometer (PM10), carbon monoxide (CO) and ozone (O3) were major air pollutants in Tehran.
Totally, the cleanest hours were 4 to 6 and then 17 to 18. Peak hours for PM10 were 23 to 1, for CO 8 and 21, and for Ozone 13 to 15 .Changes in hourly PM10 concentrations were minimal in all hours of night and day. Relatively similar patterns were also seen in exercise places using Tehran air pollution map. In addition, comparing the pollutant concentration means for summer and winter as a representative for the hot and cold seasons of the year showed that CO levels were higher in the winter while ozone had higher levels in summer. These differences were statistically significant.
Discussion: Regarding the PM10 was the major air pollutant in Tehran and its hourly concentration changes were minimal, it is advised that in all hours of night and day, unusually sensitive people should consider reducing prolonged or heavy exertion. Also it is advised that in peak hours of PM10, people with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion. For peak hours of O3, It is advised that children, older adults and respiratory patients should reduce prolonged or heavy exertion. Also according to this study, It is better to perform physical activities and conduct competitions in middle of Tehran city in early hours of morning (before 0700) and in 17 to 18 at afternoon; However it is important to consider other parameters involved in determining the best time for exercise, such as quality of air in the day and hour of event, climatologically variables, local pollutants in microenvironments and warning environmental messages about the quality of air.

689 An anthropological analysis of students' activities during recess in relation to the physical and organizational surroundings

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Introduction: Several studies show that as children grow older and enter their teenage years their physical activity level decreases.
The study 'SPACE – Space for physical activity' seek to prevent this decrease in everyday physical activity through a combination of physical and organizational interventions. The Danish public school is the basis for the SPACE-study, almost 90% of children in Denmark attend public school. My PhD. is part of the SPACE-study and explores the connections between the students' social identities, their physical and organizational surroundings and their patterns of movement i.e. during recess. The anthropological fieldwork has been conducted over a three year period making it possible to follow the children from the 5th to the 7th grade; during this period of time the student go from the age of 11 to 14 years old, a transformation from being a child to becoming an adolescent.
Methods: The analysis is based upon an anthropological fieldwork conducted at two Danish public schools. At each school the fieldwork focused primarily upon one class of approximately 25 students. The fieldwork consists of participant observation during the school day both during periods and breaks, participant observation during after school activities, and in depth interviews with the students. All in all I spend 4 months at each school.
Results: The norms for movement and physical activity among the students in the 5th to the 7th grade are created and influenced crosswise by the different places and spaces that the students stay and move between. The school yard can be compartmentalized in areas on the basis of the activities that are going on, the school yard elements, the group of students engaged in the activity, the proximity to the school building and the visibility to others. In this presentation the starting point will be the proximity to the school building and the visibility of the area to other students and the teachers on playground duty. The students engaged in physical activities close to the school building where others can see them generally speaking are students with high social status whereas the students engaged in activities on the outskirts of the school grounds have a lower social status.
Discussion: The anthropological approach to this area of research contributes with a different type of knowledge and thus a new angle to understanding the processes regarding growing up related to students level of physical activity.
Support: This study was supported by TrygFonden.

690 Associations between sitting time and a broad range of symptoms in mid-age women

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Introduction: A growing body of evidence suggests that prolonged sitting time is associated with adverse health outcomes. To date, sedentary behaviour epidemiology has mainly focused on outcomes related to metabolic health. The aim of this study was to explore whether sitting is associated with health-related symptoms.
Methods: Mid-age (50–55 years) participants in the Australian Longitudinal Study on Women's Health completed surveys in 2004 (n=10286), 2007 (n=10128), and 2010 (n=9452) with questions about total daily sitting time (categorized into <6, 6–9, or ≥9 hours/day) and frequency of symptoms in the preceding 12 months, including allergies, breathing difficulties, indigestion, chest pain, headaches, tiredness, stiff/painful joints, back pain, urine problems, haemorrhoids, bowel problems, vaginal discharge, hot flushes, night sweats, eyesight problems, hearing problems, depression, anxiety, and palpitations (categorized into often vs. never/rarely/sometimes). Longitudinal associations between sitting and symptoms were examined using logistic generalized estimating equations models with and without a 3-year time lag, and with and without adjustment for age, education, BMI, physical activity, cigarette smoking and alcohol consumption. To account for multiple testing, the significance level was set at 0.01.
Results: Approximately 50%, 32% and 18% of the women were classified as sitting <6, 6–9 and ≥9 hours/day, respectively. After adjustment for confounders, women who reported sitting ≥9 hours/day had significantly increased odds of breathing difficulties (odds ratio [OR]=1.52, 99% confidence interval [CI]=1.17–2.00), tiredness (OR=1.21, CI=1.05–1.40), bowel problems (OR=1.26, CI=1.02–1.56), eyesight problems (OR=1.16, CI=1.01–1.34), and depression (OR=1.39, CI=1.15–1.68) and decreased odds of palpitations (OR=0.73, CI=0.54–0.99) compared with women who reported sitting <6 hours/day. In the lagged models, sitting ≥9 hours/day was associated with increased odds of breathing difficulty (OR=1.94, CI=1.40–2.69), chest pain (OR=2.04, CI=1.14–3.70), and tiredness (OR=1.24, CI=1.04–1.48) compared with sitting <6 hours/day.
Discussion: Prolonged sitting time was associated with a broad range of physical and psychological symptoms, suggesting a diverse impact on health. Validation of these findings in other studies is now required.

691 Influences of social networks and sport, exercise, and physical activity promotion participation on acceptance of new exercise members in Thailand

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Influences of social networks are an important role that always has effect on humans being activity and behavior. This study examines effects of social networks and sport, exercise promotion activity participation on acceptance of new exercise member by using data from the survey of sport, exercise and physical activity promotion round two that collected data in 2009 by the Institute for Population and Social Research, Mahidol University, Thailand. The project was supported by the Thailand Health Promotion Foundation. There are 3,240 samples in the study. Dependent variable measured by categorical variable which divided into 3 sub-categories. They are: 1) do not exercise 2) new exercise member and 3) old exercise member. Independent variables are age, education, occupation, participation in community sport, exercise and physical activity promotion, social networks, etc. The main results from multinomial logistic regression analysis showed that, when number of social networks and number of times that people have been involving in sport, exercise, and physical activity promotion participation increase, probability of acceptance to be a new member of sport, exercise, and physical activity club will be increased, after controlling any other variables in the model. This finding suggest that, to promote sport, exercise, and physical activity in Thailand, it is important not only to considering on the role and function of social networks-particularly within community level i.e. village and neighborhood, but also civil population participation in the program during the campaign.

692 Womens' healthy lifestyle behaviour in urban Vanuatu – an in-depth investigation

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Introduction: The Pacific region has experienced rapid urbanisation and lifestyle changes leading to high rates of NCD prevalence. The number of successful programs addressing NCD issues remains scarce and at present there is little evidence of the effectiveness of any initiative in achieving desired development outcomes. In response, we present the first stage of a rigorous development of an urban Pacific health intervention program that investigated barriers and facilitators for healthy lifestyles in Port Vila, Vanuatu.
Methods: This study is of qualitative nature and can be referred to as formative research. Six one-hour semi-structured focus group discussions with 37 female civil servants were conducted to understand barriers and facilitators for healthy lifestyles.
Findings: Several perceived barriers and facilitators were identified. Contrary to the general belief that overweight in less developed countries is associated with higher socio-economic status, our findings suggest that financial limitations and expensive food prices are the major culprit for increasing NCD risk factors. Less expensive food (imported) is generally favoured over more costly local options such as fresh fruits and vegetables. Further, it was found that fun aspects are of central importance to program development. Participants reported that fun-centred programs are more likely to be successful than programs focussing on stern competition. We understand that a fun-loving culture needs an appropriate fun-activity approach and suggest to embrace this in program development. Overall, barriers include financial limitations; time issues; family commitments; environmental aspects; and motivational hindrances that limit time and opportunities for healthy lifestyle behaviour. Associated facilitators include supportive environments; social support mechanisms; and the implementation of rigorous health policies.
Discussion: Formative work is essential in designing meaningful health intervention programs; uncovered barriers and facilitators can help inform the development of successful health interventions. Whilst findings indicate that ni-Vanuatu women are more likely to choose walking for leisure time PA over any other sport activity, they also confirm they favour a team-approach over individual exercise activities. We assume that a team-based walking program can result in increased PA levels in this population and potentially reduce NCD risk. Future research could aim at discovering how men perceive healthy lifestyle behaviour to eventually design culturally appropriate interventions that involve men, women and the family as a whole. We conclude that for successful Pacific health programs, formative research is a prerequisite for developing culturally relevant initiatives that specifically respond to the target population's needs and wants.

693 Physical activity among rural American residents: Examining the role of faith-based institutions

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Introduction: Approximately 21% of Americans reside in rural areas and 97% of U.S. land area is classified as rural. Rural areas in the U.S. have disproportionately greater rates of chronic disease, obesity, and physical inactivity. The role of physical activity in preventing chronic disease onset and development is well established and supported. However, most Americans do not engage in physical activity at levels recommended for health benefits. Evidence consistently supports the effectiveness of collaborating with faith-based institutions to increase participation and sustainability of health behavior initiatives. Faith-based institutions become instrumental when collaborating with rural communities, where these institutions are often communal gathering places and provide facilities. Although evidence supports collaborations with faith-based institutions for planning and implementing physical activity initiatives, research has not examined the role of faith-based institutions in physical activity promotion in rural settings. The purpose of this study was to examine how rural faith-based institutions provide support for physical activity within their communities.
Methods: Faith-based institutions were identified for three rural counties within central Texas (three towns/county). Website content for faith-based institutions was reviewed and coded using a grounded theory approach. Google Maps and Google Street View were used to identify physical activity amenities available on grounds of faith-based institutions.
Results: Average population size for these counties was 19,821. Each county was mostly white (52.5%–80.7%), and the remaining population consisted of Blacks (1.6%–25.3%) and people of Latino/Hispanic origin (16.1%–20.8%). Sixteen to 23.4% of these residents were below poverty level. On average 26 faith-based institutions were identified for each county. Baptist affiliated churches were the most common. Physical activity amenities identified using Google Maps and Google Street View included on-site open fields, playground equipment, basket-ball hoops, and adjacency to a park or open lot. Review of website materials (calendars, activities, etc…) revealed the following supports for physical activity: role modeling by leadership, classes, equipment, sport leagues, gatherings, and child/youth active play time. Children/youth were targeted more frequently than adults.

Discussion: Future research should examine these characteristics in a broader sample. Understanding the role faith-based institutions play will help guide future physical activity initiatives in better understanding the support and barriers associated with faith-based institutions in communities. These results also suggest the importance of role modeling by leadership in addition to facilities and programming supportive of physical activity. Because faith-based institutions and religion are major socializing institutions for human activity, continuing collaborations with local faith-based institutions is imperative.

694   A second-order systems approach to lower socio-economic community recreation provision

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Sport and recreation plays an important role in the culture and daily lives of South Africans. Although it unites a developing country such as South-Africa on a number of levels, it unfortunately also constructs and reinforces differences that disadvantage some and privilege others. Low socio-economic communities are often the target of interventions by well-meaning volunteers and non-profit organizations. Even though volunteers approach low socio-economic communities with good intentions they tend to react to 'feedback' from the community, maintaining the unending need for the provision of basic needs.

This study utilised systems theory to analyse current community interventions and to direct a sustainable community intervention that will result in system change. In an attempt to move away from a first-order systems approach which would have inevitably contributed to the homeostasis of the community system in its current state, the study engaged in a second-order systems approach. A community recreation program framed in an action learning process was initiated as an illogical response to the needs of the community and the question was asked: 'How can community recreation contribute to positive behavioural change in a low socio-economic community?' From an investigation of a variety of community interventions it was found that interventions are often focused on a specific outcome, for example changing eating and exercise behaviours within a community to address obesity. It utilises a top-down, expert-driven approach to solving the 'problem'. A further analysis of these interventions found that it placed the lower socio-economic community in a double-bind situation from which sustainability becomes less viable. The intervention was initiated by a group of ten students in collaboration with the author. An open area in the middle of the community was identified as possible area to be used for recreation programming. The first few sessions started with the group of students playing different ball games amongst themselves. On the first day we were joined by about ten kids and together we came up with a name for our program: 'Come and play – it's Friday!' Our group have grown since the first session and we now have several adults from the community taking control of the intervention. Participation in the community-owned recreation program was sustained during the study period and is still on-going. Participants in the study reported a higher perception of well-being as well as an awareness of being in control. Although not included in the research methodology, the community social worker reported a lower level of complaints from participants in the study.

Results of the study showed that recreation have the possibility to instigate systems change within a low socio-economic community when approached from a second-order systems position, and may therefore provide a successful alternative to current low socio-economic community interventions.

695   Towards a comprehensive understanding of women's physical activity behaviour postpartum: Implications for intervention design

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Introduction: Women going through the major life transition of motherhood experience significant physical, psychological, social and lifestyle changes, including a decrease in physical activity (PA) behaviour, which compromises maternal health. The aim of this study was to understand the determinants of PA among postnatal women in order to inform intervention design.

Methods: semi-structured in-depth telephone interviews amongst a purposively recruited sample of 30 postnatal women. Interview questions were based on a socio-ecological framework and analysed through a feminist lens. Questions focused on changes in PA behaviour, general barriers and enablers of PA, individual factors, social and physical environmental factors influencing PA behaviour, and intervention suggestions.

Results: Individual factors (e.g. life changes related to motherhood, physical and psychological well being, self-efficacy, motivation, and priority), social environmental factors (social support and social capital) and the physical environment (e.g. neighbourhood safety, availability and accessibility of paths and PA facilities, and enjoyable scenery) influenced women's PA behaviour during the postnatal phase. Struggles identified by the feminist analysis, which inhibited PA, included: 1) social role strain, 2) being active for health and enjoyment as well as improved body image, 3) breastfeeding in public, and 4) fulfilling own and baby's needs.

Discussion: Existing behavioural change theories do not sufficiently explain women's PA behaviour during the postnatal period. Their unique needs ought to be addressed in order to increase PA behaviour and wellbeing during this phase of a woman's life. Strategy suggestions include improving informational support for health professionals; increasing PA groups; increasing companionship from partner, family and friends; social networking; partner involvement and support; environmental aesthetics; safety; path accessibility and connectivity; improving maternal skills in primigravidas; encouraging women to perceive and experience PA as enjoyable; supporting breastfeeding in public; and assisting women in finding a balance between social responsibilities and self-care.

696 Health promotion practice: Effect of an exercise program on functionality and physicality in elderly women

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A growing number of physical activity programs have been performed over the years in order to evaluate the potential influence of increased physical activity on elder's health and quality of life (QoL). Besides functionality, social and body perception contributes in a very significant way to QoL for the elderly. The purpose of this study was to assess body's perceptions and evaluate functionality of elderly women and analyse the effects of exercise program in the repositioning of physical identity. Nineteen elderly women were evaluated before and after 10 months generalized physical activity program (PAP). Physical fitness (Senior Fitness Test) and habitual physical activity (accelerometry – 7 consecutive days) were assessed at each moment. To understand physicality semi-direct interviews and group interviews were also performed, and the data was thereafter submitted to an inductive analysis and interpretation, using the QSRNVivo7. The main results before the PAP are: i) the qualitative data reflect perceptions of the bodies that reveal a "sick and frail body" shown by concerns about becoming less active or able related with the existence of several physical limitations and chronic diseases; ii) quantitative data showed, according to the normative values, a good functional performance necessary for an independent daily-life; The main results after the PAP are: iii) qualitative data suggest a physical identity repositioning with clear empowerment of the women's body, reflected on a better physical and social dignity; iv) the Senior Fitness Test results showed that participants are functionally and physically autonomous since only flexibility was above the normative values. We can speculate that the women elderly physical constraints are present in daily life as part of the culture. Subjects, especially woman must lead with a permanent state of symbolic dependency with their body and seems to perceive physicality with more fragility when compared with man. The overall findings suggest with exception of flexibility, a generalized PAP may help to retain functionality that is important for autonomy and QoL of older adults.

697 Physical exercise and chronic orthopedic pain: A study with retirees elderly

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Introduction: The aging process is characterized by a decline in function of several organs, and consequently, an increase in the prevalence of chronic pain. It is responsible for causing not only tissue damage but also psychological and social disorders. Therefore, effective preventive strategy to reduce the painful symptoms is the regular practice of physical exercise. This study aims to describe the characteristics of orthopedic chronic pain in elderly practitioners and non-practitioners of regular physical exercise.
Methods: An epidemiological descriptive study was performed with all elderly (n=54) practitioners (gymnastics and dance) and non-practitioners (manual crafts) of regular exercise at the Association of Retired Persons and Pensioners of Pelotas city (ABAPP), Brazil. McGill questionnaire (Br-MPQ) was used in order to verify the presence of orthopedic chronic pain in this population.
Results: The prevalence of chronic pain is higher in older non-exercise individuals (100%) in comparison with practitioners of regular exercise (44%). The most affected body region with pain was the knees for both groups (20% and 23% for exercise and non-exercise group). It was also observed that 33% of non-practicing regular exercise elderly reported unbearable pain compared with 11% of practitioners.
Discussion: The study showed a high prevalence of chronic orthopedic pain among the elderly. Despite the high prevalence of pain in both groups, this was lower among those practicing physical exercises. The results should be interpreted with caution due to reverse causality bias and confounding factors not controlled in the study.

698 Raising the bar for elder rehab

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Introduction: A growing elderly population will place increased demands on the current Australian Healthcare system especially if physical incapacity necessitates nursing and high care accommodation. Currently the Day Therapy Centre (DTC) Program is an Australian Government funded program which subsidises a range of therapies to frail older people living in the community in order to assist them to maintain or recover a level of independence that will allow them to continue to live in the community or in low level residential aged care. DTC providers utilise inputs from Allied Health practitioners and commonly provide group community exercise classes of a pre-programmed nature. Research indicates exercise is most effective when it is specific, progressive and ongoing, which requires that individuals are self motivated to sustain their activity.
Method: The authors took an innovative approach to employing a personal trainer to work within the rehabilitation team focusing on individual needs from active rehabilitation and providing a more personalised program for each client. Embedded in this service was a regular six monthly fitness assessment with the Allied Health Team using the Seniors Fitness test, standardised with Australian based age group norms. As the SFT outcomes were plotted against age norms for each client in each category the fitness program could be adjusted to focus on areas where the client was falling behind their peers.
Results: Data across all outcomes has been evaluated twice per client so far and has shown consistent improvement for clients raising them toward or above the Australian norms for healthy independent adults in their own age group across outcomes. Client feedback has been positive and the individual 1:1 personal training sessions have had to be limited due to their popularity. Individual client goals have been met enabling safe effective exercise progression. The specificity of the outcome measures has enabled positive feedback to clients, trainer and therapists.
Discussion: The process has created both challenges and rewards. Initially the integration of a "fitness' professional into a "rehab" environment necessitated a shift in perspectives from professionals on both sides regarding clients desires and capabilities. However the benefits were soon seen in improved attendance as individuals engaged more fully in the rehabilitative process and exercise regimes could be more responsive to individual needs. Furthermore a sense of satisfaction for all participants was achieved by incorporating clear objective outcome processes that demonstrated the results of their exercise.

699 Physical activity amongst older adults with musculoskeletal disorders: A descriptive study

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Introduction: The World Health Organisation has identified physical inactivity as the fourth leading effective cause of death globally. The burden of physical inactivity will increase as the population ages. In addition to increased risk or mortality, prior research has indicated older adults with chronic musculoskeletal conditions are likely to face increased morbidity and poorer prognoses if they are physically inactive. There is currently a scarcity of empirical research describing the physical activity profile of older adults with chronic musculoskeletal disorders. The aim of this investigation was to describe the self-reported physical activity profile and body mass index (BMI) profile of a sample of older adults with chronic musculoskeletal disorders accessing outpatient hospital services.

Methods: A cohort investigation with a single assessment point was undertaken amongst patients older than 60 years of age (n=81) receiving non-surgical treatment for a musculoskeletal disorder in a hospital ambulatory setting. Participants reported their physical activity levels over the prior seven days using the Active Australia Survey. Their body mass index (and category) was also calculated. Conventional descriptive statistics were used to describe the physical activity and BMI profile of the sample.

Results: All participants (n=81) had complete data sets and were included in analysis. The mean (standard deviation) age of participants was 68(6), 43(52.1%) were male. The median (interquartile-range) of walking time, moderate activity and vigorous activity (all in minutes) over the seven day recall period was 20(70–210), 0(0–60) and 0(0–0) respectively. The median (interquatile-range) met-minutes for the sample over the seven days were 612.5 (210–1260). The number (percentage) of participants who did not meet the Department of Health and Ageing Physical Activity Recommendations for Older Australians was 45(55.6%). The number (percentage) of participants in BMI categories of underweight, normal, overweight, obese and morbidly obese were 1(1.2%), 20(24.7%), 20(20.7%), 31(38.3%) and 9(11.1%) respectively.

Discussion: This study has revealed that a majority of older adults with musculoskeletal conditions in this sample do not meet physical activity guidelines. Approximately three quarters of these older adults were overweight or obese. These findings do not indicate causality of the relationship between physical inactivity, BMI and musculoskeletal disorders. However, they highlight the need for effective physical activity behavior change interventions suitable for this important clinical group that may face additional barriers to undertaking physical activity than those experienced by the general population. Future research should develop and evaluate the effectiveness of targeted interventions for this purpose.

700 Effectiveness of a community-based, non-clinical intervention on reducing the risks of fall in older adults in Liverpool (Liveability Programme)

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Introduction: Falls are a main cause of morbidity and a major threat to the health and independence of older adults. However individuals who are prone to falls can be identified and preventive measures such as regular physical activity can be applied to avoid the adverse implications of falls and injuries on public health.

Methods: Forty two participants (71 percent female) aged (60+), were recruited (intervention group=25, comparison group=17) to a 12-week physical activity intervention (Liveability programme) with measures taken pre and post programme. Twice weekly 1-hour classes were conducted in a leisure centre by trained community instructors. A quantitative approach using questionnaires including: Physical Activity Score for Elderly; PASE, Falls Risk Assessment Tool; FRAT, Confidence in Balance), and an objective measurements (senior fitness test, SFT) were employed.

Results: There were significant interaction effects (P<.05) for PASE, FRAT, Confidence in Balance and SFT between the two groups before and after the intervention. In the treatment group physical activity increased by 34 percent, confidence in balance by 7 percent, falls risk reduced by 20 percent and improved functional mobility and flexibility increased by 59 percent. These compared to 3 percent increase in physical activity, 7.5 percent decrease in confidence in balance, 1.3 percent improvement in FRAT and 42 percent improvement in SFT in the comparison group.

Discussion: The effect of 2 hours weekly of challenging exercise in reducing the risk of falls by 16 percent has been documented. The Liveability programme included 2 hours per week of challenging activities that included a mixture of strength, flexibility and balance exercises in a structured instructor led group session. This mixture of exercises not only increased habitual physical activity but also reduced the risk of falls, improved confidence in balance and increased functional mobility and fitness. As such the findings from this study concur with previous studies but also quantify the impact of the programme in increasing physical activity during day to day living. This suggests that community type non-clinical programmes can have a significant preventive effect on risk of falls in older people. Further randomised control trails are required to confirm these findings.

701 Chronic diseases and leisure time physical activity in an elder population from Recife, Brazil

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Background: The Project GUIA– Guide for Useful Interventions for Activity in Brazil and Latin America is a cross-national collaboration between recognized academic and governmental institutions from the United States and from Brazil. The GUIA has conducted an evaluation of Academia da Cidade Program (ACP) in Recife, Brazil. It had shown that ACP was associated with increased of physical activity among the population. Because ACP participants are predominantly female and older, it has potential to positively impact on chronic diseases among this population.
Objective: To analyze the association between age, physical activity and chronic diseases among this population.
Methods: The sample used it was the data from a random telephone survey of 2045 residents of Recife, Brazil to investigate the associations of age with selected chronic diseases and leisure time physical activity (LTPA). We used logistic regression to generate odds ratios of occurrence of at least one of five chronic diseases (diabetes, CVD, stroke and osteoporosis) by levels of age groups (18–59 and 60+) adjusting for other sociodemographics (sex, race, education and marital status), risk factors (smoking, and drinking alcohol). We used logistic regression to generate odds ratios of low LTPA by age, adjusted for levels of other sociodemographics (sex, race, education and marital status) and risk factors (smoking and drinking alcohol). We used tested for interactions between age and sex before adjusting models for LTPA and chronic diseases.
Results: In crude analysis, aging was not associated with LTPA was associated with diagnosing at least one chronic disease. Also, women were 2.3 times more likely than men to report low levels of LTPA and 1.37 more likely to report diagnosis of at least one chronic disease. We found interactions between age and sex in their effect on both LTPA and CD. In adjusted analysis with interaction, women of older age were still more likely than men to report low LTPA this difference was reduced by 50%. Also, while women of older age had slightly higher likelihood of reporting at least one chronic disease than men, younger women were less likely. After adjustment those with high school education were less likely to report low levels of LTPA. Younger age, high school graduation, being single and having low BMI were all protective of chronic disease.
Conclusions: The associations of age with chronic diseases and LTPA may have public health policy implications and underscore the importance of evaluating effect of the ACP on physical activity levels in Brazil.

702 Leisure-time physical activity level of elderly residents in a large Brazilian urban center

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Background: Considering physical activity (PA) to be one of the most important health-promoting factors affecting elderly people functional capacities, this work aims to analyse Leisure-Time Physical Activity (LTPA) levels of elderly residents in a large urban center, Brazil.
Methods: Cross-sectional study with a 135 elderly sample, an average age of 74,1 years (+/- 8,5 years), out of which 94 were female (69,6%). For PA data it was used the leisure domain from IPAQ, having its cut-off point at 150 minutes/week. Descriptive, qui-square and logistic regression analyses were used with significance level of p<0,05.
Results: 73,3% of the elderly were considered insufficiently active. Insufficient PA was significantly more frequent among women than men, for both crude and adjusted analyses. In the same way, in both analyses it was found a positive association between number of medicines and accomplishment of actual recommendations for LTPA.
Conclusions: The study showed a high percent of elderly people insufficiently active during leisure-time, mainly among women. Research is needed to identify public health measures to revert this situation.

703 Physical activity levels in elderly type II diabetic patients in accordance with their BMI

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Introduction: The greatest epidemiological trends of our times are the aging of the population, the obesity epidemic and Type II Diabetes. Each of these trends has important effects on body composition, morbidity, and mortality. Assessment of physical activity (PA) is necessary when the relationship between practice and health benefits is being investigated. Accelerometers (ACL) provide data about the amount, frequency and intensity of movement for extended periods of time.
Purpose: To evaluate the prevalence of obesity in elderly and its association with the minutes of moderate to vigorous PA (MVPA)/day.
Methods: Data was obtained from 116 healthy elderly subjects (mean age 65.8 years; 74 women and 42 men), which have used during a week the accelerometer (GT1M, Actigraph, LLC) to evaluate the levels of physical activity (PA) in accordance with standard procedures and specific cut-off points, and measured Body Composition using a DEXA (Hologic QDR).
Results: The prevalence of overweight and obese (O+OB) participants was high, with more than 90% of women (W) and men (M) being considered O+OB. The number of minutes of MVPA by gender and groups of BMI was: women [normal weight (nw): 25.4; overweight (ov): 36 and obese (ob): 24.2] and men (nw: 39.9; ov: 34.3 and ob: 27.2), statistically significant differences only for women (p<0.05), between ov and ob. No statistically significant differences were found between men and women for the number of minutes of MVPA/day (31.6 vs 28.5), although women present lower scores. There's a negative correlation between the MVPA/day and BMI (W:-0.20; M:-0.18) but not statistically significant.
Conclusions: The prevalence of O+OB subjects was very high, with prevalence's above 90%. The number of MVPA/days seems more relevant for women than for men. Men are usually more active than women, even among elderly adults. Considering the high prevalence of obesity among type II diabetic patients, it would be crucial to start interventions in the specific population.

704 Riding a bicycle may be a falls prevention strategy – a pilot study

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Introduction: Physical activities that increase leg strength and improve balance are recommended for falls prevention. Popular and everyday activities that achieve these recommendations are not readily available, with many older adults not willing to attend group based physical activities. Cycling is a popular form of recreation, involving leg strength and balance. There is some evidence that stationary cycling can improve the leg strength and balance of stroke patients. The aim of this pilot study was to explore the relationship between cycling participation and leg strength and balance in healthy older adults. Methods: We conducted a cross-sectional survey of 43 adults aged 40–75 years. We measured leg strength using an electronic force gauge, dynamic balance using the Choice Step Reaction Time (CSRT) test, and static balance using timed single leg standing. We also recorded cycling frequency, other physical activity, age and sex. The analysis tested the moderating effect of current cycling activity on balance and strength, adjusting for other physical activity. Results: After adjusting for age, sex, and physical activity, having ridden a bicycle in the past month was significantly associated with quicker decision speed and response time on the CSRT (which are important predictors of likelihood of falls). The single leg standing time was marginally significantly associated with cycling (p=0.06) with a large effect coefficient, with cyclists able to stand on one leg for 47 seconds longer on average than non-cyclists. Surprisingly, leg strength was not associated with cycling, but this may have been a function of the measure used to assess leg strength.
Discussion: These data suggest that cycling has promise as a falls prevention strategy for older adults, and may have an additional benefit over and above other physical activity. Cycling is a popular recreational activity and transport option in adulthood, and there are further potential health benefits from falls reduction if cycling was continued by older adults.

705 Leisure time physical activity in elderly users of primary health units in Brazil

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We conducted a cross-sectional study in a cohort of elderly individuals living in the area covered by five primary health care units in the city of Pelotas, Brazil. These individuals are part of the Education Program of Work for Health (Health-PET) of the Federal University of Pelotas.The purpose of this study was to provide baseline data for future intervention and monitoring of the elderly in relation to leisure time physical activity. We interviewed 1,436 elderly subjects aged 60 years or more. The average age of respondents was 70.2 years (SD=7.97) and 14.5% were aged 80 years or more. Among the elderly, 46% reported living with a partner, 63.9% had white skin color and 71.6% said they are able to read and write. Women constituted 64.8%of the sample. The prevalence of physical inactivity in leisure-time(<150 min/wk) was 80% (95% CI 77.9 to 82.1), being higher in women (85.3%), in those aged 80 or more (89.7%), with lower education (85.6%), with low per capita income(82.2%) and who rate their health as poor (87.4%).
In the crude and adjusted analyses physical inactivity was associated with female sex, older age and poor self-rated health. The results show that the prevalence of physical inactivity among elderly users of these basic health units is very high, indicating the need for interventions to promote physical activity.

706 Time spent in sedentary behaviors as a predictor for functional disability in the elderly

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Introduction: Maintenance of life style favors the maintenance of social functions, so identification of the amount of time spent in sedentary behavior may be useful in preventing and disabling processes aid of public health management interventions aimed at maintaining the functional state. The aim of this study was to analyze the predictive capacity and identify the cutoff of the amount of time spent in sedentary behaviors to the presence of functional disability.
Methods: Cross-sectional study was conducted with a random sample of 624 subjects aged 60 to 96 year. Functional disability was determined by the perceived limitations in relation to instrumental activities of daily living (The Lawton IADL Scale) and sedentary behavior in minutes (IPAQ). For analysis we used the Receiver Operating Characteristic Curves (ROC) and compared the areas of time spent in sedentary behaviors, by gender and absence of functional disability. Identified the cut points of time spent in sedentary behavior (minutes/week). To predict the absence of functional disability.
Results: The results suggest that the cutoff points are between 585 and 590 minutes/week for men (sensibility of 57.3–69.7 and specificity of 75.8–57.6) and 550 and 635 for women (sensibility of 55.5–46.6 and specificity of 76.6–73.7).
Discussion: Physical inactivity is a modifiable behavior that can be reduced through investment in educational activities and programs to promote physical activity, especially in public. Shares of primary health care may contribute to reduction of functional decline favoring healthy aging. The results of this study indicated that the time spent in sedentary behaviors can predict the absence of functional disability in elderly men and women.

707 Can yoga improve balance in older people?: A randomised controlled trial

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Introduction: Population ageing and the increased tendency to fall with age present a major challenge to health care providers and health systems as well as for older people and their carers. Falls affect around 1 million Australians annually, with over one third of people aged 65 years and older falling one or more times every year. Falls can result in disability, loss of mobility, reduced quality of life and fear of falling. By 2051, the total annual health cost from fall-related injury in Australia is expected to reach $1.4 billion. Exercises that challenge balance are proven to prevent falls, yet uptake and adherence by older people to existing programs has been low, prompting a need for further research in this area. Yoga includes postures that challenge balance and participation in yoga is growing among older Australians, yet minimal research has been conducted into the benefits of yoga for improving balance and reducing the risk of falls. This study aimed to measure the effectiveness of a 12 week yoga-based program for improving balance and mobility in older people.
Methods: Design: Assessor-blinded randomised controlled trial.
Participants: 54 community-dwelling people aged 60 years+.
Intervention group: Twice weekly, supervised, group-based Iyengar-style yoga, focused on standing postures.
Control group: Information about fall risk/prevention.
Measures: Short Physical Performance Battery (SPPB, primary outcome), with the addition of one-legged stance time. The SPPB includes timed tests of functional balance and mobility, such as the sit to stand test, semi- tandem and tandem stand tests and a timed six metre walk. These tests are also predictive of falling in older people. Other measures include fear of falling (Short Falls Efficacy Scale-International) and barriers/enablers to intervention uptake and adherence (Exercise Benefits and Barriers Scale).
Results: 54 people (mean age 68, SD 7.1) have been recruited to the study and randomised. Consistent with rates in the general community, 33% of the sample reported at least one fall in the past year and 46% report being afraid of falling. Study results will be available in July 2012.
Discussion: If shown to be effective for improving balance, yoga could be promoted alongside other exercise-based fall prevention strategies and would increase the exercise choices available to older adults. The results of this pilot study will guide the design and implementation of a planned large RCT (n=500) with fall rates as the primary outcome.

708 Functioning of the healthy and ill elderly people in Poland

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Introduction: The problem of aging society is a big challenge for medicine and social policy of all countries. Changing senior age into satisfactory life time through physical activity and edifying motivation and ambition to accept a challenge seem to be the basic problem. The aim of this study was to assess the range of functional activity of elderly people living in old people's homes and to define the relation of the above variables in connection with people's life satisfaction.
Methods: In the research the EASY-CARE questionnaire (a tool of complex functional estimation and sociomedical needs of an older person in their life environment) was used. For measurable features they used W. Shapiro-Wilk test to assess normality of analyzed parameters layout. To compare two independent groups a t-student test was used, for more than two groups- the analysis of differences. To check the relation of variables R. Spearman correlation was used. A hundred people (74 women and 26 men) living in old people's homes took part in this study. The average age was 74.68±10.26. 54% of them were from 76 to 90, 26% from 66 to 75 and 20% from 55 to 65 years old. The average level of BMI in the tested group was 26.37±4.39 – 26.52±4.41 for women and 25.96±4.40 for men. Seventy-five per cent of the tested group were non-smokers. The main diseases included: circulatory system diseases (54%), osseous system diseases (14%), diabetes (13%), Parkinson's and digestive system diseases (5% each), neurological diseases (7%).
Results: The level of functional activity of examined old people's homes residents is good. People aged 55–65 were in best physical condition and had best life satisfaction whilst those representing the oldest group, poorly-educated and with a low level of intelligence were the opposite. The general health condition and particular senses efficiency are assessed as average or good. The average level of mental efficiency scaling from 4 (best) to 12 (worst) was 4.55±0.96 and it is statistically higher among men. There was also a positive correlation between the age and the level of the functional efficiency of examined people.
Discussion: How to activate the body and lengthen life activity through improving physical activity are the main problems to solve these days. It is postulated to relax in an active way, do sports and exercise, prevent precocious aging of senses and body and full recovery after illness.

709 How much physical activity levels and energy expenditure in stair climbing compared to elevator riding

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Objective: As chronic diseases increased globally and even more in the Gulf Cooperation Council Countries specially diabetes and obesity that reached to a pandemic level, so has inactivity. Progressive inactivity has been attributed to labor saving devices such as washing machines, cars and elevators. In this study, we investigated the energetic cost and physical activity levels in ascending and descending the stairs compared with riding elevators.
Methods: Energy expenditure was measured in 23 female and male subjects using indirect calorimetery while the subjects climbed stairs or used the elevator up and down five floors. Heart rate (HR) and blood pressure (BP) were monitored at each floor for HR and at ground floor and the fifth floor for BP.

Results: Heart rate response during ascending the stairs from ground floor to the 2nd, 3rd, 4th, and 5th were 51.1%, 66.5%, 75.2%, and 82.7% higher than the ground floor respectively. In descending the stairs, the HR response were 31%, 33.3%, 35.7% , and 36.9% from the fifth to the ground floors respectively. A significant HR differences between floors has occurred between ascending and descending stairs, and between stairs and elevator. The energy cost of stair climbing the 1st, 2nd, 3rd, 4th, and 5th floors were 1.95, 4.21, 5.53, 6.10 and 6.11 Kcal/kg.hour[-1] respectively and descending the five floors were 1.52, 2.18, 2.6, 2.84 and 2.70 Kcal/kg.hour[-1] respectively. Systolic BP increased by 22.2% above the resting level in ascending from 1st to 5th floor while no change occurred in diastolic BP.

Conclusions: Stairs have great impact on the energy expenditure and the activity levels in both ascending and descending floors. If an 80 kg individual use the stairs for one hour, he would have spent approximately 700 Kcal. Ascending stairs HR responses resembled vigorous activity, while descending the stairs reflected mild to moderate level physical activity.

710 Comparison of older adults' steps/day using NL-1000 pedometer and two GT3X+ accelerometer filters

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Introduction: Pedometers have been used to objectively capture ambulatory free-living physical activity as steps/day. Although accelerometers are capable of detecting additional dimensions of physical activity, they have also been used to summarize ambulatory activity as steps/day. It has become apparent, however, that similarly named outputs do not necessarily translate well between instruments and not even between models of the same instrument. This hampers the ability to compare between populations and studies. Thus, the purpose of this study was to compare steps/day derived from the Actigraph GT3X+ using both the manufacturer's default filter (DF) and the low frequency extension filter (LFX) to NL-1000 (NL) pedometer in an older adult sample.

Methods: 15 older adults (61–82 years) were recruited and asked to wear a GT3X+ (24-hours/day) and a NL (waking hours) for up to 7 consecutive days. Statistical analyses were conducted using day as the unit of measure (n=86 valid days) and in a pair-wise fashion comparing: 1) the GT3X+ DF steps/day and the NL steps/day, and 2) the GT3X+ LFX steps/day and the NL steps/day. Pearson correlation coefficients and paired t-tests were computed between the pairs. Percent difference in instrument-detected steps/day and absolute percent difference was calculated.

Results: Although the DF was highly correlated with the NL (r=0.80, p<.001) there was a significant mean difference (-769 steps/day, p<0.001). There was also a strong correlation between the LFX and the NL (r=0.90, p<0.001), but again there was a significant mean difference (8,140 steps/day, p<0.001). Percent difference and absolute percent difference between the DF and the NL were -7.4% and 16.0% respectively. For the LFX and the NL the percent difference and absolute percent difference were the same (121.9%), demonstrating the consistency of direction of difference.

Conclusion: Steps/day detected by the GT3X+ using either filter is not directly comparable to the steps/day concurrently detected by the NL pedometer in this older adult sample. On average, the DF counted fewer, while the LFX counted more steps/day relative to the NL. The magnitude of the difference was much greater for the LFX.

711 Comparing the measurement of physical activity using sport specific GPS and an iPhone™ 'app'

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Introduction: Global Positioning Systems (GPS) are an objective measure of physical activity that is more accurate than self-report and provide contextual information of where activities occur, which pedometers and accelerometers are unable to do. Traditional GPS units are expensive and unavailable to the general population, limiting their use in encouraging and promoting physical activity. Therefore, this study assessed the validity and reliability of an iPhone™ 'app' to monitor distance, intensity and context of physical activity compared with a sport specific unit.

Methods: Forty (23 female, 17 male) apparently healthy 18–55 year olds from Melbourne, Australia completed two trials of 6-laps around a 400m track (2400m; 2-laps walk, 3-laps (100m walk, 100m light jog, 100m walk, 100m fast jog); 1-lap walk). Participants wore a GPSports Pro™ unit (5Hz) and an iPhone™ with a Motion X GPS™ 'app' (using the iPhone™ locations services API for sampling rate). Differences between GPS measured distances and actual trial distances (2400m) were examined using one-sample t-tests. To assess for systematic error, statistical agreement between GPSports Pro™ and Motion X GPS™ 'app' on the iPhone™ were assessed using Bland-Altman plots, with data presented as mean(SD) or 95% CI.

Results: Accurate contextual information was gathered from both measurement devices. One samples t-tests show that the GPSports Pro™ and the Motion X GPS™ 'app' on the iPhone™ both significantly underestimated the total distance covered compared to the known track distance (2400m) by 21m and 18m along with 70m and 50m for each trial and device respectively. Comparing the distance measured with the Motion X GPS™ on the iPhone™ to the GPSports Pro™, 95% of cases fell within the 95% limits of agreement. Significant (p<0.001) heteroscedasticity suggests that as the distance increases, the ability of the 'app' to measure accurately decreased. Both average speed and maximal speed for the iPhone™ 'app' showed acceptable agreement when compared with GPSports Pro™ with 96% and 95% of cases falling within the 95% limits of agreement respectively.

Discussion: Overall, the Motion X GPS™ 'app' used on an iPhone™ provides an acceptable error for monitoring community-based physical activity over 2.4km compared with a sport specific GPS. The low-cost of the Motion X GPS™ 'app' compared with sport specific options is a major benefit and may allow an accessible alternative for monitoring physical activity in the community, but is unlikely to be suitable for measurement research or high level sports performance analysis.

712 Comparison of three measurement tools in assessing sedentary behaviour in preschool children

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Introduction: Sedentary behaviour is considered to be a key contributor in the development of childhood overweight and there is an increasing interest in measuring this behaviour. The purpose of this study was to compare three measurement tools (ActiGraph accelerometer, activPAL3™ and direct observation) in assessing preschoolers' sedentary behaviour.

Methods: Preschoolers between four and six years old (n=52) wore two devices for five consecutive days and were videotaped for one hour (n=44) during classroom activities at preschool. Data of the three measurement tools were defined as non-sedentary behaviour, sedentary behaviour and standing still. If more than 10 seconds of a 15 seconds activPAL3™ interval were spent sitting or lying, this interval was classified as sedentary behaviour. For the ActiGraph data, less than 25 activity counts per 15 seconds was considered as sedentary behaviour. Criterion validity for sedentary behaviour estimated by the ActiGraph (with 100 counts per minute as cut point for sedentary behaviour) and the activPAL3™ was compared with direct observation (criterion measure). Convergent validity for sedentary behaviour estimated by the activPAL™ and the ActiGraph was defined for the measurement days.

Results: Results indicate a poor classification accuracy for the activPAL3™ data based on the direct observation data. Best results for sensitivity for the activPAL™ measures were found for sedentary behaviour, results for specificity were highest for non-sedentary behaviour. Sensitivity for the overall total time detected as sedentary behaviour with the ActiGraph monitor was 58.5% and specificity for sedentary behaviour was 61.2%. A mean bias of 7.7% in sedentary behaviour measured with the activPAL3™ and the ActiGraph monitor was found. Time spent in sedentary behaviour defined by the activPAL™ and the Actigraph monitor revealed significant differences, whereas time defined as sedentary behaviour was lower for the activPAL3™ compared to the ActiGraph monitor.

Discussion: Low percentages for sensitivity and specificity may be due to the used observation classification system in this study. Furthermore, making a comparison of time spent in sedentary behaviour derived from the activPAL3™ and the ActiGraph needs to be done cautiously and these two devices may not be considered as substitutions for each other.

713 High agreement between self-reported pedometer steps and accelerometer derived steps in an elderly population

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Introduction: Experimental studies have shown a high correlation between steps measured by the researcher using a sealed pedometer and an accelerometer. However, studies on correlations between self-reported pedometer steps and accelerometer derived steps are scarce. In a randomized controlled trial of a progressive balance and exercise training program for elderly individuals with osteoporosis, we are using both self-reported data from pedometers and accelerometer data to assess physical activity. The purpose of this study was therefore to compare pedometer steps/day, self-reported by elderly individuals, with accelerometer steps/day.

Methods: A total of 62 individuals (60 women) with osteoporosis, 66–86 years, mean 75.4±5.5, wore a Yamax 2000 pedometer and an ActiGraph GT3X accelerometer for one week during the waking hours. Wear time and daily pedometer steps were recorded by the participants in a log sheet. The sample was analyzed in total and divided into two groups based on age (≤75 years and >75 years).

Results: There was no significant difference between the two instruments, neither for the total sample nor if divided by age. Mean steps/day for the whole sample was 6142±3026 for accelerometer and 6179±3228 for pedometer (p=0.871). Mean difference (±2SD) was -37 (±3606) for total sample, 66 (±3414) for ≤75 years and -128 (±3811) for >75 years. Bland-Altman analysis showed agreement between the two instruments without tendency for heteroscedasticity.

Discussion: Our results support previous experimental studies; i.e. there is a strong correlation between pedometer steps and accelerometer steps. Our findings are also consistent with the few studies on agreement between steps/day in free-living populations. Therefore self-reported pedometer steps/day can be recommended as an objective measurement for physical activity in elderly individuals with osteoporosis.

714 Accelerometer determined physical activity and body composition in community-dwelling older adults

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Introduction: Several studies have demonstrated a positive effect of physical activity (PA) on body composition; however, few have assessed this relationship in older community-dwelling adults using accelerometer measures of PA. The aim of this study was to examine the association between accelerometer determined PA and body fat composition in a large community-dwelling sample of older adults.

Methods: A total of 636 community-dwelling older adults aged 53–84 (mean age 66, 49% male) were randomly recruited to participate in this study. Body composition, including total body fat and trunk fat, was measured using dual-energy x-ray absorptiometry. PA was measured using Actigraph GT1M accelerometers worn for 7 consecutive days. We measured counts/day and minutes/day spent in sedentary (<1.5 METs), low intensity (1.5–2.9 METs), moderate intensity (3–5.9 METs) and vigorous intensity (>=6 METs) activity, using existing accelerometer count thresholds for each level of intensity. The association between accelerometer measures and body fat measures was determined using multiple linear regression models adjusted for age and sex.

Results: Sedentary minutes were positively associated with total body fat and trunk fat. For every 10 minute increase in sedentary minutes, trunk fat increased by 84 g (95% CI 44 to 124) and total body fat increased by 147 g (95% CI 79 to 214). There was a dose-response negative relationship between activity intensity and total body fat and trunk fat. For every 10 minute increase in activity, total body fat decreased by 261 g

(95% CI -350 to -172), 1099 g (95% CI -1355 to -843), and 2593 g (95% CI -429 to -90) for light, moderate and vigorous minutes, respectively. Similarly, for every 10 minute increase in activity, trunk fat decreased by 156 g (95% CI -209 to -103), 676 g (95% CI -827 to -525), and 1611 g (95% CI -2618 to -604). We found a significant interaction between age and activity on body composition. As age increased, the magnitude of the effects of sedentary, light, and moderate activity on body fat measures all decreased (interactions all p<0.05).

Discussion: Both body and trunk fat are independently associated with both intensity of physical activity and amount of sedentary time. The magnitude of these associations decreases with age but is still clinically relevant. Thus, PA programs should aim at both minimising sedentary time and promoting activity and may need to be altered to take into account the effect of increasing age.

715 Feasibility and acceptability of two instruments for measuring physical activity (PA) in primary care

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Introduction: General practice has an important role in improving population levels of PA. However, measurement of PA remains challenging. There is a need to identify a usable, transferable and easily interpreted instrument for all members of the general practice team.

The aims of this study were to:
- Evaluate the validity and reliability of two instruments for measuring PA, administered by practice nurses (PNs) and self-administered by patients.
- Qualitatively explore general practitioner (GP), PN and patient perceptions of the two instruments

Methodology: Sample of 10 PNs and 100 patients, were invited to participate. Participating patients were allocated to PN (n=41) or patient groups (n=43). An additional, six GPs were invited to participate in semi-structured interviews to determine their opinions of the instruments.

Two instruments were examined:
- General-Practice Physical Activity Questionnaire (GPPAQ)
- Three-Question Physical Activity Questionnaire (3Q)

PN-group: Participants wore an accelerometer for 7-days then attended an appointment with their PN to complete questionnaires. Analysis determined criterion validity, comparing accelerometer counts against questionnaire responses. PNs (n=9) participated in a semi-structured interview to determine opinions of the instruments.

Patient-group: Participants self-completed both questionnaires twice, 7-days apart. Analysis determined test-retest reliability using intra-class correlation coefficients (ICCs), comparing questionnaire responses from Time-1 and Time-2. A sample of patients (n=21) participated in semi-structured interviews to determine opinions of the instruments.

Results: Criterion Validity was low to moderate for GPPAQ (rho=0.26) and 3Q (rho=0.45). For meeting PA recommendations there was moderate agreement for GPPAQ (k=70.3%, 95% CI=0.56–0.85) and fair agreement for 3Q (k=62.2%, 95% CI=0.47–0.78).The test-retest reliability ICC for the GPPAQ ranged from (0.82–0.95), the 3Q ranged from (0.94–0.98). This study found 89% Nurses and 67% patients preferred the GPPAQ. Health professionals indicated their reasons for preference were influenced by questionnaire characteristics (100%) and instrument comprehensiveness (100%) and simplicity of the instrument questions (43%)

Conclusions: The 3Q demonstrated moderate validity compared against accelerometer measures, substantially higher than the GPPAQ. Both instruments had excellent test-retest reliability. The GPPAQ demonstrated higher agreement with the accelerometer for meeting PA recommendations than the 3Q. This study raises important considerations for researchers regarding the design and implementation of PA assessment. Previous research has focused on time barriers however, this study comprehensiveness and simplicity are equally important. The GPPAQ may contain features useful for enhancing the established 3Q instrument for PA assessment, especially for PNs and patient self-management strategies.

716 Agreement between the IPAQ-long weekday sitting item and the activPAL™ activity monitor in Scottish adults

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Introduction: Recent epidemiological evidence of the importance of sedentary time and health suggests that an accurate measurement of population-level sedentary behaviour is required. The International Physical Activity Questionnaire (IPAQ) is a valid self-report measure of physical activity that has been used in population surveillance. In addition to recalled physical activity, the IPAQ contains items asking about recalled sitting time. The purpose of this study was to compare recalled weekday sitting time as measured by the IPAQ with objectively monitored sedentary time recorded by the activPAL™ activity monitor in Scottish adults.

Methods: Participants (N=41 (23 male), mean age 37 years (SD 11)) wore an activPAL™ activity monitor for three full days and completed the self-administered IPAQ long weekday sitting question (does not include time spent sitting in a motor vehicle). Average time/day spent sitting/lying as measured by the activPAL™ was compared with responses to the IPAQ. As the activPAL™ is worn 24 hours/day, eight hours of sitting/lying data (i.e. overnight time) was deducted from each participant to facilitate a comparison with the IPAQ data.

Results: ActivPAL™ sitting/lying data and IPAQ weekday sitting time were shown to be weakly correlated (Intraclass Correlation Coefficient=0.24 (95% CI -0.07, 0.51)). The means of the two samples were not equal (F (1, 40)=32.7, p<0.001). The mean difference between the two samples was 162 minutes/day (95% CI 105, 220) with the activPAL™ consistently higher (667 minutes (SD 81)) than the IPAQ (504 minutes (SD 192)).

Conclusion: Participants in this study consistently under-reported time spent sitting when completing the IPAQ by 2 hours 40 minutes. Further research is needed to explore the wording used in the IPAQ sitting items if this tool is to be of use for population surveillance of sedentary behaviour. Of particular interest is transport-related sitting time which was not included in the item used in this study but is included in other forms of the IPAQ. This study also illustrates the benefit of objective monitoring of sedentary time, helping people become more aware of their own behaviour and therefore potentially the need to change it.

717 Validating physical activity measures in middle-aged adults completing a group or home-based physical activity program

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Introduction: The main purpose of this study was to determine whether self-reported physical activity duration and intensity via exercise diaries matched accelerometer data and the Active Australia Survey.

Methods: Using a quasi-experimental design, sedentary community dwelling 50–65 year olds were recruited to a non-randomized 6 month community group exercise program (G) or a physiotherapist-led home-based physical activity program (HB). Seventy-six participants (HB 39, G 37) wore an Actigraph GT1M accelerometer for 7 consecutive days at the end of the 6 month intervention period. Activity was recorded in 5 second epochs. Over the same time period, participants completed the Active Australia Survey (AAS) and a daily exercise diary recording date, type, duration and intensity, using the modified Borg rating of perceived exertion scale. Data were analysed using descriptive statistics and Spearman rank-order correlations, as a measure of degree of agreement between paired samples.

Results: There were no differences between interventions for all demographic data except home-based participants were more likely to be employed full time ($p \leq 0.001$). There was a significant difference in exercise diary reporting of physical activity between home-based and group participants, with group participants reporting more moderate to vigorous physical activity (MVPA) minutes/day ($p < 0.05$). Correlations between exercise diaries and AAS for home-based participants ranged from $r = 0.39$ to $r = 0.68$ ($p < 0.05$), depending on the comparisons. Correlations between the home-based exercise diaries and the actigraph data also varied, $r = 0.39 - 0.76$ ($p < 0.05$). Group participant exercise diary MVPA minutes/day did not correlate significantly with either the AAS or the actigraph data. In contrast, group participant AAS had good correlations with actigraph MVPA data, $r = 0.49 - 0.64$ ($p < 0.05$).

Discussion: Participants in the physiotherapist-led home-based physical activity program had a better agreement between subjective and objective measurement of physical activity compared to participants completing the community group exercise program. Having a good understanding of intensity may lead to an increase in physical activity at a level that is necessary to gain health benefits. Group exercise participants, who received some education on physical activity guidelines, tended to over report moderate and vigorous physical activity and these self-report data should be interpreted cautiously. Self-reported physical activity via the AAS for group participants had an improved correlation with objectively measured physical activity. Based on this evidence, the AAS is the preferred self-report measure in sedentary middle-aged adults living in the community.

718 Identifying sedentary behaviour types using SenseCam: A pilot study

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Introduction: Sedentary behaviour is independently associated with negative health outcomes but its measurement is a challenge in public health. The study investigates the feasibility of using wearable image capture devices to objectively record, identify and categorize the type and context of an individual's sedentary behaviours in a free living context.

Method: Adult participants (n=62), wore SenseCam (a person worn camera) for 2–3 days of normal free-living activities. Initial exploration of 16 days of images from 6 participants generated a provisional set of both context and types of sedentary behaviours. A protocol for identifying sedentary bout duration was devised and tested from analysis of a further random sample (n=10). Three researchers separately categorized the list of observed behaviours into a coding framework and applied it to a further random sample (n=20).

Results: 59,656 images were reviewed. The interrater agreement for bout duration was ICC=0.997. Agreement for categorizing behaviours was 0.646 (Cohen's Kappa). Mean time spent sedentary was 460.6 mins/day (95% CI: 397.5–523.6). At work individuals mean sedentary time was 320.35 mins/day (95% CI: 246.1–394.6) and 131.1 mins/day (95% CI: 80.0–182.1) in home settings. Mean sedentary time at a screen was 288.3 mins/day (95% CI: 224.2–352.4).

Conclusions: We found Sensecam was able to identify sedentary behaviour in free living settings. In addition it also provided information on the duration, context and type of sedentary behaviour episodes. SenseCam may offer a pragmatic alternative to current objective measurements and provide new insight into the primary determinants of sedentary behaviour.

719 Validity evidence of Omron pedometer HJ-720ITC for Korean children: A preliminary study

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Introduction: The accuracy of the newly developed measure has barely been examined in free-living for children. The purpose of this study was to determine the validity and reliability evidence of a pedometer for Korean children.

Methods: The participants were 24 boys (10.30±1.49yrs, BMI 19.13±2.91) and 16 girls (9.94±1.48yrs & BMI 18.80±3.38). Omron Pedometer HJ-720ITC (Japan) was employed to measure walking steps, and hand-tally counts by a tester were employed as a criterion measure for the step counts. An accelerometer (Actigraph GT3X, USA) was employed to investigate the convergent validity of the pedometers. To determine the reliability evidence of the step counts measured by the pedometer, participants were wearing two pedometers (left & right) on the waist. To investigate the validity and reliability evidences, two research settings were employed, which were 1) on the treadmill and 2) in free-living. For the treadmill protocol, walking (slow, normal, & fast), running (natural & fast), stair up and down, and moving a box were included based on the scientific evidences. In free-living, the physical activity level for 7 consecutive days were measured by the pedometer and the accelerometer. Descriptive analysis was applied, and correlation coefficients (r for the validity), internal consistency (R for the reliability), percent of error rates (%error) were calculated with SPSS 19.0.

Results: Walking steps counted by the pedometer were relatively highly correlated with hand-tally step counts, r=.87 (left) &.89 (right), on the treadmill. The consistency of the step counts between left and right sides obtained by the pedometers was R=.85. In detail, the slow walk showed the highest %error (-33.01±39.87), and the stair-down showed the lowest %error (-1.34±7.19). The highest correlation of walking steps between the pedometer and hand-tally counts showed in the natural walking speed (r=.87) and the lowest correlation coefficient showed in slow walking (r=.31). In free-living, daily total walking steps of the children were 7541.48±2121.69steps taken (weekdays:8276±2504.34 vs. weekend:6024.00±3287.70). Daily walking steps showed moderate correlations with moderate and vigorous intensity of PA obtained by the Actigraph, r=.71 &.54, respectively.

Discussion: Omron Pedometer HJ-720ITC was relatively precise to estimate walking steps of Korean children on the treadmill and in free-living. However, the slow walking speed was a critical issue to reduce the accuracy of measuring step counts for children.

720 Validity of the global physical activity questionnaire in the National Health Survey – Chile 2009–10

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Introduction: Physical Activity (PA) is one of the most important risk factors associated with cronic non-communicable diseases. Therefore, having a valid and reliable instrument to measure PA is crucial for health surveillance systems. However, data from national surveys from middle-income countries is limited. The purpose of this study is to evaluate the validity of Global Physical Activity Questionnaire (GPAQ) in a subsample of the National Health Survey (NHS) of Chile 2009–10 using the accelerometers.

Methods: Population older than 15 years of different educational levels of the urban area of the Metropolitan Region of Santiago – Chile were recruited as part of the 2009–10 NHS. PA was measured using accelerometers (ActiGraph GT3X) for seven days and the moment of the collection of the device the Questionnaire was applied again. Different measures of agreement and median differences were explored. Agreement between the questionnaires and the accelerometer measurements was also evaluated using Bland Altman plots.

Results: Of the 306 subjects recruited, 158 participants used the accelerometers for 5 or more days. The mean age of the sample was 44,6±14,5 years and included 55,7 % females. 58.9% reported at least 8 years of education. According to BMI, 33,6% were normal and 66,4% were overweight. The criteria validity for the "sufficiently active" category according to GPAQ versus accelerometer was (Kappa=0.24 p<0.01, Agreement=71,9%). The correlation of both measures in time (minutes) of weekly PA was (Spearman's rho=0.35 p<0,01). Median of the differences between GPAQ versus accelerometers was of 548 minutes per week. The reported time of PA according to GPAQ was positively associated with being a male and having low educational level (p<0,05). Similarly, PA measured by accelerometers was positively associated with being a male, higher educational level and negatively associated with BMI (p<0,05).

Discussion: The validity of the GPAQ in the population of Chile is comparable to other populations from Latin America. The Questionnaire, in comparison with the accelerometers measurement, overestimates the minutes of weekly PA, mainly in men and individuals with low educational level. Lack of understanding of complex concepts in questions like "typical week", level of intensity of PA and "10 continuous minutes" might explain the differences with the measurement made by the accelerometers. Information regarding the relationship between some specific questions of the Questionnaire and health outcomes could help to improve its validation.

721 How many consecutive days of pedometer monitoring is required to estimate weekly physical activity levels of young healthy adults?

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Introduction: Pedometers are an inexpensive and convenient way to measure physical activity. Several studies have suggested that 3–5 days of pedometer monitoring are required for accurate and reliable estimates of daily physical activity levels in mature adults. However, the minimum number of days of monitoring needed to estimate total physical activity over a week for young adults is unknown. The aim of the current study was to determine the number of consecutive days needed to estimate weekly pedometer-based, physical activity levels for young healthy adults.

Methods: Eighty-two (31 males, 51 females) healthy adults volunteered for this study (age 20.4±4.1 yrs). All participants provided informed written consent prior to participation with all procedures conducted in accordance with approval of the local university Human Ethics Sub-Committee. Participants wore a Yamax Digi-Walker SW-700 pedometer (Yamax, Japan) on their waist for seven consecutive days during wakeful hours (except water based activities). At the end of each day, participants recorded the number of steps taken. Differences in daily physical activity were determined via 1-way ANOVA while estimates of weekly physical activity were assessed via linear stepwise regression.

Results: Significantly less physical activity was undertaken on Sunday compared to Monday and Thursday (p<0.05). Stepwise regression analysis identified that one day (Wednesday) accounted for 48.1% of the model variance with two (Wednesday–Thursday), three (Wednesday–Friday), four (Saturday–Tuesday) and five (Wednesday–Sunday) consecutive days accounting for 64.9%, 79.2%, 85.5% and 93.5% of the model variance.

Discussion: The results of the current study suggest that five consecutive days (Wednesday–Sunday) will accurately estimate total weekly physical activity level based on pedometer measures in young adults.

722 Reliability of the international physical activity questionnaire among Mexican adults

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Introduction: The International Physical Activity Questionnaire (IPAQ) is used as a physical activity surveillance tool in several countries. Mexico has included the Spanish version of the short form IPAQ within its 2012 National Health and Nutrition Survey. Although the IPAQ is now being used to measure physical activity within Mexico, the reliability of the IPAQ within this population is unknown. Therefore, the purpose of this study was to determine the test-retest reliability of the IPAQ within a sample of Mexican adults.

Methods: The study sample consisted of 267 adults who worked in a variety of occupations at a factory within Mexico City. The Spanish version of the short form IPAQ was administered in an in-person interview two times, nine days apart (IPAQ1 and IPAQ2). Height and weight were also measured. The volume (min/week) of moderate-to-vigorous physical activity (MVPA) and adherence to the World Health Organization physical activity guidelines (150 min/week of MVPA) was determined for IPAQ1 and IPAQ2 using the standard IPAQ protocol. The relation between MVPA measures in IPAQ1 and IPAQ2 was determined using a Pearson correlation. The difference between continuous MVPA measures in IPAQ1 and IPAQ2 was determined using a paired t test. The difference between the proportion of participants meeting the physical activity guidelines in IPAQ1 and IPAQ2 was determined using a chi square test.

Results: Participants were 19 to 68 years old and 48.3% were female. The mean (SD) body mass index of the participants was 26.9 ± 4.1 kg/m^2 and 19.7% were obese. IPAQ1 and IPAQ2 measures of MVPA were significantly correlated to each other ($r=0.55$, $p<0.01$). On average, participants reported a higher MVPA in IPAQ1 (395 ± 22 min/week) than in IPAQ2 (352 ± 22 min/week), although this difference did not reach statistical significance ($p=0.066$). The mean difference between MVPA measures in IPAQ1 and IPAQ2 was 39 ± 24 min/week with an interquartile range of -80 to 145 min/week. The percentage of participants who met the World Health Organization physical activity guidelines was higher based on IPAQ1 than IPAQ2 (76.8% vs. 68.9%, $p<0.01$).

Discussion: There were not significant differences between IPAQ1 and IPAQ2. This implies that the short form IPAQ could be a reliable tool to assess MVPA within Mexican adults. Future physical activity surveillance studies within Mexico should consider using objective measures of physical activity.

723 Evaluation of the Exact Day of the Week Scale (EDW Scale) in physical activity questionnaires: A pilot study

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Introduction: Commonly used physical activity (PA) questionnaires assess weekly frequency of PA using open-ended or ordinal scale questions, e.g. in the International Physical Activity Questionnaire (IPAQ) – "During the last 7 days, on how many days did you walk for at least 10 minutes at a time? ___days per week". These types of questions do not provide information on the exact distribution of PA throughout the week. Therefore, many existing questionnaires do not allow for the calculation of the prevalence of insufficient/sufficient PA in accordance with PA recommendations, in which a required number of active days per week is specified. In addition, these questions do not provide information on weekdays and weekend PA, or on between-day variability of PA. The above mentioned problems could be solved by implementing the Exact Day of the Week response scale (EDW Scale) in PA questionnaires instead of open-ended/ordinal-scales. The aim of this pilot study was to evaluate the agreement between PA levels estimated by the original IPAQ and IPAQ with the EDW Scale.

Methods: The EDW Scale – "Mo Tu We Th Fr Sa Su" – allows participants to indicate on which particular day/s of the week they were physically active. To evaluate the scale, IPAQ (short) was administered on two occasions, 2 hours apart, to a convenience sample of 89 university students in Austria (36% female, mean age 20 ± 2 yrs). About half of the participants completed the original IPAQ on the first occasion and IPAQ with the EDW Scale on the second occasion, while the other half did it in reverse order.

Results: Intraclass correlation coefficient between total weekly level of PA estimated using the original IPAQ and IPAQ with the EDW Scale was 0.88 (95% CI, 0.83–0.92, n=89). The difference between median PA levels (d=2.90 MET-hour/week) was not significant (Wilcoxon test, p=0.37).

Discussion: The EDW Scale provides useful data on the weekly distribution of PA and for the health-related classification of PA, which are imprecisely estimated if the frequency of PA is assessed using open-ended or ordinal-scale questions. These pilot results indicated that the implementation of the EDW Scale in IPAQ does not significantly change PA estimates, which justifies further assessment of its measurement properties. A team of researchers from Australia, Austria, Croatia, Czech Republic, Finland, Serbia, Switzerland and United Kingdom have commenced further testing of the EDW Scale in the IPAQ, Global Physical Activity Questionnaire and Single-Item Physical Activity Measure.

724 Accelerometer use in children: Differences in weekend compliance

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Introduction: Physical activity (PA) benefits in children are widely recognized however an accurate assessment of the PA habitual patterns are crucial, to avoid misinterpretations. PA patterns during weekdays and weekends is known to differ considerable; nonetheless compliance with using accelerometer is greater on weekdays than in weekends which compromise a reliably estimate of habitual PA, and impose restrictions to data analysis in this field. Therefore the aim of our study was to investigate the effect of the day accelerometer was initially placed, on the weekend compliance with wearing accelerometer.

Methods: Participants were 479 students with a mean age of 11.6(±0.8) years old. 81 were assigned to start using accelerometer on a Monday, 107 on a Tuesday, 83 on a Wednesday, 118 on a Thursday and 89 on a Friday. PA was measured using Actigraph accelerometers, model GT1M. Participants were educated to use the accelerometer attached to an elastic belt and placed above the right iliac crest for 7 consecutive days. Instructions were given to wear the monitor all times except when sleeping or doing water activities. Data was analyzed with Actlife software and inclusion criteria consisted of a minimum recording of 8h; 60min of consecutive zeros were considered invalid data.

Results: In average, children wore the monitors for 5 days if placed on a Monday or Tuesday and for 6 days when the monitor was placed on the remaining weekdays. Significant differences were found in general compliance with accelerometer use. Friday (65.2%) and Wednesday (59%) obtained a higher percentage of compliance within 7 days of accelerometer use. Qui-Square showed differences in compliance with wearing the accelerometer at least one weekend day and the weekday of initial monitoring (p<0.05). Excellent compliance rates were obtained for at least one weekend day for children starting the accelerometer-based monitoring on a Friday (92.1%), good compliances were achieved also on Thursdays (81%) and Wednesdays (76%). Greater compliance (76.4%) with wearing the accelerometer on both weekend days was achieved when children wore the accelerometer for the first time on a Friday, followed by Thursday (65%). The worst compliance for wearing the accelerometer on both weekend days was observed in children wearing the accelerometer for the first time on a Tuesday (29%).

Discussion: For a precise assessment of habitual patterns of PA in children, especially during weekends, the accelerometer use should be initiated on a Friday as it revealed greater compliances on both weekend days and weekdays.

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725   Translation of children's cycling into steps: The share of cycling in 10 year-olds physical activity

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Background: Active travel is a potential way to increase children´s physical activity (PA). Pedometers are a cost-effective and valid option to measure and communicate PA, however unable to capture cycling activity. Children's self-reported distances travelled by cycling can be analysed by Geografic Information System (GIS)

Aim: The aim was to combine pedometry and GIS mapping to identify the relative amount of cycling in children's PA.

Methods: Of all fourth-graders (N=187) in Staffanstorp, Sweden 167 (89%) participated. Of these 94 (55%) (49 girls) reported at least one cycle distance and for 88 of them pedometer data of steps/day were available as well. All individual cycle trips were entered into GIS and calculated into a total cycling distance for the investigated week. Previously reported cycling speed, 13,5 km/h, was used to calculate cycling minutes cycleminutesperday=(cyclelengthmeanpday /(13.5/3.6))/60. Expenditure of 4 and 5 METs has in children been reported equivalent to 122 and 127 steps/min respectively. We estimated 4,7 MET (13,5km/h) as 126 steps for every minute of cycling (127−122=5 x 0,7=125,5).

Results: Daily mean cycle distance was 676 metres, on average 379 additional steps/day for cycling children (min 21, max 1385, SD=299) with no gender difference. Additional "steps" obtained by cycling corresponded to on average 3% of their PA. Recorded mean steps per day did not correlate with either the reported number of cycle distances (r=-.12, ns) nor the average distance cycled per day as measured in GIS (r=-.07, ns).

Discussion: Pedometers like most motion sensors are unable to capture cycling activity. This lack of information has concerned researchers. This study indicates that the relative contribution of cycling to daily physical activity in this age group in a Scandinavian setting is very low. In addition, with no correlation between recorded mean steps and frequency and distance of cycling the hypothesis of compensation was out-ruled. By combining the objective (pedometer) and the subjective diaries and recordings by aerial photos (GIS) a method has been created that make it possible to identify the proportion of cycling as well as related qualitative information. We do not know of any previously published study with this combination.

Conclusion: The relative contribution of cycling in ten-year old children's PA level is quite small and stable between children across different levels of activity levels, regardless of gender.

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726   Calibration of ActiGraph GT3X, Actical and RT3 accelerometers in Brazilian adolescents

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Introduction: The use of accelerometers to investigate physical activity has increased sharply in the last years, even outside high-income countries. However, there is no evidence that thresholds of accelerometers counts developed from high income countries can be valid for other settings. The different types of physical activities practiced across populations might play a role in this issue. The objective of this study was to develop thresholds for counts of ActiGraph GT3X, RT3 and Actical accelerometers in order to classify different physical activity intensities in Brazilian adolescents.

Methods: Seventy-nine adolescents aged 10 to 15 years participated in the study. Accelerometers and oxygen consumption (measured by the portable device K4b2 Cosmed) data were collected at rest and in ten physical activities at different intensities. The three accelerometers were worn simultaneously. The activities were: watching DVD, writing, playing videogame and standing (sedentary activities), walking at 2km/h (light activity), walking at 4km/h (moderate activity), running at 7.2km/h, playing soccer, basketball and jumping rope (vigorous activities). Accelerometers were used on the waist and VO_2 was measured by portable metabolic system Cosmed K4b2. ROC (Receiver Operating Characteristic) curves were used to determine thresholds at which sensitivity and specificity were maximized.

Results: The range of thresholds for sedentary (SED), light (LPA), moderate to vigorous (MVPA) and vigorous (VPA) activities was 0–180, 181–756, 757–1111 and >1111 counts.15s^{-1} for ActiGraph; 0–17, 18– 440, 441–872 and >872 counts.15s^{-1} for Actical and 0–5.6, 5.7–20.3, 20.4–32,1 and >32.1 counts.s^{-1} for RT3, respectively. For the three accelerometers, a very high discrimination of SED and MVPA (ROC>0.97) and excellent discrimination of VPA (ROC>0.90) were observed. Areas under the ROC curves indicated better discrimination of MVPA by ActiGraph and Actical when compared to RT3 (P<0.05). The prediction of intensities was not improved when the analyses were stratified by age and sex.

Discussion: This was the first calibration study with Brazilian adolescents and most of the results were consistent with previous studies from richer settings. The thresholds developed in this study for ActiGraph GT3X, Actical and RT3 accelerometers have high ability to discriminate physical activity intensity and are recommended to be used in studies objectively measuring physical activity of Brazilian adolescents.

727   Variations in energy expenditure during repeated movement based video game sessions

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Introduction: It has been shown that movement based video games offer potential for game play at moderate and sometimes vigorous levels of activity. Almost all previous research is based upon a single opportunity for participants to play the game. We hypothesised that over time children will change their activity levels as they become more familiar with game play and learn to minimise the movement required to achieve similar game play results.
Methods: We recruited twenty one 10 to 15 year old children to attend four sessions (one per week) to play the same movement based video games. Microsoft's Kinect Adventure, Kinect Sports and Virtua Tennis 4 were selected for their popularity and sport related game play. Actiheart monitors recorded activity and heart rate in 15 second epochs. At the beginning of each session baseline heart rate was recorded during a 5 minute rest period. During each testing session, participants played each of the three games for 15 minutes, with game order rotated between each session. Participants could play alone or in pairs.
Results: We found significant increases in energy expenditure (activity counts and heart rate) compared with resting levels during each gaming session for all three games. Significantly higher levels of expended energy were required to play Kinect Adventures than Kinect Sports, with Virtua tennis requiring approximately half the required energy expenditure of playing Kinect Adventures. No significant difference in energy expenditure over the 4 sessions within each game was found.
Discussion: The findings suggest that for the movement based video games used in this study, energy expenditure was higher than at rest and maintained over several sessions, although each game required a different level of energy expenditure. While motivation to play the game repeatedly may limit longer term use, the results suggest that the level of energy expenditure appears to remain consistent, irrespective of practice or changes in how children play the game. The results, if supported across a broader range of games, provide valuable information on how these games might contribute to children's energy expenditure or reduced sitting time.

728   Calibration and validation of MVPA estimates derived from the Physical Activity Questionnaire (PAQ)

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Introduction: The Physical activity questionnaire (PAQ) is a self-administered 7-day (previous week) recall questionnaire that was developed to provide an overall indicator of youth physical activity levels. Research has supported the psychometric properties of this instrument but the ordinal scoring system (1–5 scale) limits the utility of the instrument for studying PA behavior. The purpose of this study was to develop and validate a calibration equation that would improve the utility of the PAQ for future research applications.
Methods: A total of 261 participants were recruited from 9 elementary and 3 secondary schools in a Midwestern town in Nebraska, USA. Participants wore an Actigraph accelerometer for 7 days and then completed either the PAQ-Children (PAQ-C) or the PAQ-Adolescent (PAQ-A). Accelerometer data was processed using standard reduction procedures (e.g. 4 days of valid data, screening for nonwear time) and age-specific cutpoints developed by Freedson et al (2005). Data from the PAQ was processed according to the recommendations from the PAQ developers. The final compliant sample (n=148) was divided into two groups: calibration (70%=103) and cross-validation (30%=45) group. Multiple linear regression was used to compute a final calibration equation. The accuracy of the calibration equation was examined based on the root mean square error (RMSE) and inspection of residuals. Upon examination of different models, age, gender and PAQ score were used as the final predictors of daily percent time in MVPA measured by accelerometer. The calibration equation was then applied to the cross-validation sample for further examination using correlation statistics, paired t-tests, and modified Bland-Altman plots.
Results: Age and PAQ score were significant predictors of %MVPA while gender was borderline significant (p=.06). The final model was able to explain 40% of the variance of accelerometer daily %MVPA (%MVPA=14.56 − (sex*0.98) − (0.84*age) + (1.01*PAQ); R^2=0.40). The RMSE was equal to 2.54 and residuals were normally distributed. Similar agreement was found between predicted and recorded activity in the cross-validation group. The Pearson correlation was moderate and significant (r=.63) and non-significant differences were observed between the predicted and recorded MVPA (Mean diff.=25.3±18.1min; t=1.4, p=.17). Modified Bland-Altman plot revealed a discrete systematic pattern suggesting MVPA was overestimated at the lower end of recorded activity. This effect was reversed at higher activity levels (underestimation).
Discussion: Results supported the validity of the calibration equation to estimate MVPA in groups of individuals. Total weekly minutes of MVPA can be determined using PAQ scores.

729   A step-defined physical inactivity index for adults: How many steps/day are too few?

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Introduction: Step counting (using pedometers or accelerometers) is becoming more widely accepted by researchers, practitioners, and the general public alike. Questions about "how many steps/day are enough?" naturally emerge. However, given mounting evidence of just how little physical activity some populations actually perform, in addition to growing interest in the potentially deleterious and independent effects of excessive sedentary behaviors on health, it may be that the more appropriate question is "how many steps/day are too few?" Therefore, the purpose of this brief review is to examine the utility and appropriateness of using a re-occurring candidate for a step-defined physical inactivity index: <5,000 steps/day.
Methods: A professional librarian identified 1,594 articles by conducting a search of English language literature published since 2000 in CINAHL, ERIC, MEDLINE, PsycINFO, SocINDEX, and SPORTDiscus using the keywords (pedomet* or acceleromet*) and step* and ((physical activity) or walk*). Among studies reporting the prevalence of taking various steps/day, 17 included a specific report of proportion taking <5,000 steps/day among adults.
Results: Findings revealed individuals taking <5,000 steps/day are more likely to have a relatively lower household income, and be female, older, African American versus European American ethnicity, a current versus never smoker, and/or be living with chronic disease and/or disability (including morbid obesity). Precious little is known about how environment (natural, built, or social) fosters such low levels of step-defined physical activity.

Unfavorable indicators of body composition and cardiometabolic risk (specifically metabolic syndrome) have been consistently associated with taking <5,000 steps/day. In small samples of young, healthy and active individuals, short-term reductions in step-defined physical activity to values <5,000 steps/day have shown dramatic effects on a number of health parameters.

Discussion: A growing number of studies have used the <5,000 steps/day cut point to categorize adults as physical inactive or sedentary since it was first proposed by Tudor-Locke and colleagues in 2001and subsequently included in a more fully expanded graduated step index. A standardized steps/day definition of an inactive lifestyle facilitates comparisons between studies and groups and can also be useful for screening, recruiting, and tracking purposes as well. Although few alternative values have been considered, the continued use of <5,000 steps/day as an inactive lifestyle index for adults is appropriate for researchers, practitioners, and communicating with the general public at this time.

730   Is stepping time a constant proportion of upright time in 11–13 year old school children between seasons?

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Introduction: Recent evidence suggests that when considering health benefits it is important to include within the term 'activity' such behaviors as 'quiet' standing. Key benefits of adopting an upright posture are that sedentary periods are reduced and broken. Therefore, whilst energy consuming stepping periods may be of highest concern in the development of a 'healthy' life style, quiet upright time also has relevance to health. The relative importance of standing as a component of upright time has not been investigated extensively. The aim of this study was to quantify standing time and examine its seasonal dependence. For clarity the following terms are used: Time spent upright and not stepping ('Upright-Not-Stepping') and time spend upright and stepping ('Upright-Stepping') as contributions to overall upright time ('Upright'). We hypothesized that the proportion of 'Upright' spent in 'Upright-Not-Stepping' compared to 'Upright-Stepping' would be constant between seasons and the adolescents would simply increase their overall 'Upright' from winter to summer.

Methods: Thirty three adolescents (12.2±0.3y) wore the activPAL™ activity monitor for 4 full 24-hour periods on school days on two occasions: November/December (winter) and May/June (summer) (Scotland). The proprietary algorithms of the thigh worn activity monitor were used to determine 'Upright' and the proportions of this time spent in 'Upright-Not-Stepping' and 'Upright-Stepping'. Further analysis was used to examine the changing behavior over the period of the day of school attendance (0900–1600) and the evening period (1600–2200), where a greater freedom of choice existed in activities undertaken.

Results: There were no differences in mean total daily 'Upright' between the seasons (winter=327mins/d; summer=324mins/d). However, 'Upright-Not-Stepping' (winter=195mins/d; summer=171mins/d) and 'Upright-Stepping' (winter=131mins/d; summer=153mins/d) were significantly different (p<0.001). These differences occurred at different times of day: During school hours for 'Upright-Not-Stepping' (winter=94mins/d; summer=70mins/d, p<0.001) and during the evening period for 'Upright-Stepping' (winter=43mins/d; summer=66mins/d, p<0.001). 'Upright-Not-Stepping' contributed 60% of total daily 'Upright' in winter, but only 53% in summer.

Discussion: Adolescents spent a greater amount of time upright and not stepping than they did stepping, in both winter and summer. The observed seasonal effects in both 'Upright-Not-Stepping' and 'Upright-Stepping' and the relationship between them demonstrates that physical activity behavior is a complex construct and that a complete understanding of the health giving elements of this behavior require independent characterization of both time spent upright but not stepping as well as stepping time.

731   Locomotive and non-locomotive activities in Japanese adults and elderly people evaluated using a triaxial accelerometer

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Introduction: Comparable data on locomotive and non-locomotive physical activity (PA) according to age are lacking for Japanese adults. The purpose of this study was to assess objectively the levels of PA using triaxial accelerometry to discriminate between locomotive and non-locomotive PA in adults and older people living in Japan.

Methods: PA was assessed using a triaxial accelerometer (Active style Pro: HJA-350IT, Omron Health Care) for 6 consecutive days, including weekdays and weekend days in a sample of 571 women and 315 men aged 18–92-years living in the Kanto region. The algorithm used to classify locomotive and non-locomotive activities and the intensity of these physical activities (metabolic equivalents) has been developed previously (Oshima, 2010; Ohkawara, 2011). The duration in minutes of locomotive and non-locomotive activities for light, moderate, and vigorous intensity was evaluated using a triaxial accelerometer.

Results: For women, participants older than 70 years spent significantly less time in non-locomotive and total moderate-to-vigorous PA (MVPA), and total light activity than those in the other age groups, and less time in locomotive MVPA and light activity than those aged 18–49 years. Time in locomotive and total MVPA, and locomotive light activity for women aged between 50–69 years was also significantly lower compared with those aged 18–49 years. On the other hand, time in non-locomotive activity for women aged between 50–69 years was significantly higher than those in the other age groups. For men, the time in locomotive and total MVPA and locomotive light activity for those older than 70 years was significantly lower than those in the other age groups. There was no significant difference between the male age groups for non-locomotive time at MVPA and light activity and total light activity. There was also no significant difference in men between the groups aged 50–69 years and 18–49 years.

Discussion: Elderly people, especially women, spent less time, in not only locomotive MVPA and light activity, but also in non-locomotive MVPA. This finding indicated that evaluation of non-locomotive activity is important.

732 Relationship amongst three activity monitors commonly used to quantify physical activity

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Introduction: There is a wide variety of activity monitors available for quantifying physical activity and predicting energy expenditure under free-living conditions, each utilising different technologies. This study explored relationships amongst the ActiGraph™ (AG), ActiHeart® (AH) and Sensewear® (SW) monitors in describing physical activity energy expenditure (PAEE) and time spent doing moderate-to-vigorous intensity physical activity (MVPA) during free-living.

Methods: All participants (n=32) wore the AG accelerometer at the waist, the SW positioned midway at the posterior aspect of the upper right arm, and the AH attached to electrodes just below the apex of the sternum during all waking hours for a period of 7 days. Only data from 5 days in which there was a minimum of 10 hours wearing time were analysed. Simultaneous measurements related to physical activity were continuously recorded by all 3 devices. Customised software specific to AG and SW were used to derive average PAEE (kJ•hr-1) and minutes of MVPA for each day. Software specific to the AH was used to derive average PAEE, but minutes of MVPA was extracted from raw data. For the AG, average counts were also extracted. Each day was analysed separately, using Pearson's correlation and Lin's concordance. Range of agreement across the 5 days is reported.

Results: Women wore the devices on average 12.6±1.7 (h•d-1). Overall concordance of PAEE amongst the 3 devices was non-existent to very low (Rc=-0.01 to 0.46), and this was reflected by significant differences in means between devices. As the AG was designed to measure activity rather than PAEE, the relationship between its activity counts and PAEE from the SW and AH were explored. The devices were low-to-moderately correlated (SW: r=0.47 to 0.72; AH: r=0.13 to 0.35). Concordance of MVPA among the 3 devices was also non-existent to very low (Rc=0.05 to 0.61), with a low-to-moderate correlation (r=0.05 to 0.75).

Discussion: Whilst the three devices all purported to measure PAEE and MVPA, they had very poor agreement on the measures. Some of the differences may have arisen from participants not wearing the devices correctly, and may explain day to day variance. Caution should be exercised when selecting a wearable physical activity monitor, and also in the interpretation of results from using such devices. As a means of understanding which of these devices more accurately quantify physical activity during free-living, validation of each of these devices against a reference method such as doubly-labelled water is necessary.

733 Reduction of sitting time in sedentary men and women. A randomized controlled trial (Sedentary Intervention Trial)

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Introduction: Prospective epidemiological studies suggest that prolonged leisure time sedentary behaviour, in particularTV-viewing, is associated with an increased risk of type 2 diabetes, cardiovascular disease and all cause mortality in adults. Sedentary leisure time behaviour is also associated with cardiometabolic biomarkers in cross sectional and longitudinal studies. A few intervention studies with small numbers of study participants have demonstrated a reduction in sitting time among adults using individual lifestyle counseling. The purpose of the present study was to investigate 1) whether it is possible to reduce amount of daily sitting time using individually tailored, theory-based motivational counseling and 2) whether a reduction in sedentary time is reflected in cardiometabolic biomarkers and anthropometric measures.

Methods: From an on-going population-based epidemiological study including men and women between 18 and 69 years of age (the Health2010 Study), participants who self-reported at least 3.5 hours of leisure time sitting per day, were invited to participate in the present randomized controlled trial. As determined by power calculation, a total of 171 participants, who gave written informed consent, went through an extensive baseline health examination including blood samples and measurement of height, weight, waist circumference, blood pressure, muscle strength, cardiorespiratory fitness. Participants wore an activPAL™ monitor for 7 days and were then randomized to either a control group (usual lifestyle) or an intervention group. The primary outcome measure was sedentary time measured by activPAL™. The intervention consisted of 4 individual theory-based counseling sessions conducted by trained nurses over the following 6 months. The intervention focused on individual goal setting and written materials with key messages and ideas for reduction of sitting time were handed out at each session (booklets, postcards and stickers). After 6 months, all participants wore the activPAL™ for 7 days again followed by an extensive health examination, similar to the baseline examination. The study is registered at ClinicalTrials.gov (ID NCT00289247).

Results: Data collection was terminated march 2012, with the last follow-up examination taking place on March 5th 2012. Data have not been processed yet and final results can therefore not be reported, but will be presented at the ICPAPH conference. Data will be analysed using intention to treat analyses.

Discussion: Result from the present study may help elucidate whether it is possible to reduce sitting time and improve cardio metabolic biomarkers in a group of adult sedentary men and women, recruited from a population-based study and using an individual approach.

734 Building healthy communities: What can we learn from systematic reviews to increase population levels of physical activity?

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Introduction: It is well established that regular physical activity can play an important role in both the prevention and treatment of many chronic diseases. However, in most countries, population rates of physical activity are declining. Both policy makers and health practitioners seek evidence about which strategies have the potential to increase population's level of physical activity, and avoid interventions which are ineffective or harmful. Many primary studies have been undertaken and the results have been incorporated into systematic reviews.

Methods: A search of Health Evidence Canada (HEC), an online database of systematic reviews of public health interventions, was conducted. The database was searched with physical activity as the focus in combination with "community" in the record.

Results: A preliminary search of health-evidence.ca identified 248 reviews. Assessment of the quality scores using the HEC assessment tool shows the reviews range considerably in quality: 100 strong, 89 moderate and 58 weak. Initial screening found many of these reviews were not of interventions intending to increase population levels of physical activity. Nonetheless, some of the reviews made conclusions regarding effectiveness. For example, a Cochrane review of individual-based interventions found they may be effective in encouraging the uptake of physical activity. At a broader level, a Cochrane review of community-wide interventions did not find adequate evidence to support the hypothesis of effectiveness. Separate reviews on interventions targeting walking and cycling had mixed conclusions.

Discussion: There is a wide range of studies currently undertaken of varying quality, including some beyond those identified in HEC in this study. It is conceptually difficult for decision makers to make sense of this available evidence to inform policy. Given the lack of an up to date synthesis of current reviews, there is a need to undertake an overview review of systematic reviews. The presentation will detail our steps in closing this gap.

735 Walk&WorkSpain: Participants' perspectives and experiences on reducing occupational sitting time

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Introduction: Emerging evidence suggests that sedentary behaviour is negatively associated with health. Workplaces are convenient settings for delivering health promotion interventions and reduce occupational sitting time. However, most studies have focused on quantitative analyses to understand the impact of workplace physical activity interventions on reducing occupational sedentary time rather than employees´ experiences. We assessed employees´ perspectives who undertook a 20-week pedometer-based programme (Walk&WorkSpain) – based on Web technology – that aimed at reducing daily sitting time and increasing daily step counts at work.

Method: Two-hundred and sixty-four inactive employees from 4 Spanish universities engaged in Walk&WorkSpain. The intervention group (n=129) accessed gradually to different strategies through a Webpage: "incidental walking" (active work tasks, i.e. walk talk meetings), "short and long Campus walking routes" (10 minutes, i.e. parking the car a bit far; 20 minutes, i.e. walking at lunch time respectively). Semi-structured interviews were conducted with 8 employees from the intervention to gather qualitative data on personal experiences. The most inactive employees who volunteered were recruited. Participants were evenly divided between men/women and job roles; academic-male (n=2), academic-female (n=2), administrative-male (n=2) and administrative-female (n=2). Each participant was interviewed three times at the beginning (baseline), middle (8 weeks) and two months after completing the intervention. Interviews were transcribed verbatim and subjected to inductive coding within the major themes of opinions on sitting reduction strategies and experiences of success when implementing them.

Results: At baseline, participants had little awareness about the need of reducing sitting time. Most employees were on the contemplation stage for changing this behavior. Eight weeks later, most participants perceived to implement the different strategies successfully, being incidental walking the mostly widely used followed but short walking routes. However, they could not implement them as regularly as they wanted. At this stage, participants were on preparation for reducing sedentary behavior. The long walks around the Campus could not be implemented successfully at work but most employees put these into practice outside work by the end of the program (i.e. walking to school to pick up their children). At this point, all participants reached the "action stage".

Discussion: Walk@WorkSpain was perceived to be a feasible program to promote sustained reductions on sitting time and increases on physical activity both inside and outside work. The program was perceived to be successful not only in improving participants´ awareness but also in gradually introducing changes to reduce sitting time in employees' lives.

736 Objectively measured sedentary behaviour and physical activity in office employees: Relationships with presenteeism

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Introduction: Results of previous studies suggest there may be an association between presenteeism (or loss of 'on the job' productivity) and sedentary behaviour and physical activity (PA). Studies have explored these relationships using self-reported measures of activity, which may result in inaccurate or incomplete data. This study examined associations between presenteeism and objectively measured sedentary behaviour and PA in office employees.

Methods: 157 full time office employees were recruited from 9 workplaces in urban South East Queensland. Daily time spent sedentary ($\leq$150 counts), and in light (151–1689 counts), and moderate-to-vigorous (MVPA; 1690–6166 counts), and total PA (>150 counts) was measured over seven days using ActiGraph GT3X accelerometers. Data were included if accelerometer wear time was >10 hours per day, on at least 3 work days and 1 weekend day. Presenteeism was measured using the Work Limitations Questionnaire (WLQ) to give an overall WLQ Index, and four subscale scores: time management, physical demands, mental-interpersonal demands and output, each with a Likert scale of 1–5. Pearson's Product Moment correlation coefficients were used to analyse relationships between sedentary behaviour, time spent in each activity category and WLQ variables.

Results: Data from 75 employees (48%) were included in this analysis (mean age 42.7 SD 11.3y; mean BMI 27.0 SD 4.55; 50 women). Median accelerometer data indicated that employees spent 71.1% of their total day sedentary (664 mins, IQR 96.7), and 26.0% in light activity (242 mins, IQR 73.0), 2.9% in MVPA (15 mins, IQR 39.7), and 28.9% in total PA (267 mins, IQR 81.4). Overall, WLQ scores ranged from 0 to 19.8 (of a possible 100) with a median of 4.9 (IQR 5.0). Median WLQ subscale scores for time management, physical, mental-interpersonal and output were 5.6 (IQR 20.0), 39.0 (IQR 100.0), 11.0 (IQR 19.8) and 5 (IQR 21.3) respectively. There were no significant associations between time spent sedentary, or in light activity, MVPA and total PA and overall WLQ scores (r=-0.10 to 0.07), or WLQ subscale scores (r=-0.03 to -0.202).

Discussion: This was the first study to explore the relationship between employee presenteeism and objectively measured sedentary behaviour and PA. Results indicate no relationship. Limited variation in WLQ scores, with all cases in the lower quintile of potential scores, may explain this. Future research should recruit employees with a greater range of WLQ scores, in order to further examine these associations and explore the potential for improving employee presenteeism using targeted activity strategies.

737 Physical activity programs for older people receiving a restorative home care service, which is more effective?

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It is important to stay physically active as we age to help maintain strength, balance and endurance and to decrease our chances of falling. Restorative home care services are available to older people when they have an injury or illness or require some assistance to continue living independently. Research has shown that restorative home care services can reduce the need for ongoing home care services for at least five years, and therefore are a cost benefit to the community. Silver Chain, the largest domiciliary care provider in Western Australia, offers these short-term services, which have multiple components, including a physical activity program, and are delivered by allied health professionals. The aim of this study was to assess the effectiveness of two physical activity programs (the current traditional exercise program versus LiFE, a lifestyle activity program developed by Clemson et al at the University of Sydney) to improve strength and balance of older people receiving a restorative home care service. A randomized controlled trial was used to determine the most effective program; post-testing occured after an eight week intervention. Participants were receiving a Silver Chain restorative home care service, were aged over 65 years and had been assessed as needing an activity program by their Care Manager. Data collected included information about falls (falls efficacy scale, activities specific balance confidence scale), balance, lower body strength, function and disability. Data collection will be complete by July 2012 and comparative effective analyses shortly after. To date 59 participants have been recruited and it is anticipated that the final sample size will be about 70 participants. As older people age it is important that they continue to maintain strength and balance to stay living independently. Using traditional exercise programs that include sets and repetitions may not be the most effective method to help them build up and maintain their strength and balance after spending time in hospital. This research will contribute towards increasing the knowledge base surrounding restorative home care services which are becoming more popular in Australia and around the world as the population continues to age and the cost of community care continues to rise.

738 Step counts and sitting time reported during the segmented working day in office workers

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Introduction: Technological advances have led to a high proportion of adults employed within sedentary occupations. Given evidence linking prolonged sitting to chronic disease risk, it is important to understand how physical activity and sitting behaviours are accumulated during and outside of the workplace in order to inform effective interventions. This study assessed these behaviours in a sample of UK office workers.
Methods: 75 participants (60% female, age: 36.9 ± 12.9 years, BMI: 24.0 ± 3.6 kg/m2) wore a pedometer (SW-200) throughout waking hours for 7-days. On work-days participants recorded their step counts upon arriving at work, before and after their lunch break, upon leaving work and when going to bed at night. Participant reported sitting times during the morning, afternoon and evening, along with their mode and duration of transport to/from work. Total step counts and sitting times were reported for non-work days. The sample were divided into tertiles based on the proportion of time spent sitting at work. Step counts and sitting times reported outside of work were compared between groups using one-way ANOVA's with post-hoc tests.
Results: Participants reported spending 8.5 hours/day at work. The sample accumulated 1339 ± 1131 steps before work, 1585 ± 1277 steps during the morning, 701 ± 641 steps over lunch, 2157 ± 1468 steps in the afternoon and 3119 ± 1592 steps after work. Participants reported sitting for 151 ± 74 minutes in the morning, 176 ± 70 minutes in the afternoon and 144 ± 44 minutes after work. Overall, 66% of the time at work was spent sitting.
When split into tertiles according to sitting at work, participants in the highest tertile reported sitting for significantly longer than those in the lowest tertile during motorised transport (64 ± 58 vs 22 ± 16 mins, $p<0.01$) and at weekends (382 ± 133 vs 294 ± 134 mins, $p=0.03$). There was a tendency for participants in the highest tertile to also report sitting for longer after work in comparison to those in the lowest tertile (154 ± 30 vs 132 ± 51 mins, $p=0.07$). The three groups did not differ significantly in terms of time spent at work, steps accumulated outside of work, or step counts accumulated on weekend days ($p>0.05$).
Discussion: Office workers who sit for a large proportion of their working day (>85%) also report sitting for longer outside of work. These individuals do not compensate for their increased sitting times at work by being more active outside of work. Interventions should focus on reducing both workplace sitting and leisure-time sitting in adults who sit for a large proportion of their working day.

739 Physical inactivity among bus drivers and conductors of public transportation of a southern city in Brazil

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Introduction: Bus drivers and conductors form a group at risk for certain health problems due to occupational characteristics, especially some overloads related to the work environment and the activities they perform. The aim of this study was to describe the characteristics of urban public transport workers of a medium-sized city in southern Brazil.
Methods: A sample of 227 drivers and conductors answered a questionnaire including sociodemographic, economic, behavioral, nutritional, health and work questions. International Physical Activity Questionnaire (IPAQ) long version was used to check total, transportation and leisure physical inactivity of these professionals.
Results: The mean age and schooling level were respectively 36.3 and 9.2 years. Almost all the respondents were male, 77.5% were white, 64.3% were married/living with a partner. As for the self-perception of health, 14.7% of respondents reported their health as fair/poor, 3/4 were classified as overweight/obese by BMI, more than 20.0% of respondents admitted smoking at the present time and only 3.1% were classified as positive for alcoholism. Almost 40% of workers did not reach the minimum physical activity recommended for health promotion in the leisure time and transportation domains together (47.6 and 72.6 were considered insufficiently active in leisure time and transportation domains, respectively).
The prevalence of pain in the lower back, chest, neck and shoulders were high and 9.0% of respondents tested positive for minor psychiatric disorders.
Discussion: Drivers and conductors show disturbing prevalence of factors associated with chronic diseases. Programs to encourage physical activity and healthy habits are needed to improve the quality of life and work of this occupational category.

740 | Which men can increase physical activity & lose weight after a gender-sensitive intervention delivered in a male-friendly setting?

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Introduction: Obesity and lack of physical activity (PA) increasingly threaten individual and public health. Scotland has the highest levels of obesity in men in Europe. Gender-sensitisation is needed to attract overweight/obese men to weight management and PA interventions. Few studies have: focussed solely on men; assessed the impact of such interventions on both self-reported and objectively measured PA or of feeding back objective PA data to men; or identified predictors of success in achieving increased PA in this high-risk group. We have shown that the professional soccer setting can attract 'high-risk' men, a traditionally hard-to-reach group.

Objective: We report on: changes in self-reported and objectively measured PA (pre/post intervention) in overweight/obese men aged 35–65 taking part in Football Fans in Training (FFIT)), a 12-week, gender-sensitised group intervention, delivered via Scottish Premier League (SPL) clubs. We also examine; acceptability of wearing objective PA monitors (activPALs); impact of providing feedback on objectively measured PA on weight loss and PA; which sub-groups are least able to achieve health-relevant PA/weight loss targets.

Methods: 11 SPL clubs delivered FFIT to 203 overweight/obese men in February–April 2012. At 4 clubs, men were invited to wear activPALs prior to starting FFIT and 12 weeks later. Height, weight, waist and blood pressure were measured at baseline and 12 weeks; data on socio-demographic status, health behaviours (diet, IPAQ, smoking, alcohol), self-efficacy in relation to changing PA and diet, and health and physical functioning (longstanding illness, joint pain, SF12, health service use) were also obtained.

Results: 63/73 men attending FFIT at four SPL clubs agreed to wear activPALs. Their mean age was 44.78 (sd10.29), 85.7% were married/cohabiting, and 30.1% lived in deprived communities. At baseline, men were at high risk of subsequent morbidity (mean BMI=35.60 (sd5.26); mean waist circumference=117.36cms (sd11.96)), and many had particular challenges to increasing PA: 63% had pre-existing joint pain; 57.1% reported their fitness as poor/very poor. At baseline mean daily PA measures were: time sitting/lying 17.78h (sd1.62); step count 7953.70 (sd2973.21); time standing 4.54h (sd1.36); time stepping 1.66h (sd0.58); sit to stand transitions 31.80 (sd12.08); EE (MET) 33.80h (sd1.22).

Discussion: This programme reaches a population group that does not traditionally enrol in existing weight loss services. These baseline characteristics suggest we have recruited the correct target group, but identify specific challenges for increasing their PA levels and success in losing weight; future programmes must be tailored to these needs.

741 | Sitting time and physical activity in the UK working population: A cross sectional study

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Introduction: Working late, a large scale Research Programme underway at the Work and Health Research Centre, Loughborough University, is exploring how the health of people in the workplace can be improved and maintained. This paper presents findings from a first phase of the research project which involved exploring self-reported activity levels and sedentary activity among the UK working population.

Method: The research was conducted using a cross-sectional questionnaire, distributed to employees in 145 UK organisations in both the private and public sectors. Data on self-reported physical activity levels, sitting time, work-related variables, health promotion initiatives and demographic variables were collected.

Results: Of the 1141 employees who responded to the questionnaire, 55% were female, with a mean age of 43 (SD=11.9, range 18–65) years. Overall, the mean sitting time on a workday was 9 hours 18 minutes. More time was reported sitting at work (5 hours 7 minutes) than any other sitting activity, with work sitting time accounting for more than half of the average sitting time on a workday (55%). On average, more time was spent sitting on a workday than a non-workday (8 hours 25 minutes). The mean sleeping time on a workday was 6 hours 42 minutes whereas on a non-workday this was 7 hours 20 minutes. The results therefore suggest that participants spend as much time sitting as they do sleeping. Results for individuals in the Body Mass Index categories of normal and overweight showed significantly lower mean sitting times on a workday compared to those individuals in the obese category. On average, those in the obese BMI group sat for approximately 60 to 90 minutes longer than those in the overweight or normal BMI categories. Furthermore, two thirds (66.7%) of the respondents indicated they regularly engaged in physical activity and/or exercise during their leisure time. However, only 26.6% actually met minimum recommended guidelines for physical activity.

Discussion: Findings from this large scale research study provided an insight into sitting time and self-reported activity among the UK working population. The sitting time results from this research of the UK workforce are consistent with the sitting time prevalence in Australian workers, reported by Miller and Brown (2004). The data from this survey indicates there may be scope to increase physical activity and reducing sedentary activity through workplace health promotion programmes and occupational health initiatives.

742　Designing an effective physical activity intervention using the Google TV – putting user input at the forefront

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Introduction: Physical activity is critical to maintaining physical and mental health in postpartum women. However, up to one-year postpartum, 57% of women are sedentary. These women report they have less time for physical activity and spend more time indoors. Innovative physical activity videos delivered via an Internet connected television may be used to help Mothers overcome these key barriers and provide a realistic way for them to increase their physical activity. To create a technology driven intervention for a population that has specific needs and physical activity barriers, it is important to get the users' (Mothers') input.

Methods: Focus group data were used to develop the structure of the activity program and incremental sessions of usability testing are being used to determine the functionality of the program. Programming of the web-based application is now underway and Mothers (n=32) are being recruited for four sessions of usability testing. Each session is divided into two phases to allow researchers to test the changes made. In each session, Mothers complete specific tasks related to each component of the program including: 1) using an Internet connected television, 2) locating and playing premade workouts, 3) creating tailored workouts, 4) using the workout tracker, and 5) using "settings" to configure their user profile.

Results: Thirteen Mothers have tested the program thus far. The mean age of the sample is 33.3 years and they averaged 1.9 days of 30 minutes of physical activity per week. For the last eight participants, the mean System Usability Scale Survey Score was 84.7 out of 100. While Mothers have been able to navigate the program, some of the visual components were too complex; Mothers wanted less information and fewer shortcut options. However, the majority of Mothers said they would still recommend the program to friends.

Discussion: Each session of usability testing resulted in incremental improvements to the web-based application such as simplifying the navigation, thereby creating a more user-friendly version. The titles and labels used throughout the program were thought to be intuitive but we discovered that Mothers were confused by some of them. Without this involvement of Mothers, a different program would have been created. Once testing is complete, the authors will research the effectiveness of this program at increasing physical activity in a randomized controlled trial.

743　Providing low costs physical activity and healthy lifestyle activities for our Logan community – Active Logan and Healthy Logan

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Logan City Council provides low cost or free activities encouraging community members to lead happier and healthier lifestyles. These activities are delivered as part of two innovative and successful programs – Active Logan and Healthy Logan. The Active Logan program was developed by Council in 2008, it has grown substantially from providing 4 activities in to now providing 19, activities range from yoga to parents and bubs activities catering for the whole Logan community. The growth of the program has led to the completion of a program review ensuring the program continues to respond to community need and expectations. Following this review new policies, procedures, program structure and processes will be developed ensuring the continued successful delivery of the program. Healthy Logan is currently being delivered as part of the Healthy Communities Initiative which is funded by the Federal Government until June 2013. Healthy Logan provides a wide range of health promotion programs including the development of community gardens, healthy shopping, healthy cooking and physical activities classes. The Healthy Logan Program is being evaluated by an external organisation to measure its successes and help direct the future of the program both nationally and locally. Both programs target specific groups which include but are not limited to low socio economic, CALD, Indigenous and Torres Strait Islander communities; but both programs are open to the whole community. All activities are delivered based on community need, working in partnership with local community organisations which ensures organisational development and sustainability of the activities. The results of the review of the Active Logan Program and the full evaluation of the Healthy Logan program will guide the future development of health promotion programs in Logan and provide a professional case study for other local authorities.

744　Sporting attitudes: The success of participation. An evaluation of participant experiences in an organised Australian charity bicycle event

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Introduction: The benefits of charity sporting events are multi-fold: to encourage sports participation, to promote community awareness, to building camaraderie and support fundraising efforts. Organised sporting activities have proven benefit in increasing motivation, participation and enjoyment in physical activities. This study aimed to investigate the success of a charity bicycle event through evaluating experiences of participants. It was hypothesised that a positive personal experience in such an event could foster long-term psychological, behavioural, emotional and physiological changes that promote and support a physically active lifestyle.

Methods: A retrospective five-part written survey was administered to 30 adult participants involved in the NSW Chain Reaction Corporate Bike Challenge. Cyclists were all professional business people. The event was a seven-day 1,100km bicycle ride from Coolangatta to Sydney. Part A involved questions pertaining to motivation and participation, Part B to training and preparation, Part C to cycling education, Part D to injury prevention and Part E to experience and post-event attitudes. Survey answer types were a combination of single and multiple-answer multiple choice questions, and semantic differential, Likert and general ranking scales.

Results: Survey analysis involved descriptive summaries, data tabulation and regression modeling. Study findings revealed the most important motivational consideration for event participation was close personal emotional association with the charity, followed by increased fitness, enjoyment and accomplishment, and improved work/team relationships and camaraderie. Participants reported a greater awareness and understanding of bicycle mechanics and cycling biomechanics, injury prevention and treatment, and optimisation of nutrition and hydration.

Discussion: Study results indicate that community involvement and participation in charity amateur sporting events can be of great benefit in providing sport-specific education, training motivation and physical activity modification. In addition, psychological and physiological alterations resulting from training and participation can lead to a sustained increase in physical activity levels in the long-term. While limited to a specific demographic group, results from this study can be extrapolated to other population sub-groups, suggesting that a goal-oriented approach to physical activity and exercise prescription may increase levels of physical activity, sporting participation and enjoyment in the general community.

745   "I knew it was dangerous, but I never knew it was that dangerous." Physical activity as a vehicle to promote smoke free messages to children and youth: SmokeFree Sports

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Introduction: Smoking is one of the leading causes of preventable morbidity and death in England and is a risk factor for cardiovascular disease, chronic obstructive pulmonary disease and multiple cancers. Smoking is an addiction largely taken up in childhood and adolescence; therefore early prevention strategies are crucial. This pilot study evaluated the impact of SmokeFree Sports, a novel community intervention that used sport and physical activity to promote smoke free messages in children and young people.

Methods: SmokeFree Sports was a 6 month multi-dimensional intervention that consisted of 1) social-marketing strategies, 2) training sports coaches and dance instructors to encourage their participants not to smoke, 3) delivery of dance, boxing and dodgeball for 12 weeks within 5 youth clubs, and 4) community launch and celebration events. A total of 246 children and young people aged between 6 and 18 years participated in the campaign. Seventy-one children (Age=11±2.7yrs; 56% boys) took part in the research study. Smoking prevalence, intentions to smoke, attitudes and beliefs about smoking, and perspectives of the SmokeFree Sports campaign were assessed at baseline and post-intervention using a modified version of the Global Youth Tobacco Survey and through semi-structured focus groups.

Results: Almost all participants (n=69) were non-smokers at baseline. Self-report data revealed that the campaign had no effect on children and young people's smoking behaviour (due to ceiling effect). Significant positive educational effects were observed in relation to attitudes and beliefs around smoking and weight gain, and smoking addiction. Focus group data also revealed that children's awareness of smoking factors increased and participants stated that the campaign made them more determined to stay smoke free.

Discussion: SmokeFree Sports appears to be a promising medium to positively educate children and young people about smoking and health. Training for community coaches may offer a sustainable model for promoting the smoke free message to large numbers of children and young people. Further experimental research with long term follow up is warranted in a larger, more representative sample to investigate the effectiveness of the intervention. Physical activity and sport may provide a novel vehicle for school-and-community public health promotion, beyond physical activity per se.

746   Exploring the role of International Sporting Federations in the promotion of physical activity and health

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Introduction: Physical activity promotion for health (PAPH) needs multifaceted approaches in order to ultimately exert an effect on behavioural lifestyle changes. Besides government health agencies and the healthcare industry's obvious role and interest in PAPH, the role of international sporting organizations is not well understood. This study investigated the potential interest of international sporting federations (ISF) in PAPH.

Methods: The city of Lausanne, Switzerland, hosts numerous ISF as well as the IOC and umbrella sporting organizations such as SportAccord (which regroups 105 member organizations). An introductory brief online questionnaire was sent to 93 ISF, followed by a second detailed one to the ISF who agreed to participate and eventually an interview was conducted with a member of the ISF involved in corporate social responsibility aspects or the like.

Results: Out of the 93 ISF contacted through SportAccord, only 15 (16%) responded positively, and only 4 (4%) of those ultimately responded to the second detailed survey, and agreed to the final personal interview. None of the respondents have a PAPH program, reasons being: not the ISF's role (20%) and other priorities (40%), lack of finances (60%), lack of human resources (40%), lack of expertise/knowledge (20%). 1/3 of ISF was in the process of setting up a Corporate Social Responsibility department, while 1/3 consider developing health-oriented activities in the next 5 years and would support a program developed by an umbrella organization like SportAccord.

Conclusions: The response rate was very low, which points to a general lack of interest in the health promotion issues. ISF have a role in the promotion and survival of their own sport and they already suffer from a lack of financial and human resources. There is nevertheless a willingness to get help and develop novel social responsibility approaches that would benefit both the sporting world and the health promotion agencies, with the hope of tackling the issue of spreading non-communicable diseases from an additional angle. This is reflected in recent events like the IOC's Sport for All conference and FIFA's 3 Fives program (with the WHO), which put health at the forefront, while using the image, influence and reach of the endorsing sporting organizations. The latter need help from health promotion partners to develop novel coordinated programs, and this represents an important opportunity for PAPH.

747 Occupational and leisure time physical activity and physical work load among construction workers

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Objective: Construction workers are considered to have physically heavy work but there is a lack of quantification of the work load. In addition little is known on their leisure time health physical activity. The purpose of this study was to describe external load, posture, and general physical activity among constructions workers during working hours, as well as during leisure time.

Methods: At baseline 67 participants completed a sub-maximal fitness test (Åstrand). Additionally, they had their physical activity assessed with the international physical activity questionnaire (IPAQ) and 7 days of combined accelerometry and heart rate monitoring. Additionally, working routines including specific postures and movements were observed for 17 hours distributed over 4 working days using PATH.

Results: The mean physical activity for the construction workers in this study expressed as activity energy expenditure (AEE) was 34.1±1.8 J/kg/min on weekdays and 25.4±1.8 J/kg/min on weekends (P<0.001). During working hours (7–16 h) mean AEE was 57.0±3.1 J/kg/min, and during awake leisure time (16–23 h + weekends) 33.1±2.1 J/kg/min (p<0.001). Manual handling tasks were performed by more than 90% of the participants during work. When divided into pushing/pulling i), and carrying ii), and lifting iii) these were performed for >25% of working time by 50%, 57% and 52% of the participants for i, ii, and iii, respectively, and likewise burdens of >10 kg were handled by 55%, 52% and 41% of the participants for i, ii, iii, respectively, while burdens >25 kg were handled by 18%, 9%, and 6%, for i, ii, iii, respectively. Strained work postures were observed, as 19–24% of the working time (almost 2h) spent with the trunk bended or double bended. 81% of working time was spent, in an upright position either standing or walking.

Discussion: Constructions workers in this study had low physical activity level during leisure time compared to working hours. The physical activity intensity was low both at work and leisure time and their physical activity intensity level did not reach the international recommendations on physical activity. Furthermore, a high proportion of strained work postures were observed. Initiatives reducing the relative physical strain and increasing health-enhancing physical activity are recommended among construction workers.

748 Heart Foundation Walking Park Walks: Developing opportunities for physical activity whilst exploring the natural environment

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Introduction: Less than half of the Australian adult population is undertaking sufficient physical activity to benefit their health. Walking is the most popular form of physical activity and walking in groups has the added benefits of social interaction. Visiting a park and enjoying the natural environment provides a 'healthy' place for body, mind and spirit and can improve physical and mental wellbeing. The Heart Foundation encourages Australians to increase their levels of physical activity. Heart Foundation Walking (HFW) is Australia's largest network of free walking groups and aims to increase the community's participation in physical activity by encouraging individuals to walk together in groups. As of February 2012 the program has over 19000 participants and over 1200 groups nationally. Heart Foundation Walking – Park Walks is a collaborative initiative between the Heart Foundation and State based Parks services in NSW, SA and Tasmania. The program was initiated in 2006 with the aim to encourage participants to explore new walking opportunities. A walk schedule has been developed and walks are led by HFW, Park Rangers and volunteers.

Methods: The program invites HFW groups and community members to participate in free monthly walks in conservation and recreation parks and botanic gardens. All organisations work together to develop an annual calendar of walking events and to promote, implement and evaluate the program. In order to determine the effectiveness of the Park Walks program, data was collected from program participants in each state through paper based and online surveys.

Results: Since its inception the program has offered 69 walks with 2054 participants. Results include:
- Walks attract between 29–30 participants
- 50% indicated they were visiting the park for the first time
- 90% indicated an intention to re-visit the Park
- 90% indicated they were very satisfied with the walk
- Primary reasons for enjoying the Park Walk including: learning about flora and fauna, socialising and trying out a new walk

"Park walking has meant that I have discovered new places and have been able to share my excitement with my group and we have revisited many of the great walking tracks"

Discussion: Heart Foundation Walking Park Walks is a unique collaboration between the Heart Foundation and relevant State based peak departments to promote the health benefits of walking in parks. The initiative has attracted much interest with positive outcomes for the community. There are plans to build on its success with expansion nationally.

749 "I was happy I come last… it was like something off the Olympics": The meaning of intervention impact for obese adolescents

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Introduction: Despite being a prominent issue on the public health agenda, levels of obesity continue to rise. Some evidence suggests the current 1% annual increase will lead half of all young Australians to be overweight by the year 2025. There is growing support for encouraging obese adolescents to be active and multi-component models of obesity management suggest incorporating physical activity within interventions. However, there are limited guidelines on how to optimise this experience for obese young people and even less is known about how adolescents with obesity experience and ascribe meaning to the 'impact' of physical activity following intervention. This study aimed to uncover detailed qualitative accounts of experiences of physical activity during and following an intensive residential weight management intervention.

Methods: For inclusion, participants were required to a minimum stay on the program of at least five weeks. With parental consent and assent from participants, interviews were conducted around a semi-structured schedule and followed a progressively focused process of a) 44 single end-of-stay

interviews, b) a second interview conducted in the home environment at three months post-intervention (n15) and c) a third interview at nine months (n5). Questions probed participants' general experience of the intervention, enquired about specific components of the multi-disciplinary program and explored transitions to life post-intervention. Data analysis Interviews were audio recorded and transcribed verbatim. Transcripts were read several times to acquire an overall sense of the data. Emergent and recurrent issues associated with intervention impact were identified and a number of themes were clustered and incorporated into textural-structural descriptions of the meaning of physical activity experiences.

Results: Composite descriptions representing common experiences suggest that the young people experienced positive intervention impact and this continued into life beyond the intervention. However, highly positive or highly negative meanings were often ascribed to events that were seemingly minor when compared to adult norms and expectations. Over time everyday 'successes' and 'hassles' disproportionately impacted on perceptions of competence and ability to sustain levels of physical activity.

Discussion: Qualitative accounts enable health professionals to better understand how young people experience interventions. They can also uncover impacts not identified using short-term, objective measures of physical activity. Given the high meaning placed on seemingly trivial events, practitioners involved in intervention design, delivery and on-going care following successful intervention, might also consider how they help young people to manage meaning-making around setbacks in order to optimise success in maintaining regular, beneficial physical activity.

750 Development of an evaluation framework to measure the public health impact of a 'natural experiment': The PARC study

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Introduction: Physical inactivity has been identified as one of the top five causes of mortality and morbidity. Recent European figures show that less than 30% of the adult population are sufficiently active (i.e. meeting current physical activity guidelines). Active living has been proven to have many physical and mental health benefits, and thus the promotion of physical activity is a public health priority. Increasingly, the importance of the built environment to public health is being acknowledged. The Foresight report emphasised the need to improve our understanding of the relationships between individuals, communities and their social capital, statutory and non-statutory agencies, and the environment, in order to design effective population approaches that reduce sedentary living.

Methods: The Connswater Community Greenway (CCG) is a £32 million regeneration project in Belfast, Northern Ireland. It aims to provide safe and accessible space for recreation and active travel, and improve the quality of life for the 40,000 people living nearby. The PARC (Physical Activity and the Rejuvenation of Connswater) study is a 5-year evaluation of the effects of the CCG on physical activity and health. The RE-AIM (Reach, Effectiveness, Adoption, Implementation and Maintenance) framework has been proposed as the basis for planning and evaluating public health interventions. This allows the concurrent evaluation of dimensions considered relevant to real-world implementation, such as the capacity to reach socially-disadvantaged populations and the changes in health related outcomes, such as physical activity. This paper puts theory into practice by appraising the usefulness of the RE-AIM framework in developing an evaluation of a 'natural experiment', the CCG, outlining the challenges faced and suggested improvements.

Results: The RE-AIM Framework was used to plan an evaluation of the public health impact of a major urban regeneration project in a socially-disadvantaged community. The importance of using mixed methods and incorporating a trans-disciplinary approach are emphasised. In addition, the framework needs to take account of contextual factors, for example, weather, crime, road safety which have been shown to affect physical activity levels. The measurement of the actual change to the built environment needs to be considered as an adjunct to the framework.

Conclusion: The construction of an urban Greenway has afforded the unique opportunity to evaluate a 'real-world' natural experiment. Comprehensive assessment requires trans-disciplinary approaches in order to assess the effects of environment change on complex health-related behaviours. The RE-AIM Framework provides a useful template in which to plan such a comprehensive evaluation.

751 Qualitative findings from a community-led intervention aimed at reducing health inequalities in Stoke-on-Trent, UK

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Introduction: The environments in which we live and with which we interact have become ones that encourage lifestyle choices that decrease physical activity and increase the consumption of unhealthy foods. This project aimed to develop and evaluate a community-led intervention to reduce health inequalities related to physical activity and healthy eating by; 1) baseline mapping of the built environment using Geographical Information Systems (GIS) and community survey; 2) developing partnerships between community members and key stakeholders in the health economy; 3) collaboratively identifying, prioritising and designing interventions to address environmental disparities related to physical inactivity and healthy eating; and 4) piloting interventions to assess process, implementation and impact of this approach. This paper will report findings from the process evaluation of the My Health Matters project.

Methods: Processes involved in the development and implementation of specific community interventions were evaluated through 6 focus group discussions with n=36 residents (n=30 female, age range 32–70 years) and 7 face-to-face or telephone interviews with partner agencies (n=5 female). A focus group discussion was also conducted with n=12 (n=9 female, age range 49–69 years) individuals who were identified as project community champions. Interviews and focus groups were analysed using Thematic Analysis.

Results: Themes associated with health-related behaviour were identified from the data. Community members stated that 'health is not always a priority' and it is therefore important to facilitate and support communities to identify and prioritise their own issues. My Health Matters was viewed as a mechanism for bringing people together, linking services and ensuring 'communities communicate'. Focus group participants identified that people often 'don't know what's available on their door step' and frequently, it is 'word of mouth' that is most effective in promoting projects. Concepts relating to social capital were also evident, participants identified that 'we all have skills, even if we don't know it' and that the My Health Matters project gave people the opportunity to 'give something back' to their community.

Discussion: Overall, this project was viewed positively by focus group participants who highlighted the pivotal role that local people can play in shaping local decisions and addressing a communities public health issues. The biggest challenge in engaging communities is overcoming apathy, especially in increasingly cynical, over-consulted areas without evidence of subsequent action. It is important to recognise that change does not happen overnight and partnerships need to be cultivated at all levels over an ongoing period to ensure success.

752   Localism approach to promote the physical activity, sport, and exercise in Thailand

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Localism approach is an alternative method applied to physical activity, sport, and exercise promotion in Thailand through the integration of local cultures, traditions, and beliefs. It can publish the innovation in physical activity and exercise in harmony with the social context uniquely, which creates a sense of belonging and pride for their activities. Furthermore, it is also expected that the localism approach will strengthen the relationships among 3 age groups, namely, children, working age, and elderly, by having the health activities together properly. This study aims to explain the phenomenon of the physical activity and exercise promotion with localism approach in Thailand. The data are from the Evaluation of Physical Activity and Local Exercise for health operated by Department of Local Administration of Thailand, sponsorship of Thai Health Promotion Foundation. The quantitative cross-sectional data for a total of 26,667 cases from 9,126 households in 20 provinces of Thailand are employed in analysis process. The results showed that localism activities created by communities can predispose to a new exerciser for about 5 percent, while the exerciser was continued for about 44 percent regarding this program. Interestingly, the sample reflects positive attitudes toward physical activity by local wisdom, the results from correlation analysis indicated that people with positive attitudes would also have positive health behaviors. This finding corresponded with results from the Multiple Regression Analysis, in which found that the awareness and participation in localism activities have significantly positive effect to health behaviors of Thai population. Whilst, gender, age, and partner for health promotion are also the essential factors of the increment of new exerciser. Regarding the results, the promotion of physical activity and sport exercise by localism approach can be considered successful in term of the method for health activity promotion. This approach is the innovative ideas that can be applied to motivate physical activity and exercise in Thailand particularly among local population. Therefore, it should be established in the health policy, and offered to health promoter to achieve the sustainability of the health behavior integrated in life style of people finally.

753   Opportunities to promote physical activity in the workplace

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Introduction: The change from a manufacturing to service industry, the latter characterised by office work, has contributed to a lack of physical activity (PA) by increasing sitting time requirements at home and at work. Occupational based PA is an important contributor to daily levels of energy expenditure. Most adults spend more than half of their waking hours at work; hence worksites have the potential to be a key setting for health promotion activities. This research identifies descriptive data on employees' PA levels at work.
Method: The research was conducted using a cross-sectional questionnaire, distributed to employees in 145 UK organisations in both the private and public sectors. Feedback on incidental PA levels and prevalence data on travel to work was collected. Further data on health promotion initiatives in the workplace was recorded.
Results: Of the 1141 employees who responded to the questionnaire, 55% were female, with a mean age of 43 (SD=11.9, range 18–65) years. A cross tabulation analysing respondents' distance to work against their usual method of travel showed that 36.36% of respondents who lived less than 1 mile from their place of work used a car to travel to work. When investigating workplace health initiatives, 32.9% of the sample reported that there were no health initiatives available, 29% reported no PA focused initiatives were available and 38.1% indicated there were PA health initiatives available. Where PA initiatives were available, 73.9% were identified as subsidised gym memberships or onsite gym facilities. Using a 4-point Likert scale (where 1=never/rarely and 4=whenever possible), respondents indicated they were most likely to climb the stairs (instead of taking the elevators) (3.04) and walk or cycle to nearby destinations (2.74). Responses for getting off the bus a stop early (1.48) and parking vehicles further away from the destination (e.g. the furthest point in a car park from the entrance to a building) (1.97) scored the lowest.
Discussion: The results show there is a need to improve occupational health interventions that promote PA. An individual's job role will somewhat dictate the amount of PA accumulated during the workday. However, from the sample studied, it appears there may be opportunities for the promotion of active commuting to and from a place of work. Policies supporting incidental type activities may prove fruitful in creating sustained behaviour change in employees.

754   Development and usability testing of a web-based physical activity promotion program: Walk 2.0

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Introduction: The internet has become an increasingly important communication tool, and web-based physical activity (PA) interventions have the potential to reach large populations and contribute to the promotion of PA and behaviour change. Despite the proliferation of publically-accessible health-related and health promotion websites, relatively little work has been undertaken to study the utility and effectiveness of these population-targeted websites. The Walk 2.0 Study involves the development and testing of a Web 2.0 informed web-based intervention which will be compared for effectiveness and utility against an established (Web 1.0) PA promotion website (10,000 Steps) and control group. The purpose of this paper is to report on the development of the Walk 2.0 intervention and the testing of usability and acceptability among a sample of users from the 10,000 Steps health promotion website.
Methods: For initial development, potential Web 2.0 features were identified and the case for inclusion in the Walk 2.0 platform was considered by a panel of experts from health promotion, public health, PA, psychology, web development, and health informatics disciplines. Following consensus, the website was developed for beta and usability testing. During beta testing, the functionality and acceptability of the Walk 2.0 platform was assessed with 18 active users of the 10,000 Steps program, who engaged with the site for four weeks, noting any difficulties or problems encountered on a web-based survey. During the usability testing 4 participants were individually observed while completing 17 representative tasks on the website. Time taken to complete each task was recorded and subjective user preferences were gathered via the System Usability Scale (SUS) and interview.

Results: The average rate of engagement for the beta testing participants was 3.4 logins per week. During the four-week beta testing period, a total of 40 session surveys identifying issues with the Walk 2.0 website were submitted. The mean (±SD) SUS score of beta and usability testers was 68.9 (±18.4) /100, which is considered moderate or average. The mean (±SD) time taken to complete the 17 usability tasks was 425(±100) seconds. Three tasks were identified as more difficult than others taking 180 seconds combined.

Discussion: Feedback provided during the beta and usability testing of the Walk 2.0 website informed further development of the platform to ensure appropriate usability and acceptability. The Walk 2.0 website is now being tested for efficacy and utility in a randomised controlled trial and an ecological trial.

755 — Randomised controlled trial protocol: Physical activity and exercise in adults with intellectual disability.

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Introduction: Substantial health inequities exist for people with intellectual disability with alarmingly low levels of engagement in health-enhancing physical activity. A common hurdle to engaging people with intellectual disability in physical activity is that they are reliant on direct personal support to plan, organise, travel to and take part in physical activities. The staff of disability service organisations could be instrumental in providing such support, however they do not currently have the knowledge or skills to support people with intellectual disability to engage in adequate levels of physical activity. The overarching aim of this trial is to evaluate the effects of two approaches to sustainably increase physical activity and exercise in people with intellectual disability: a lifestyle physical activity approach and a structured exercise program.

Methods: Participants in this randomised controlled trial are 102 ambulatory adults with intellectual disability between the ages of 18–55 years receiving services from disability service providers across Sydney. Down Syndrome was the largest reported secondary diagnosis (45%), followed by mental illness (17%). As part of daily life, the lifestyle physical activity participants will, with the support of an exercise professional, build up to150 minutes per week of planned, low- to moderate-intensity physical activities with support from disability staff trained to use Active Support techniques. The structured exercise program group involves 150 minutes per week of moderate-vigorous-intensity small-group exercise sessions. Sessions take place 3 days per week within the local community, with exercise intensity progressing from 40%–50% of heart rate reserve to 50%–70% of heart rate reserve. The initial 12-weeks are delivered by exercise professionals with later implementation supported by trained disability staff.

Results: Outcome measures of physical activity, fitness and strength will be assessed alongside psychosocial measures including skills and behaviour, depression, social support and self efficacy about exercise. All assessments are conducted at baseline, 3 months and 9 months.

Discussion: This randomised controlled trial will evaluate whether, through support for increased physical activity and exercise, adults with intellectual disability will experience improved fitness, reduced sedentary behaviour and improvements in well being. The trial will also evaluate the sustainability of the interventions and their effects, to determine whether training disability service staff to support physically active lifestyles will lead to sustained capacity to support physical activity and exercise by their clients with intellectual disability.

756 — Social behaviour change: Getting active in Geraldton with conversations, small steps, and friends

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This presentation will cover both the theory and the practice of social behaviour change initiatives that successfully enhance physical activity and active transport in our communities.

UrbanTrans recently completed delivery of a social behaviour change project called ActiveSmart in Greater Geraldton, WA. The project connected with over 4,000 households in the community, engaging them in conversations to begin an incremental process toward being more physically active. This dialogue covered different activity options for different fitness levels, ages, and interests. Ideas ranged from getting active through gardening and housework, to short walks with friends, to cycling to work, to organised team activities. About half of participants wanted to move into an on-going engagement phase that included personalised coaching sessions, progressive goal-setting, tracking progress with pedometers, and a strong emphasis on social connectivity and activity planning with friends and family.

While the presentation will be structured around this significant case study, it will also outline the theoretical framework of Social Behaviour Change. UrbanTrans has refined this approach through multiple sustainability and public health projects across Australia and New Zealand. The core of our approach emphasises: 1) one-on-one conversations which allow people to frame the issues at hand in their own, personally meaningful way (rather than telling people why something is relevant to them), 2) commitment to very small first steps that jump-start a progressive cycle of new behaviours, and 3) planning activities with friends and small groups to sustain changes and strengthen social ties. Finally, our projects focus on taking behaviour change initiatives to scale. After initial testing, these efforts must be done at a large scale to have a real impact. The presentation will cover the logistical requirements for these projects, as well as their cost-effectiveness.

757 Feasibility and development of a novel Healthy Sports Clubs Program

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Introduction: Junior community sports clubs are an important setting for health promotion as 63% of Australian children participate in organised sport. However, only 32% of Australian children are meeting physical activity recommendations. In addition, health-promoting policies and practices in sports clubs are not uniformly present, and some clubs rely on funding provided through sponsorship by companies that promote less healthy products, such as non-core food and drinks. Alternative funding models for sport are possible, and may include a centralised fund to resource sports clubs. This funding system could maintain the financial viability of clubs, while reducing children's exposure to inappropriate commercial promotions in the sports setting. Funding could also be used to support the adoption of other healthy practices.
Methods: The feasibility and development of a novel Healthy Sports Clubs Program was investigated through two processes. A Delphi survey of 26 experts in health promotion and sport delivery addressed the 'importance' and 'feasibility' of potential program standards around seven key areas. Two-staged interviews with potential funding organisations asking for feedback on the proposed model were used to refine program specifications. Four groups of potential funding organisations were consulted: i) private and family philanthropists; ii) corporate philanthropic foundations; iii) corporate organisations aligned to the program (companies known to promote health and/or physical activity); and iv) corporate organisations not aligned to the program (companies that manufacture or sell mostly unhealthy food products and alcohol, and gambling organisations).
Results: The Delphi survey generated23 program standards which were rated important and feasible by most participants, comprising standards to promote healthy eating (N=5), sponsorship and fundraising (N=2), alcohol management (N=2), smoke free environments (N=2), sun protection (N=4), social inclusion (N=5) and injury prevention (N=3). In terms of potential funding organisations, two rounds of interviews were conducted with five philanthropic or family foundations (71% response rate), five corporate foundations (100% response rate), three aligned organisations (38% response rate) and one non-aligned organisations (10% response rate). Overall, potential funders were supportive, and particularly interested in a program that addressed disadvantaged groups and promoted sports participation.
Discussion: The Delphi standards provide expert-driven content for the Healthy Sports Clubs Program. Engagement with potential funding organisations has helped to refine the program, and to inform the governance structure and funding requirements for program implementation. Engagement with community level sports clubs will assist further in program development and contribute evidence in this area to inform broader healthy lifestyle policy and practice.

758 Health promotion in the sports club setting

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Introduction: Evidence evaluating the implementation processes and outcomes of health promotion interventions in the New Zealand sports club setting is lacking. This applies particularly to interventions targeting Maori and Pacific people who feature disproportionately in health statistics for diabetes, obesity and heart disease compared to New Zealand's Pakeha population. Maori and Pacific people also feature disproportionately in statistics for rates of smoking, problem drinking and violence against children. To help to address this situation Play 4 Life, a health and wellbeing programme was developed by the Waitemata District Health Board and New Zealand Rugby League in 2008 and piloted during 2010/2011 in five rugby league clubs in the Auckland region. The programmes goal is to create a healthier future for sport and recreation organisations by increasing health awareness and enabling health promoting environments in these settings. A process evaluation of the pilot was undertaken by the University of Auckland during 2011.
Methods: Data were gathered from semi structured individual interviews with seven key job holders, from health and sport stakeholder organisations and from one focus group with rugby league club officials involved in the pilot. Site visits, club and stakeholder meetings and an analysis of club documents were other data gathering methods employed to inform the evaluation.
Results: The Play 4 Life programme is supported by rugby league club officials and relevant health and sports stakeholders involved. This support base is influenced by evidence of the commitment and backing the sport's governing body New Zealand Rugby League has invested in the programme. The implementation of the individual Play 4 Life programme modules has resulted in positive aspects of change for participating clubs, including in areas related to nutrition, side line drinking and smoking, and 'social capital' gains evidenced by the improved image of rugby league clubs in local communities. The programme's implementation has also enabled health stakeholders to target young men, and Maori and Pacific communities with specific health promotion messages they were otherwise less likely to receive.
Implications: While these outcomes are encouraging, Play 4 Life has struggled to sustain its momentum. Factors contributing towards this outcome include a low level of on-going stakeholder engagement with clubs and a 'top down' approach to the programmes development and implementation. Before a wider roll out of the programme takes place the capacity of health and sports stakeholders to resource and support the programme requires clarification and confirmation so that Play 4 Life remains sustainable.

759 The effect of 12 week fitness centre based; physical activity counselling and exercise upon cardiovascular risk factors

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Introduction: Worldwide obesity levels have more than doubled since 1980 and in 2008 1.5 Billion adults were overweight, many remaining averse to fitness facilities and exercise. The aim of this investigation was to examine the effect of 12 weeks fitness centre based physical activity counselling (PAC) compared with unstructured exercise (GYM) on cardiovascular risk factors in sedentary individuals.
Methods: 33 participants (6 male, 27 female, mean: age 42.2±5.7 years, BMI 28.46±5.95 kg/m², predicted maximum oxygen uptake (VO_2) 32.01±6.07 ml/kg/min) free from chronic conditions, performed health assessments including; predicted VO_2 (Modified Blake protocol – Fitmate Pro), body composition (BODPOD), blood pressure (BP), cholesterol (LDX Cholestech), resting heart rate (RHR) and leg strength (sub-max 1repmax), before completing 12 weeks of fitness centre based PAC (n=15) or GYM (n=18). PAC was delivered bi-weekly and based on the 5 A's method (Assess, Advise, Agree, Assist, Arrange) whilst GYM had access to fitness centre facilities and were encouraged to attend by researchers during bi-weekly contact, although followed no structured exercise programme. Physical activity levels were monitored using 'mywellness key' accelerometers (Technogym) during the 12-week period. The health assessments were repeated following the 12 week intervention period.

Results: Following the intervention, significant reductions in body mass (80.3±17.76 vs 78.65±17.76 kg P<0.001), fat mass (30.91±13.75 vs 28.98±13.95 kg P<0.001), BMI (28.42±5.95 vs 27.83±5.95 kg/m2 P<0.001), body fat% (37±9.28 vs 35.31±10.1 P<0.001), and RHR (77±12 vs 70.±11 bpm P<0.001), leg strength significantly increased (88.6±24.14 vs 123.67±37.51 P<0.001) with no differences between groups. Systolic BP decreased in GYM only (129±12 vs 123±12 P<0.001), but cholesterol and diastolic BP remained unchanged. Fat free mass was maintained in both groups and VO_2 increased by 7% and 6.5% in PAC and GYM respectively, although this difference was not significant (P>0.05). Average weekly METs were not significantly different between groups (PA=31.98, GYM=32.38), but increased 16.8% over 12 weeks.

Discussion: This study demonstrates that PAC delivered within a fitness centre and monitored by a commercially available accelerometer is as effective as fitness centre based exercise in improving cardiovascular disease risk factor indices in a previously sedentary cohort over a 12 week period. A longer term investigation is required to identify if cholesterol may be significantly affected, and whether the reported effects are still evident. These findings suggest that PAC, in combination with an accelerometer, which may function to enhance motivation, may become an effective tool in the fight against physical inactivity in exercise averse, sedentary populations.

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760 Sogo Active: Engaging and empowering youth in physical activity

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Introduction to Sogo Active: Only seven percent of Canadian children and youth under 18 meet the Canadian Physical Activity Guidelines of 60 minutes of moderate to vigorous activity per day. In response, Sogo Active was developed by Coca-Cola Canada in collaboration with ParticipACTION, the national voice of physical activity and sport participation in Canada. Sogo Active empowers youth aged 13–19 years to challenge themselves and their peers to solve the inactivity crisis.

Sogo Active: Sogo Active is a national youth engagement initiative that strives to increase physical activity among youth. Delivered through a network of 13 provincial/territorial coordinators (PTCs) and over 2,000 Community Hosts, Sogo resources are provided for youth to address barriers and encourage physical activity. PTCs are responsible for recruiting and supporting Community Hosts, acting as spokespersons, and promoting and administering Micro Grants (up to $500) that help youth reach their goals. Community Hosts provide teens with the means (e.g. grounds/facilities, equipment, instructors) to get active. Engaging youth through challenges and contests is an integral component of the program using an interactive website as the central mechanism. In phase one of the program, 1,300 Sogo Active youth leaders were selected as torchbearers in the Vancouver 2010 Olympic torch Relay through Coca-Cola's Olympic Sponsorship.

Results: Over 30,000 youth have registered. In its initial three years, over two million dollars was distributed to associated organizations. Since July 2010, 800 grants have been distributed across Canada. Awareness of physical inactivity among teens has risen from 57% in 2010 to 91% in 2011. Ninety percent of Sogo Active participants reported Sogo Active increased how much they care about youth inactivity. Sogo Active has helped youth develop and utilize leadership skills. Compared to 2009, more Community Hosts in 2011 report Sogo Active activities included a youth-led component to their initiatives. Community Hosts report an increase in leadership skills development among participating youth, from 70% in 2009 to 88% in 2011.

Discussion: Physical activity levels start to decline in early adolescence. Sogo Active targets 13–19 year olds using a "for youth by youth approach". Engaging youth in decision making and leadership roles to encourage their peers to get active has great potential to increase the awareness of the physical inactivity crisis, the importance of physical activity and the ways in which physical activity can be incorporated into daily life based on individual needs.

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761 Effect of a person centred consultation intervention to reduce the sedentary behaviour of working Scottish adults

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Introduction: There is increasing evidence that sedentary behaviour is related to poor health outcomes and risk of chronic disease independent of physical activity behaviour. Occupational environments often promote prolonged periods of sedentary behaviour. Interventions to reduce and break up sedentary behaviour are required. This study investigates the immediate effect of a person centred consultation intervention for reducing sedentary behaviour (sitting time) in Scottish working adults.

Methods: The study was a two week, one group, pre-test post-test design. 41 participants (23M/18F, mean age 37.3yrs (SD 11.4)) in full time occupation were recruited. Sedentary behaviour was measured objectively and subjectively before and after the intervention. Objective measurement involved participants wearing the activPALTM monitor continuously for three full working days (inc sleep), recording time spent 1) sitting/lying, 2) standing, 3) stepping, 4) step counts and 5) sit to stand transitions. Subjective measurement involved part completion of the International Physical Activity Questionnaire (IPAQ) capturing usual weekday sitting time. The intervention was adapted from a successful, evidence based physical activity consultation intervention and involved a 30 minute individual discussion incorporating cognitive behavioural strategies (e.g. decisional balance, goal setting) to encourage individuals to think about their current sedentary behaviour and strategies to change.

Results: Before intervention participants spent on average per day 19.3hrs (SD 1.2) sitting/lying; 3.2hrs (SD 0.96) standing and 1.5 (SD 0.5) stepping. They did an average of 8091 steps(SD 3336), made 52 sit to stand transitions (SD 15) and self-reported an average sitting time of 9.6hrs (SD 2.4). After intervention participants spent on average per day 19.1hrs (SD 1.3) sitting/lying; 3.3hrs (SD 1.1) standing and 1.5hrs (SD 0.5) stepping. They did an average of 8356 steps (SD 3201) and made 56 sit to stand transitions(SD 19) and self-reported an average sitting time of 8.4hrs (SD 3.2). A pre to post intervention change was recorded for sit to stand transitions (p=0.008) and self-reported sitting time (p=0.009). No other comparisons were statistically significant.

Discussion: Participants completed four additional sit to stand transitions/day post intervention. Further analysis of the change in pattern of sedentary behaviour (bout frequency and duration) may provide a clearer picture of behaviour change. Although not statistically significant, recorded sitting time decreased by 38mins/day and step counts increased by 265steps/day, suggesting favourable changes post intervention. Research using larger samples, control comparison and longer follow-up are required to fully determine intervention effectiveness. Participants self-reported a 70mins/day reduction in sitting time. This reduction was not supported by the activPALTM, highlighting the need for objective measurement of sitting time in intervention research.

762 Effects of Kinect Sports on health indices of female university students

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Introduction: Proportion of obesity among young women in Japan is low, and that of underweight is high. The causes of this situation seem to be not high amount of physical activity, but lack of food intake. As this situation may lead to several kinds of health troubles later, we should encourage them to become more aware of physically active life. To motivate young people to exercise regularly, the focus is on fun. As most of young people is interested in video game, we examined the efficacy of new active-play video game system of Kinect Sports (2010, Microsoft Co.) to encourage them to become more active.

Subjects and methods: Study subjects were 34 young female students of Mukogawa Women's University. They participated in the exercise program using Kinect Sports for 3 month. We measured heart rate (HR) by RS800CS HR monitor (Polar Electro Co.) and calculated %HRmax during playing several games of Kinect Sports. We simultaneously measured exercise intensity (EI, METs) by tri-axis accelerometer Active style Pro (ASP, Omron Healthcare Co.). Participants wore ASP for at least 7days before and after the program. Specific sessions of Kinect Adventure (one of Kinect Sports game series) were used to measure HR and EI on a like-for-like basis. Before and after the program, we measured weight, BMI, and several parameters of body composition by InBody 3.0 (Biospace Co.) and asked them about the stage of behavioral change for exercise habit and their impressions of several characteristics of Kinect Sports program.

Results and discussion: 1) Mean±SE of EI during several sessions of Kinect Adventure varied from 2.5±0.1 METs to 5.4±0.2(max 8.9) METs. Mean±SE of %HRmax varied from 39±5 % to 64±4 %. 2) After the program, mean HR (average, maximum, steady-state) during the session is significantly decreased, which suggest the improvement of physical fitness, but BMI and body fat did not change significantly. 3) Most of participants show a positive response to Kinect Sports. Those who did not exercise regularly at the beginning improved their behavior significantly.

Conclusion: These results suggest that Kinect Sports have great potential as new tools to motivate young people to enjoy exercise, and to improve physical fitness and body fat.

763 Effectiveness of Start to Run, a 6-week training program for novice runners, on increasing physical activity: A controlled study

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Introduction: The organized sport sector has been identified as a potential setting for physical activity promotion. In the Netherlands, national sporting organizations were funded to develop and implement sporting programs that are easy accessible, especially for the least active population groups. Start to Run, a 6-week training program for novice runners, developed by the Dutch Athletics Organization, is one of these programs. In this study, the effects of Start to Run on physical activity were investigated.

Methods: Physical activity levels of Start to Run participants were assessed by means of the Short QUestionnaire to ASsess Health-enhancing physical activity (SQUASH) at baseline, immediately after completing the program, and after six months follow-up. A control group, matched for age and sex, was assessed at baseline and six months follow-up. Compliance with the Dutch physical activity guidelines was the primary outcome measure. Secondary outcome measures were the total time spent in physical activity and the time spent in each physical activity intensity category. Changes in physical activity within groups were tested with paired t-tests and McNemar tests. Changes between groups were examined with multiple linear and logistic regression analyses.

Results: In the Start to Run group, the percentage of people who met the Dutch Norm for Health-enhancing Physical Activity, Fit-norm and Combi-norm increased significantly, both in the short- and longer-term. In the control group, no significant changes in physical activity were observed. When comparing results between groups, significantly more Start to Run participants compared to control group participants were meeting the Fit-norm and Combi-norm after six months follow-up. The differences in physical activity between groups in favor of the Start to Run group could be explained by a significant increase in the time spent in vigorous-intensity activities.

Discussion: The results of the current study show that an easy accessible sporting program can influence physical activity behavior of participants positively. As sporting organizations have an enormous reach into community, they could play a major role in promoting physical activity to the general population. Research in the area of effectiveness of sporting programs in increasing physical activity is, however, still scarce. The role of sporting organizations in promoting physical activity should therefore be further explored.

764 Physical activity classes in community settings: Interventions to promote healthy lifestyles

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Introduction: Physical activity classes in community settings (PACCS) are recognized as a strategy for promoting physical activity in Latin America (LA). However, these interventions have limited evidence. Objectives: To describe selected PACCS programs developed in LA, to show the positive effect they have on the promotion of physical activity at the population level, and to demonstrate its potential implementation as a national policy using lessons learned from Brazil.

Methods: A literature review process of peer-reviewed and non–peer-reviewed literature in Portuguese, Spanish, and English was carried out using electronic databases. This process was complemented by interviews and consultations with experts, as well as program coordinators.

Results: Four Latin American programs (Academia da Cidade, CuritibAtiva, Recreovia, and Vida Chile) involving PACCS were found to be promising for promoting physical activity at the population level. PACCS are defined as regular interventions of structured exercise group classes, which involve an educational component, and make use of available environmental resources in communities for physical activity practice. They are conducted by

trained instructors, offered free of charge to community members and implemented in public places (e.g. parks, streets). Practice based evidence applied to these interventions along with the participation and social engagement have sparked their expansion to other Latin and North American countries, and its adoption as a national policy in Brazil.

Discussion: PACCS imply environmental, social, and policy actions; they are based on an ecological framework, supported by social cognitive and social support theories. Studies have shown that environmental interventions hold particular promise for promoting physical activity; but this is not sufficient to ensure that people will engage in active behaviour. PACCS potentially increase population levels of physical activity when public places are available by providing free and guided activities, and motivating people to be active. Moreover, these programs have certain regularity (three or more times/week), which increases the likelihood of producing behavioural change. In Colombia, Chile and Brazil, countries with high inequality, PACCS could contribute to address disparities and enhance quality of life among vulnerable populations such as older adults, women, low-income individuals, and people with disabilities.

Conclusions: PACCS are accessible and multi-sectorial interventions, which make use of readily existing infrastructure. They are likely to be effective in promoting healthy lifestyles and to have a positive impact on population quality of life; however, more future research is needed.

765 The FamilyFIT Program: Feasibility of an innovative family-based intervention designed to increase physical activity levels

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Introduction: There is a gap in the evidence base regarding effective and sustainable programs that engage parents to promote children's PA and a shortage of programs in community and home settings. The aim of this study was to assess the feasibility of a family-focused, community-based intervention (FamilyFIT), to increase physical activity levels in primary school children.

Methods: A single arm pre-post design was used to test recruitment strategies and assess the feasibility and acceptability of the data collection methods used and the intervention content and delivery mode. Recruitment rate, program retention, adherence and satisfaction data were collected. Nine families (n=14 children; n=15 parents) with at least one primary school-aged child (5–12 years) were recruited. The FamilyFIT Program was theoretically based and evidence informed, comprising 8 weekly face-to-face sessions that incorporated structured parental health education, child PA, and whole family games and PA. Education session topics included; strategies to increase family PA and reduce sedentary behaviour, goal setting, improving children's fundamental movement skills, health-related fitness. Parents and children wore a pedometer for seven days. Parents and children also completed self-report (parental support for child PA, parenting styles, home physical and social environment, sitting time) and objectively assessed (height, weight, waist, blood pressure, resting heart rate) items. Parents completed a process evaluation questionnaire and one parent from each family took part in a semi-structured telephone interview to assess acceptability and satisfaction.

Results: Forty two per cent recruitment rate, (77%) attendance rate and (77%) retention rate at 10 week follow-up. One-third of families attended all 8 face-to-face sessions and 45% of families attended 6 or 7 sessions. Most parents agreed or strongly agreed that FamilyFIT helped their family to be more active together (75%) and impacted positively on the whole family (83%). All interviewed parents reported positive changes in PA related-behaviours in the family's home environment as a result of attending FamilyFIT and all would recommend FamilyFIT to other families. Four parents and 4 children increased their mean step count. Self-reported PA behaviours, parenting practices and changes in the family home environment will be presented.

Discussion: Findings demonstrate the feasibility of FamilyFIT with high retention, acceptability and satisfaction. These results will be used to refine the program in readiness for a fully powered RCT to assess the efficacy of the intervention.

766 The impact of a sport-for-development programme on the physical fitness of young adolescents in Gulu, Northern Uganda

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Introduction: Physical inactivity is thought to be contributing to low levels of physical fitness (PF) and the emergence of the double burden of disease in low- and middle-income countries (LMICs). Behavioural, environmental and socio-economic characteristics of post-conflict settings may expedite this epidemiological transition. The sport-for-development (SfD) sector is rapidly expanding and claims to positively influence PF in this context. This study examined the impact of a SfD programme on PF levels of young adolescents in Gulu, Uganda.

Methods: Voluntary male registrants for a SfD programme in Gulu aged 11–14 years were randomly allocated into an intervention (T, n=73) or wait-list (W, n=71) group. All voluntary female registrants aged 11–14 years were allocated into group T (n=79). A non-registered control (O) group was also formed for both boys (n=450) and girls (n=727). The intervention comprised 9-weeks of activities (1x40 minute football match and at least 1x1.5 hour training per week). All groups undertook measurement for the multi-stage fitness test (MSFT) and standing broad jump (SBJ) before and after the intervention. Within-group changes ($\triangle$) were assessed using paired t-tests. The between-group comparisons of $\triangle$ were analysed using a repeat measures ANOVA adjusted for baseline, age, school, residential division and history of abduction.

Results: There was significant improvement in the MSFT for all groups [p<0.05]. For the boys MSFT, the $\triangle$T was significantly greater than the $\triangle$O [p<0.01], but not different to the $\triangle$W [p=0.141]. A similar trend was observed for the $\triangle$T vs. $\triangle$O for the girls MSFT, but it was statistically insignificant [p=0.065]. The SBJ performance of the boys in T deteriorated during the intervention [p<0.05]. Although there was a statistically insignificant improvement in the SBJ of the boys in W [p=0.333] or O [p=0.882], there were no significant between-group differences after adjusting the data [$\triangle$T vs. $\triangle$W: p=0.392, $\triangle$T vs. $\triangle$O: p=0.770]. There was no change in the SBJ for the girls in T [p=0.499] or O [p=0.836] and no significant between-group difference in the $\triangle$T vs. $\triangle$O [p=0.834].

Discussion: The SfD intervention appeared to positively affect aerobic PF. The deterioration in SBJ of boys in T may be due to physiological adaptation to a higher "dosage" of aerobic physical activity than the girls and wait-listed boys. The development of local capacity by the SfD programme may explain the community wide changes in aerobic PF most evident in the wait-listed boys who were more keen and available to play sport.

767 Insights into engaging men in weight loss: Process evaluation of the SHED-IT RCT of gender-sensitised weight loss programs for overweight men.

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Introduction: Process evaluation can provide important information about the quality of an intervention, participant's views regarding intervention components and insights into the mechanisms of change. However, process data are rarely reported, particularly in weight loss studies of men. The aim of this study is to report the process evaluation outcomes from the SHED-IT community trial.

Methods: Assessor-blinded RCT in 159 overweight/obese men (mean [sd] age=47.5 [11.0] years; BMI=32.7 [3.5]) who were randomised to 1) Resources: gender-sensitised weight loss materials (DVD, handbooks); 2) Online: Resources materials plus website to self-monitor diet and exercise with e-feedback on seven occasions. 3) wait-list control group. Process measures included recruitment, retention, satisfaction (via questionnaire; n=22 items) and adherence to self-monitoring protocol.

Results: Relative to controls, significant intervention effects were found for weight (p<.001) in both the Online (-4.7 kg; 95% CI -6.1, -3.2) and Resources (-3.7 kg; 95% CI -4.9, -2.5) group. Recruitment: Over 600 men responded to recruitment materials after 1 week. The four main reasons cited for signing up to the program include i) seeming 'doable' (54%), ii) university based (44%), iii) male only (31%), iv) being attracted to the picture of a beer (25%). Retention: Measures obtained for 81% at 6 months with no difference in follow-up rates between study arms (χ2=0.809, df=2, P=0.667). Satisfaction: Men reported the SHED-IT program improved their knowledge regarding weight loss strategies (mean=4.2/5, sd=0.5). Components of the program, specifically the DVD (mean=4.1/5, sd=0.6); paper-based resources (mean=4.0/5, sd=0.7), study website (mean=3.9/5, sd=0.6) and e-feedback (mean=4.0/5, sd=0.7) were also reported to be enjoyable, engaging and useful tools to assist weight loss. A significant association was found between weight loss and the number of weight loss strategies utilised (r=-0.44, p<0.001). Adherence to self monitoring: 30% of the Online group and 20% of the Resources participants complied fully with the assigned treatment. Further, 42% of participants who were randomly allocated into their preferred treatment group were compliant, compared to 21% of those who did not receive their preferred group.

Discussion: Both SHED-IT weight loss programs were considered efficacious and feasible with high levels of participant recruitment and retention. Participants reported a high level of satisfaction with the program materials and the level of support for weight loss provided, despite no face-to-face contact. Additional research into strategies to improve compliance is warranted.

768 Case study: Exploring the "black box" of intervention development

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Introduction: There is a need for effective physical activity (PA) support services that can be provided in a cost effective and sustainable way. Such programs should be grounded in sound behavioural theory and tailored to address key determinants of PA among the target group. However, practical and detailed information on how to integrate these factors into a coherent and comprehensive intervention is lacking. This presentation describes this process using the case study of a theory-based computer-tailored intervention targeted at breast cancer survivors currently being evaluated in a national RCT in Australia.

Method: A review of the literature and original qualitative research was undertaken to identify key determinants of PA among breast cancer survivors and identify the most appropriate theoretical framework. Social Cognitive theory (SCT) was identified as the most useful theory for guiding intervention development. The Intervention strategies were developed based on guidelines on how to operationalise SCT and previous research suggesting the efficacy of specific strategies for changing SCT constructs and PA behaviour.

Results: The tailored-print intervention consists of three tailored newsletters, iteratively tailored over a three month period. The content of the newsletters is informed by responses to items measuring SCT constructs (full model) and PA performance at baseline, and responses to items about PA performance and goal setting at 4 weeks and 8 weeks post baseline. Overall, the development of the intervention (computer programming and graphic design costs) cost AUD $12,000.

Conclusion: This presentation provides insight into the "black box" of theory-based intervention development.

769 A Healthier Sweden – awareness week on healthy eating habits and physical activity

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For the last three years the Swedish National Institute of Public Health (SNIPH) has coordinated an awareness week on healthy eating habits and physical activity, called A Healthier Sweden. The assignment was a collaborative project and aimed at promoting healthy eating habits and physical activity in the public. The implementation took place in collaboration with municipalities, county councils/regions, non-governmental organizations (NGOs) and private actors. SNIPH appointed contacts in all counties. The objective of the county contacts was to act as facilitators for the involved stakeholders at regional and local levels. The starting point for the work with A Healthier Sweden was to emphasize and call attention to the on-going work and activities that aim to promote healthy eating habits and physical activity at various levels in the country. The target group of the assignment was the entire population, but in the implementation of the assignment particular focus was placed on four prioritized target groups: children aged 0–12, teenagers aged 13–19, adults aged 65 or older, and individuals with an intellectual disability. SNIPH offered three kinds of support to participating stakeholders and activity organizers prior to and during the focus week: communication support, knowledge support and collaboration support. The communication support consisted of a graphical toolbox with posters and templates for advertisements and PR support in the form of templates for editorial articles and press releases at the local and regional level. Extensive publicity work was also implemented and planned by SNIPH.

Nearly 3,000 activities were arranged nationwide during the awareness week in 2011 and around 1,000 unique organizers participated. This is a three-fold increase in the number of activities and activity organizers from 2010. The number of stakeholders increased in all sectors, particularly private stakeholders and NGOs. Over a four-week period, A Healthier Sweden received around 850 media hits. An evaluation was conducted consisting of web questionnaires. Detailed results will be presented. An awareness week can place focus on food and physical activity and their significance to health and generate new collaborative opportunities, but it provides no long-term effects on the population's health. If this kind of measure is combined with an overall national strategy the possibility of achieving long-term effects on health improves. In order to reach the groups in the population that have a greater risk of illness, special measures are required.

770 Train surfing: Apposite recreation provision as alternative to adolsecnt risk-taking and sensation-seeking behaviour

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This study originated from an observation of an increase in male teenagers engaging in train-surfing, a well-known risk-taking behaviour among teenagers. Train-surfing is a potentially fatal game where participants avoid overhead electric cables while standing on top of moving trains, climbing in and out of moving carriages or hanging out of carriages. With a background in community recreation the authors initiated a qualitative study in order to understand adolescents' perception of train-surfing and possible alternatives to this behaviour.
In constructing the semi-structured interview schedule the study focused on male adolescent characteristics that have an impact on risk-taking behaviour including emotional, social and physiological factors in order to answer the question: 'How can leisure and recreation be applied to fulfil the need for risk-taking behaviour experienced by the male teenager?' Participants in the study included male adolescents between the ages of 14 and 19 years of age attending three high schools whose main form of transportation included the Metro rail.
Adolescents engaging in the study saw train-surfing as a highly skilled activity that alleviates the sense of boredom they experienced. It was found that adolescents saw current interventions to stop them from engaging in train-surfing as adding to the excitement of the activity. The possibility of prosecution added to the thrill. This finding emphasised the need for an intervention in which the adolescent as train-surfer is not condemned but where risk-taking behaviour is channelled into more positive activities while still fulfilling the need for novelty and excitement. Results from the study suggest elements to include in recreation programming for teenagers. It also emphasised the need for people involved in programming for teenagers to understand the adolescent in a holistic manner including an understanding for the adolescents' brain development. Programs must be based on and adapted to the adolescents' social and emotional characteristics but also to specifically facilitate successful development of the cortex and prefrontal cortex. Recreation provides an avenue in which opportunities can be created for positive risk-taking under structured circumstances. Recommendations originating from a combination of the literature review and the semi-structured interviews with adolescents included adaptations to current recreation programming for adolescents.

771 Enhancing health resources and reducing risk factors for overweight and inactive children by a long-term physical activity intervention

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Regarding the fact that, in Germany, 15 % of the children suffer from overweight and 6% are obese effective interventions preventing overweight are necessary. Though physical activity has to be considered as a strategy enhancing health and wellbeing, there is still a lack of studies concerning effects of long-term interventions on physical and psychosocial resources of health and behavior besides a reduction of risk factors of overweight and inactive children. Therefore, the objective of the present study was to evaluate the effects of a combined physical activity and behavior intervention on health status (physical and psychosocial resources, risk factors) and behavioural changes (level of physical activity) of overweight children in the setting of a sports club. The structured intervention covered 30 weeks each with a physical activity class of 90 minutes and additionally 3 workshops for parents. Each exercise session comprises elements that train and strengthen the physical resources endurance, strength, flexibility and coordination as well as techniques that focus on psychosocial and cognitive aspects. At the beginning, in the middle, and at the end of the intervention period data about physical (KATS-K) and psychosocial resources (quality of life, KINDL; self-concept, FSKI) as well as data about anthropometry (BMI-SDS) and the physical activity and inactivity (HBSC-index) has been collected of the 8 to 12 year old children (BMI >90. to 99.5 percentile) (IG: n=17; CG: n=20). Compared to the CG, the results indicate significant effects on physical resources, for example increased values of strength (F=83.954, p<0.001) speediness (F=15.149, p<0.001) and on psychosocial resources, for example increased values of self-concept (F=4.835, p=0.032). Also body fat as a risk factor of obesity was significantly lower (F=4.987, p=0.029). Quality of life was comparatively higher (F=2.838, p=0.098) as well as the values of the HBSC-index (F=4.797, p=0.033).
The positive effects on the children's quality of life and their level of physical activity serve as a good basis for continuous and sustainable changes in their behavior. Participants realized that there was a need to change their way of life and that they were able to put these changes into practice. Additionally, the setting of a sports club simplifies the process of continuing different types of physical activity also alternatives to sport specific and performance-orientated activities.

772 Contemporaneous correlations within individuals in an automated web-based walking program (Walk@Work) over a six week period (three phases) of time

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Introduction: Participants may respond to phases of a workplace walking program at different rates. This study evaluated the factors that contribute to the number of steps through phases of the program. The intervention was automated through a web-based program designed to increase workday walking.

Methods: The study reviewed independent variable influences throughout phases I–III. A convenience sample of university workers (n=56; 43.6±1.7 years; BMI 27.44±.2.15 kg/m^{2}; 48 female) were recruited at worksites in Australia. These workers were given a pedometer (Yamax SW 200) and access to the website program. For analyses, step counts entered by workers into the website were downloaded and mean workday steps were compared using a seemingly unrelated regression. This model was employed to capture the contemporaneous correlation within individuals in the study across observed time periods.

Results: The model predicts that the 36 subjects with complete information took an average 7460 steps in the baseline two week period. After phase I, statistically significance increases in steps (from baseline) were explained by age, working status (full or part time), occupation (academic or professional), and self reported public transport (PT) use (marginally significant). Full time workers walked more than part time workers by about 440 steps, professionals walked about 300 steps more than academics, and PT users walked about 400 steps more than non-PT users. The ability to differentiate steps after two weeks among participants suggests a differential affect of the program after only two weeks. On average participants increased steps from week two to four by about 525 steps, but regular auto users had nearly 750 steps less than non-auto users at week four. The effect of age was diminished in the 4th week of observation and accounted for 34 steps per year of age. In phase III, discriminating between participants became more difficult, with only age effects differentiating their increase over baseline. The marginal effect of age by phase III compared to phase I, increased from 36 to 50, suggesting a 14 step per year increase from the 2nd to 6th week.

Discussion: The findings suggest that participants responded to the program at different rates, with uniformity of effect achieved by the 6th week. Participants increased steps, however a tapering off occurred over time. Age played the most consistent role in predicting steps over the program. PT use was associated with increased step counts, while Auto use was associated with decreased step counts.

773 More about the talking than the walking – Heart Foundation Walking creates active and social communities

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Introduction: Only half of the Australian adult population are sufficiently activity to benefit their health. Amongst those least likely to be active are older people, women, people who are overweight or obese, socially isolated people and people with low incomes.

Heart Foundation Walking (HFW) is Australia's largest free group walking program and aims to increase physical activity by developing social networks through training and supporting volunteer Walk Organisers to lead free walking groups.

HFW establishes partnerships with Area Coordinators from local governments, health and community organisations to develop local walking groups. Utilising the HFW train-the-trainer package, volunteers are recruited to lead walking groups and are provided with training, resources, insurance cover as well as audit tools to assess route walkability. All HFW members can opt into the Walker Recognition Scheme to assist with motivation and goal-setting.

Methods: Program resources, training, support, demographic factors and walker physical activity levels were evaluated through paper-based and online methods. Data was collected from 7399 walkers and Walk Organisers receiving 44% response rate and 395 Area Coordinators receiving 46% response rate.

Results: HFW groups on average walk weekly for 56 minutes. Over 80% of walkers reported participating in 150 minutes or more of moderate or vigorous physical activity in the last week and reported walking their most common form of activity. Most respondents joined HFW for health reasons (75%) but continued for fun, safety and social reasons (71%). Program support rated as very important including quarterly newsletters (75%) and the Walker Recognition Scheme (75%). Over 90% of Area Coordinators stated HFW provided all or most of what they needed to successfully implement HFW.

HFW attracts and retains those least likely to be active including:

- women (80%)
- older people (average age 56 years)
- people with lower income (47%)
- overweight or obese people (60%)
- people who live alone (30%)

HFW has outstanding retention rates attributed to group ownership, volunteer support and participants stating a sense of belonging:

- 6 months – 84%
- 1 year – 65%
- 2 years – 53%
- 3 years – 51%

Areas for improvement included increased advertising and simplifying online registration and logging monthly attendance.

Discussion: HFW successfully operates in 295 local government areas through partnerships with 462 Area Coordinators. It engages over 19,500 active participants and 2,000 volunteers each month and provides an appropriate, transferable framework to:

- Engage Australians in free, fun, social, physical activity
- Encourage community connectedness and ownership
- Train, resource and up-skill communities to facilitate walking groups
- Contribute to meeting individual physical activity recommendations for population groups least likely to be active.

774 Identifying men for physical activity interventions through workplace health screenings

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Purpose: Men living in regional and remote areas of Australia have a higher prevalence of chronic disease, are more likely to lead unhealthy lifestyles and do not often meet physical activity (PA) guidelines. With federal and state based initiatives focusing on preventative health initiatives in the workplace, the aim of this study was to identify men who are at risk of being insufficiently active and may benefit from workplace strategies to promote PA.

Methods: Self-reported information on demographic characteristics, lifestyle choices, medical history, and PA levels were collected as part of a workplace health screening program for men working in Ipswich and West Moreton from 2005–2011. Blood pressure, blood glucose, cholesterol levels and waist circumference were measured by a nurse. The prevalence of these risk factors was compared among the men. Consistent with Active Australia Survey protocols, total PA level was calculated by adding time spent in walking, moderate PA and vigorous PA (x2); men were classified as active and meeting guidelines if they achieved ≥150 minutes of moderate-to-vigorous PA per week. Univariable and multivariable logistic regression analyses were used to estimate odds ratios (OR) for not meeting PA guidelines. A post-hoc analysis, including significant variables from the multivariable model, was performed to identify men who were most at risk of not meeting PA guidelines.

Results: 1748 men representing 130 worksites took part in the screening. 59.7% of men >40 years were inactive. The univariable model showed that men >40 years were 1.38 (CI=1.14–1.67) times more likely not to meet PA guidelines than men <40 years. This association remained significant after adjustment for BMI, history of high blood pressure, diabetes and renal disease (OR=1.29; CI=1.04–1.60). The multivariable model showed that men <40 years, who had completed a trade certificate/diploma and earning between AUD$40,000–$60,000 had the lowest risk of not meeting PA guidelines. Post-hoc analysis showed that men >40 years, who did not undertake education beyond high school and earning below AUD$40,000 had the highest odds of not meeting PA guidelines (OR=2.19).

Discussion: The findings of this study identify older and less educated regional Australian men to be most likely not to meet PA guidelines. Future research will utilize these data to target these groups of men for PA interventions, through the development of tailored strategies in regional Australian workplaces.

775 Relationship between physical activity outcomes and adherence to paper-based social cognitive tasks in a weight loss program for men

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Introduction: Evidence suggests that physical activity (PA) interventions may be strengthened by the application of behavior change theory. However, many PA interventions are a-theoretical or use theory as a 'loose framework', rather than mapping key constructs to specified behavior change techniques. The primary aim of this study was to examine how men engaged with a Social Cognitive Theory (SCT)-based logbook during a 3-month weight loss intervention. The secondary aim was to investigate whether engagement was associated with changes in hypothesised SCT PA mediators and objectively measured PA.

Methods: Baseline and 3-month (post-test) data were sourced from the SHED-IT community RCT of weight loss programs for men. Resources for these programs included a handbook, logbook, DVD and pedometer. PA was measured objectively using pedometry and PA cognitions were measured with validated scales (self efficacy, social support, outcome expectations, intention). In the logbook, men were advised to set one PA goal and two social support strategies per month, and to self-monitor and plot their average daily step count each week. At post-test, logbooks were collected from 63% of intervention participants (n=67). Independent analysis of logbooks was conducted to generate individual quantity and quality scores for each construct.

Results: i) Goal setting: 59% of men set a PA goal in the first month, however this decreased to 52% in month 2 and 42% in month 3. Overall, most PA goals related to "increasing step counts/walking" (59%) or "increasing PA levels/going to the gym" (34%). ii) Social support: Only 31% of men created at least 1 acceptable PA social support strategy. For most PA strategies, men selected their partner as their source of support (35%), followed by their children (22%). iii) Self-monitoring: 67% of men used the pedometer chart to plot their average step counts and the median number of weeks recorded was nine. A repeated measures ANOVA revealed that participants who achieved all goals had significantly increased perceived self-efficacy at 3 months, compared to those who did not (P=0.02). The only SCT variable which showed a significant, positive relationship to PA was self-monitoring of pedometer steps.

Discussion: Our findings suggest that a key strategy to promote PA amongst overweight men is the instruction to self-monitor physical activity using a pedometer. Given that approximately half of the men were unable to set appropriate goals and social support strategies, further instruction or education may be required to ensure that this process is understood.

776 Roles and functions of sport and recreation officers on physical activity and sport exercise promotion in Thailand

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Sport and Recreation Officers play an important role in the dissemination of information about physical activity, sport, and exercise to communities. They also take responsibility to explore, and provide appropriate health promotional activity for people in the area by mainly considering on social context. In the recent years, Sport and Recreation Officers have created numerous numbers of physical activity and exercise in the whole country. Unfortunately, there is no clearly study describing the roles and responsibilities of these personnel in the health promotion procedure. Thus, this study aims to assess the performance of Sport and Recreation Officers focusing on 1) what does the role of these officers in the physical activity, sport, and exercise promotion, and 2) how do they get involved with the health promotion partners and networks. The data are from the project of exercise and sport promotion at provincial level with the sponsorship of the Thai Health Promotion Foundation. Data were collected from officers, health clubs, and health organizations working in 5 provinces of all Thailand regions. Dataset presents the meaningful information of social networks, and role of individual health partners in health activity at community level. The results from the Social Networks Analysis (SNA) showed that Sport and Recreation Officers are the key person as a leader in promoting physical activity and exercise in the community. Furthermore, they are the center of the health workers network that are responsible for coordinating the work ties and maintaining the relationship among organizations related to the physical activity, sport and exercise promotion. Also, when considering a socio-diagram from SNA, it pointed out that these personnel are also indispensable of the activity management system in terms of staffing, budgeting, equipment and information. Without these personnel, there is no continuity and connectivity of the social network of health partners. It is therefore suggested that to provide effective health promotion activities at the community level, it should assign a liaison role to Sports and Recreation Officers. They would directly coordinate and transmit any of health policy and activity to their partners, networks, and people in the community thoroughly.

777 Coalitions linking action and science for prevention (clasp) – a cross-sectoral approaches to address increasing physical activity in Canada

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Introduction: Cancer and chronic disease prevention, while addressing common risk factors like physical activity, are largely fragmented into disease, jurisdiction, and discipline-specific silos. The Canadian Partnership Against Cancer implemented a pan-Canadian initiative to support the development of:
1. Collaborative partnerships integrating evidence from research, practice and policy to deepen the impact of cancer and chronic disease prevention.
2. Multi-province/territorial partnerships that broadened the reach of existing cancer and chronic disease prevention initiatives.
The CLASP model expanded knowledge exchange on chronic disease prevention among public health leaders, as well as leaders in environment, transportation, and education fields. The model has enabled a shift from coalitions networking and coordinating to cooperating and collaborating among leaders across disciplines and jurisdictions to better address complex cancer and chronic disease prevention challenges.
Methods: Seven projects collectively representing every province and territory were funded. An extensive Knowledge Translation and Exchange (KTE) process led by the Partnership was undertaken including participation in semi-annual KTE meetings to support CLASP project efforts and to promote inter-project knowledge sharing, cooperation and collaboration. Three of the seven coalitions focused on increased physical activity focusing on active transportation to school, decreasing screen time and community design for walkability.
Results: Two articles have been published or in press in a peer-reviewed public health journal (JPHMP) documenting the CLASP model consultation and RFP Adjudication processes. The evaluation of the model has demonstrated an increase in collaboration across jurisdictions and disciplines. The three projects focused on physical activity and their individual initiative evaluation reports have demonstrated early successes including local policy development for a healthy built environments and an increase in active transportation to schools.
Discussion: The three CLASP projects focused on increasing physical activity initiative engaged researchers, practitioners and policy specialists from all province and territory in Canada. Early successes demonstrate the importance of multi-jurisdictional and multi-sectoral approaches to increasing physical activity in Canada. CLASP continues to be a funding opportunity going forward.

778 Bridging the gap – coordination of researchers and practitioners

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Introduction: In Denmark there is a growing tendency for adolescents to become physically inactive when they reach the age of 12 to 13. Less than half of Danish children are as physically active as the National Board of Health recommends. This has widespread consequences both for the individual and for society in terms of obesity, diabetes and heart diseases. "Space for physical activity" is one of Denmark's largest research projects and addresses this problem. The project is a multi component intervention study addressing the level of physical activity among adolescents (aged 11 to 15). 1.350 pupils in 14 schools in five municipalities in Southern Denmark are participating in the project in the period 2010 till 2012.
Method: To coordinate the many participants in the project, the Region of Southern Denmark has engaged a project coordinator. The role of the project coordinator is to facilitate the co-operation of researchers and practitioners, i.e. school leaders, teachers, municipal officials and external participants. Furthermore the project coordinator is in charge of fundraising and raising awareness about the project in the media.

Results: The fact that the project coordinator is a third party to both researchers and practitioners has turned out to be a very successful idea. Besides coordinating, the project coordinator acts as a go-between and functions as a problem solver. This is made possible by the fact that the project coordinator is paid by the Region of Southern Denmark and not by any of the municipalities or by the university.

Discussion: In the process of coordinating the project many learning points have been made about the differences between the world of researchers and the world of practitioners, e.g. terminology, timeframe and the differences the participants place in the importance of the various aspects of the project. These learning points have been collected and made into a booklet to guide future projects involving researchers as well as practitioners. The oral presentation will focus on the learning points and experiences gained during the "Space" project. The presentation will discuss what the researcher has to take into account when working with various practitioners and how a third party coordinator can help both the researcher and the practitioner to reach their goals.

Support: The project was supported by TrygFonden.

779 Behaviour change theory based research in the promotion of healthy diets and physical activity in Latin America

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Introduction: Cardiovascular and metabolic diseases are important public health issues in Latin America. The Latin American population have a greater tendency to accumulate abdominal fat, and develop insulin resistance and fatty liver which are related to non-communicable chronic diseases. Unhealthy diet and physical inactivity are among the risk factors most commonly related to deaths from major non-communicable chronic diseases. There is evidence regarding the effectiveness of behavior change theories related to interventions modifying behaviors to healthy diet and increasing physical activity to prevent and manage non-communicable chronic diseases.

Method: A systematic review of published literature was conducted using six databases Psycinfo, LILACS, SCIELO, MEDLINE, BECS, and COCHRANE. Inclusion criteria included: studies conducted in a Latin American country with a Latino population, physical activity or nutrition outcomes, published until August 2011, published in Spanish, English or Portuguese, intervention or cross-sectional studies. Methodological quality was assessed, types of behavior change theories and levels of use of behavior change theories were determined. The results of the systematic literature review debated by leading behavior change researchers from around the world at the 'Think Tank on changing diet and physical activity behaviors in the Latin American context' (Think Tank), Colombia. The Think Tank also discussed the state of the art for behavior change strategies related to physical activity, diet, and healthy lifestyles in low and middle income countries (LMIC) with an emphasis on Latin America.

Results: The literature search identified 4279 articles of which 19 articles met the inclusion criteria. Eleven of the articles included a behavior change theory. The most (n=11) common theory reported was the Transtheoretical model. Of the eleven studies that included a behavior change theory, eight studies were cross-sectional and three were experimental. The Think Tank results recommended increasing the capacity beyond researchers to include basic training in behavior change principles for those responsible for planning, evaluating and implementing public health programs for physical activity and diet, and encouraging multi-sectoral collaborations and partnerships to enhance research in the area of behavior change theories in Latin America.

Conclusion: There are a small number of nutrition and physical activity research studies conducted in Latin America using behavior change theories. Further research on the application of behavior change theories is warranted in Latin America as evidence support its use to improve the effectiveness of diet and physical activity interventions.

780 How does network structure relate to the likelihood of inter-organizational collaboration for promoting physical activity? Evidence from Brazil and Colombia

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The objective of this study was to describe the network structure and factors associated with collaboration in two networks that promote physical activity (PA) in Brazil and Colombia. Organizations that focus on studying and promoting PA in Brazil (35) and Colombia (53) were identified using a modified one-step reputational snowball sampling process. Participants completed an on-line survey between December 2008 and March 2009 for the Brazil network, and between April and June 2009 for the Colombia network. Network stochastic modeling was used to investigate the likelihood of reported inter-organizational collaboration. While structural features of networks were significant predictors of collaboration within each network, the coefficients and other network characteristics differed. Brazil's PA network was decentralized with a larger number of shared partnerships. Colombia's PA network was centralized and collaboration was influenced by perceived importance of peer organizations. On average, organizations in the PA network of Colombia reported facing more barriers (1.5 vs. 2.5 barriers). Future studies should focus on how these different network structures affect the implementation and uptake of evidence-based PA interventions.

781 Participatory action research on public health policy development for physical activities in local administration organizations, Chiang Mai Province, Thailand

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 At present, various research shows that the occurrence of non-communicable diseases (NCD) is increasing has a more negative impact on society than other types of disease. Many NCD are related to risks such as high blood pressure, high cholesterol, and obesity. These factors are closely related to diet and physical activity and are a leading cause of death in most of the world, including Thailand. Public health policy development supporting physical activity is a management tool to solve the issues mentioned above. However, the public policy development process requires the participation of all parties involved in the community, working together and sharing knowledge with public policy oriented on physical activities. This research project aims to assess the situation of NCD of working and elderly people, and to develop public health policies on physical activity as well as to provide a model for development of health public policies by the local community. The research project was conducted in two municipalities in Chiang Mai province namely Muang Kaen Pattana and Mae Jo municipalities from July 2010 until December 2011. The participatory action research methodology was employed at all steps of the research process by local community and local administration organization officers. The research reveals that the occurrence of NCD of working and elderly people in both Muang Kaen Pattana and Mae Jo municipalities were high blood pressure, cholesterol, fat, obese and lack of physical activity. The research also found that the process of public health policy for physical activities of the two municipalities was the fifth steps; firstly, Identify the problem; This step was participatory health survey and collect data about NCD to the policy identification. Secondly, an alternative policy development; the serious issue will be suggested in this step from people and local community leader through the representative to municipality council as well as develop the project to solve a NCD issues. Thirdly, policy declaration; after the members of municipality was debated and conclude, the policy will be announced and declaration to the people in the community. Fourthly, public policy implementation; various project and activities was implemented in to the community to achieve NCD policy and the last steps was policy evaluation; the fifth step was assessed by using questionnaires and focus group meetings to discuss about the behaviour change of NCD in the community. Suggestion is to disseminate research results to all Local Administration Organizations in the North of Thailand.

782 Physical activity in Northern Ireland-not in pole position but still on the grid!

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Introduction: This paper reports on a review of policy documents concerning the nature and role of physical activity (PA) in improving health and wellbeing. Currently, over two thirds of adults surveyed in NI fail to meet recommended PA levels, whilst 1 in 4 girls and 1 in 5 boys aged 4–5 years are classed as overweight or obese. An important first step in any attempt to increase and improve levels of PA involves recognition of rates of physical inactivity and an awareness of the design and implementation of current relevant policies. Consequently, this review aimed to discover the extent to which issues relating to PA are acknowledged and dealt with in published NI government documents.
Methods: a systematic search was carried out on government websites and documents, using keywords, 27 government documents met the selection criteria for inclusion. Documents were analyzed using a grid that included an a priori list of "indicators" that were considered indicative of good practice in policy making. Documents were awarded a score based on their inclusion of such indicators (0–10) and also for salience, i.e. the level of importance given to physical activity (1–4). Documents were also reviewed to see whether health impact assessment (HIA) had been mentioned.
Results: 8 out of 12 government departments, plus the NI Executive had documents mentioning PA, most were produced by 2 departments (n=17). Documents were mainly produced in one of two waves around 2005 or 2009. 5 documents scored a salience rating of 4, meaning that the document's main focus was on PA: only 1 of these was produced since 2005. 15 documents scored a salience rating of 1 or 2, indicating that PA was mentioned but not a major focus of the document. Most documents scored highly on the inclusion of indicators of good practice (89% scoring at least 9). The indicators not dealt with in enough detail were: budget, evaluation, surveillance and use of current evidence. Only 2 documents carried out a HIA.
Discussion: evidence indicates that NI government departments are attempting to address physical inactivity, but inactivity is not a priority in recent documents. PA needs to be in the driver's seat, it deserves a higher profile and current PA policy and action plans need to be implemented. A more "accountable" joined-up approach to policy making is required, which is evaluated and monitored by an independent body and is evidence-based.

783 Differences in health beliefs and health behaviors between university, academic and professional staff

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Introduction: Physical inactivity is a known contributor to a variety of chronic diseases, with many adults spending a large proportion of their lives working in sedentary occupations. The aim of this project was to examine the impact of occupational classification on health behaviors and health beliefs in full-time employees.
Methods: This project was a self-report, descriptive design. The participants included 117 Academic and 180 Professional staff employed at a regional University (65% female, age 43.2±11.0 years). Participants completed an online survey that involved a self-report of demographic characteristics, physical activity and sitting time (via the International Physical Activity Questionnaire) and health beliefs (via the Health Belief Model). Independent t-tests, Mann Whitney U-tests and Chi-squared tests were used to compare Academic to Professional staff responses. Spearman rank correlation coefficients were calculated to determine relationships between dependent variables.

Results: Academic staff agreed more than Professional staff that regular exercise would reduce disease-related mortality, surgery and anxiety, and that they were likely to develop a disease during their lifetime (p<0.05). Academic staff also agreed more that maintaining good health was extremely important to them (6.5±1.0 vs. 6.3±0.9, p<0.05). Academic staff reported significantly longer working hours (49.9 ±10.4 vs. 39.9±5.0 hours/week, p<0.05), significantly less moderate intensity physical activity (1613±1508 vs. 2150±2308 MET-minutes/week, p<0.05) and a similar amount of walking (866±990 vs. 811±845 MET-minutes/week, p>0.05) and sitting (3004±1076 vs. 2758±1031 minutes/week, p>0.05) to Professional staff. Working hours were not significantly correlated to sitting or physical activity time in either group. Sitting time was significantly (negatively) correlated to walking time for the Professional staff (ρ=-0.203, p=0.02), with no relationship evident for the Academic staff.

Discussion: Academic and Professional staff at a regional University report differences in health beliefs and health behaviors. The health beliefs of Academic staff do not appear to directly affect exercise behavior. The impact of both occupational classification and individual health beliefs should be considered when designing worksite health programs.

784 Adherence to the Canadian Sedentary Behaviour Guidelines for the Early Years (aged 0–4 years) among children from Kingston, Canada

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Introduction: The negative health effects of excessive sedentary behaviour begin early in life, particularly for screen-based sedentary behaviours such as television and video/computer games. As a result, the Canadian Society for Exercise Physiology recently released the first Canadian Sedentary Behaviour Guidelines for the Early Years (aged 0–4 years). The guidelines were informed by a systematic review of the literature, which was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. The objectives of this study were to assess adherence to these new guidelines among a sample of 0- to 4-year-olds and to describe parental attitudes towards and barriers to reducing screen time.

Methods: Results are based on the Healthy Living Habits in Pre-School Children study. Participants were 657 children aged 0–4 years from Kingston, Ontario, Canada. Data were collected between May and September, 2011. Parents reported the average time per day their child spent watching television and playing video/computer games on weekdays and weekends. For those parents whose child engaged in screen time, their attitudes towards and barriers to reducing their child's screen time were also assessed.

Results: On average, children younger than 2 years engaged in a 32.0 min/day of screen time and children 2–4 years engaged in 80.3 min/day. Approximately 32% of children younger than 2 years engaged in no screen time and approximately 46% of children 2–4 years engaged in less than 1 hour per day; thereby, meeting the recommendations of the Canadian Sedentary Behaviour Guidelines for the Early Years. The majority of parents whose children exceeded the guidelines agreed that screen time is enjoyable for their child (97%), provides parents an opportunity to get things done (87%), or is a good learning tool (79%). Furthermore, most agreed that reducing screen time would be difficult because screen time is enjoyable for their child (79%), parents need time to do household chores (70%), or their child does not engage in too much screen time (68%).

Conclusion: Less than half of the 0- to 4-year-olds adhered to the new sedentary behaviour guidelines. Future interventions and initiatives aiming to promote healthy growth and development in the early years should inform parents of the health benefits associated with the new sedentary behaviour guidelines and provide them with the necessary skills to help their children meet these guidelines.

785 Louisiana's report card on physical activity and health for children and youth

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Introduction: Louisiana's Report Card on Physical Activity and Health for Children and Youth is an authoritative, evidence-based advocacy tool providing a comprehensive evaluation of the level of physical activity and health behaviors among Louisiana's children. The 2011 Report Card established baseline data and set goals, objectives, and specific targets for the year 2020 for 15 indicators related to physical activity and health.

Methods: A Research Advisory Committee composed of scientists and health professionals guided the Report Card's development. The methodology for setting public health targets was modeled on Healthy People 2020, the U.S. national initiative for improving the health of Americans. However, the data and targets in the Report Card are specific to the population of children and youth in Louisiana. Given the poor ranking of Louisiana's children, the committee chose goals of 20% improvement in physical traits such as obesity, and 40% improvement in modifiable behaviors such as physical activity. Prior to publication, a draft of the Report Card was released for public comment on the objectives, targets, and action strategies. Baseline state-level surveillance data were established to set objectives and specific targets to reach by 2020 for each indicator. Data for tracking progress towards the goals will be provided in future annual Report Cards.

Results: The results of the 2011 Report Card indicate that only 23% of Louisiana's children are meeting current physical activity recommendations, while 48% are overweight or obese. Over 2,900 hard copies of the Report Card were distributed to key stakeholders in all 64 Louisiana parishes, a 16% increase compared to 2010. It was distributed to educators, school food authorities, healthcare professionals, school-based health centers, state and local government officials, children's advocates, and organizations/corporations committed to improving children's health. Thousands of electronic copies of the Report Card were also disseminated through an email initiative. Surrounding its release in November, the Report Card was covered in 18 television news stories with a total audience of 499,621 viewers. The Report Card also resulted in 17 newspaper articles and was included in 3 healthcare journals.

Discussion: The 2020 targets established for Louisiana are practical, achievable, and can be reached if collaborative efforts are made to implement initiatives, strategies, and policies supporting healthy behaviors and environments to improve physical activity levels of children. The results indicate good media coverage of the Report Card. Future efforts will be made to increase penetrance into key decision-making audiences.

786 Physical activity level of Chinese people in 2007

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Introduction: From Jan 1st to April 30th in 2008, with the aims to learn physical activity and exercise level of Chinese people, General Administration of Sport of China (GASC) conducted a survey on the residents in towns and in rural areas of China.
Methods: The survey covered 31 provinces (or municipalities) in mainland China, and complex multi-stage stratified sampling was applied. 88625 non-student residents over 16 years old in towns and in rural areas were investigated successfully by door-to-door interview. Questionnaire used in this survey includes daily lifestyle physical activity and structured exercise (type, frequency, intensity and time).
Results: 1) 32.7% of the whole population participated in leisure physical exercise in 2007 (36.0% and 29.1% for males and females respectively, 45.7% and 21.6% towns and rural residents respectively). The proportions of the population involving in physical exercise were declined with age growth, which changed from 41.5% aged 16~19 to 22.2% aged over 70. 2) Only 8.3% of population got exercise volume recommended by Chinese physical fitness center (30 min/day, and 3 days/wk moderate exercise), and 4.8% of population meets the dose of activity that promotes good health (recommended by WHO, 30 min/day, and 5 days/wk moderate exercise). 3) Chinese people have higher lifestyle physical activity. 70.1% and 65.7% of towns and rural areas population do housework, and in which they spent 90 and 120 minutes per day respectively. 65.1% of population walking out or by bicycles.
Discussion: Individuals lifestyle physical activity should be considered when exercise prescription and guideline were made for Chinese people, especially for people living in different areas or engaging in different occupations. Health education or health promotion programs aiming to improve people's exercise level also should be developed according to different people's needs: energy expenditure or leisure entertainment. It is important to promote active, healthy lifestyle and propagate knowledge, belief and skills in population who have needs to improve physical activity level, especially for people engaging in sedentary work.

787 Swiss recommendations for physical activity and health in an international comparison: State of affairs in 2011 and options for updating

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Introduction: Switzerland has recommendations for adults since 1999 and for young people since 2006. International experts have recommended that in view of new global recommendations, countries in Europe should review their national ones.
Methods: The five most important international and illustrative national examples of recommendations for different age groups were selected, namely those by WHO, the American College for Sport Medicine ACSM and the American Heart Association, the US federal administration, Canada and Austria as an example of a neighbouring country. They were analyzed using a standardized grid with regard to implications for the Swiss situation.
Results: Overall, the main Swiss recommendations for young people and adults are mostly in line with recent evidence but some differences were found regarding specific aspects. In particular, the explicit possibility to combine moderate- and vigorous-intensity activities is missing, and – in contrast to most examples analyzed a weekly minimal dose of of 5 x 30 minutes of moderate-intensity activity instead of 150 minutes is still used. Minimum activity bouts of 10 minutes are recommended not only for adults but also for youth. No Swiss recommendations for pre-school children or older adults exist.
Discussion: Based on the analysis, options for updates and further developments of the current Swiss recommendations were developed, concerning their content as well as their structure and dissemination. They form the basis of a national process lead by the Swiss Federal Office of Sport, with a wide consultation with all relevant stakeholders which will be finished in autumn 2012.

788 Development and launch of the Canadian Physical Activity Guidelines for the Early Years

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Introduction: In response to calls from the child care, health care and public health sectors, the Canadian Society for Exercise Physiology, with assistance from multiple partners, stakeholders and researchers, developed the first evidence-informed Canadian Physical Activity Guidelines for the Early Years (aged 0–4 years).
Methods: A rigorous and transparent guideline development process was followed and included: establishing a leadership team; instituting process assessment procedures; forming a guideline development committee; international and inter-jurisdictional guideline harmonization; systematic literature review; interpretation of findings; identification of research gaps; consensus and stakeholder engagement; knowledge translation strategy (including language translation, messaging, communication strategy, dissemination strategy); evaluation; and update and revision planning. The guideline development process was informed by the Appraisal of Guidelines for Research Evaluation (AGREE) II instrument and the evidence assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. The final guideline recommendations were informed by evidence from a systematic review examining the relationships between physical activity and health indicators (healthy body weight, bone and skeletal health, motor skill development, psychosocial health, cognitive development and cardio-metabolic disease risk factors) for three age groups (infants less than 1 year; toddlers 1–2 years; preschoolers 3–4 years). A public relations and media strategy supported the release of the guidelines to the Canadian public.
Results: The guidelines reflect input from nearly 1000 domestic and international stakeholders and end-users and include a preamble to provide context, followed by the specific recommendations. The final guideline recommendations state: for healthy growth and development, infants (aged less than 1 year) should be physically active several times daily – particularly through interactive floor-based play. Toddlers (aged 1–2 years) and preschoolers (aged 3–4 years) should accumulate at least 180 minutes of physical activity at any intensity spread throughout the day, including a variety of activities in different environments, activities that develop movement skills, and progression toward at least 60 minutes of energetic play by 5 years of age. More daily physical activity provides greater benefits. The launch of the guidelines received extensive media coverage with more than 170 media hits generating greater than 60 million media impressions in Canada.

Discussion: With the addition of the physical activity guidelines for the early years, there are now current physical activity guidelines for all ages in Canada. The comprehensive, inclusive and transparent process used to develop and release these guidelines in Canada resulted in extensive media coverage facilitating dissemination, awareness and uptake by stakeholders.

789 Development and launch of the Canadian Sedentary Behaviour Guidelines for the Early Years

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Introduction: In response to calls from the child care, health care and public health sectors, the Canadian Society for Exercise Physiology, with assistance from multiple partners, stakeholders and researchers, developed the first evidence-informed Canadian Sedentary Behaviour Guidelines for the Early Years (aged 0–4 years).

Methods: A rigorous and transparent guideline development process was followed and included: establishing a leadership team; instituting process assessment procedures; forming a guideline development committee; international and inter-jurisdictional guideline harmonization; systematic literature review; interpretation of findings; identification of research gaps; consensus and stakeholder engagement; knowledge translation strategy (including language translation, messaging, communication strategy, dissemination strategy); evaluation; and update and revision planning.

The guideline development process was informed by the Appraisal of Guidelines for Research Evaluation (AGREE) II instrument and the evidence assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. The final guideline recommendations were informed by evidence from a systematic review examining the relationships between physical activity and health indicators (healthy body weight, bone and skeletal health, motor skill development, psychosocial health, cognitive development and cardio-metabolic disease risk factors) for three age groups (infants less than 1 year; toddlers 1–2 years; preschoolers 3–4 years). A public relations and media strategy supported the release of the guidelines to the Canadian public.

Results: The guidelines reflect input from nearly 1000 domestic and international stakeholders and end-users and include a preamble to provide context, followed by the specific recommendations. The final guidelines state: for healthy growth and development, caregivers should minimize the time infants (aged less than 1 year), toddlers (aged 1–2 years) and preschoolers (aged 3–4 years) spend being sedentary during waking hours. This includes prolonged sitting or being restrained (e.g. stroller, high chair) for more than one hour at a time. For those under 2 years, screen time (e.g. TV, computer, electronic games) is not recommended. For children 2–4 years, screen time should be limited to under one hour per day; less is better. The launch of the guidelines received extensive media coverage with more than 170 media hits generating greater than 60 million media impressions in Canada.

Discussion: To our knowledge, these are the world's first sedentary behaviour guidelines for the early years that are separate and distinct from physical activity guidelines. The comprehensive, inclusive and transparent process used to develop and release these guidelines in Canada resulted in extensive media coverage facilitating dissemination, awareness and uptake by stakeholders.

790 Differences in health-related fitness and physical activity between Canadian and English 15-yr olds

C. Voss[1]* ▪ Joan. Wharf-Higgins[2] ▪ P. Naylor[2] ▪ G. Sandercock[3] ▪ S. Gibbons[2] ▪ R. Rhodes[2] ▪ H. Macdonald[1] ▪ L. Sulz[2] ▪ V. Tan[1] ▪ H. McKay[1]
[1]University of British Columbia, Centre for Hip Health and Mobility ▪ [2]University of Victoria, School of Exercise Science, Physical and Health Education
[3]University of Essex, Centre for Sports and Exercise Science

Introduction: Canada and England are similarly confronted with considerable public health burdens stemming from high rates of childhood obesity and concurrent declines in health-related fitness and physical activity (PA). Our aims were two-fold: to compare indices of body composition and fitness between contemporary samples of Canadian and English youth; and, to assess if differences in fitness are explained by differences in PA.

Methods: We assessed Canadian (n=440, 49% boys; 15.3±0.4 yrs; Fall 2011) and English 15-yr olds (n=983, 58% boys; 15.1±0.4 yrs; summers 2006–2008) for: BMI (kg·m^2, classified by International Obesity Task Force criteria), waist circumference (WC; cm), upper body strength (dominant arm hand grip; kg), aerobic fitness (20m shuttle run; laps) and self-reported PA (Physical Activity Questionnaire for Adolescents; PAQ-A).

Results: There were no differences in BMI for Canadian vs. English boys (21.6±3.4kg·m^2 vs. 21.2±3.4kg·m^2, respectively). Canadian girls had greater mean BMIs compared with English girls (22.3±4.2kg·m^2 vs. 21.6±3.11kg·m^2, p=0.027). IOTF categories were no different in boys (15% overweight, 4% obese), but there was a trend for more overweight and obese Canadian than English girls (20% vs. 16%, 5 vs. 2% p=0.053). WC was identical in boys (73.8±8.3cm vs. 73.8±8.8cm), but higher in Canadian girls (71.5±9.2cm vs. 69.8±7.8cm, p=0.014). Canadian and English boys had similar strength (36±7.7kg vs. 36±8.0kg), whereas Canadian girls were stronger than English girls (29±5.1kg vs. 26±4.9kg, p<0.001), even after adjusting for body mass. Aerobic fitness did not differ between Canadian and English boys (65±21 vs. 66±27 laps), but Canadian girls outperformed their English peers (42±18 vs. 36±17 laps, p<0.001). Boys' PAQ-A scores were no different (2.9±0.5 vs. 2.9±0.7), but Canadian girls scored slightly higher than English girls (2.6±0.5 vs. 2.5±0.6, p=0.020). In linear regression analysis, inclusion of PAQ-A scores reduced the 'country-effect' on girls' strength and fitness scores.

Discussion: Despite substantial cultural differences between countries, we found no differences in body composition or health-related fitness between contemporary Canadian and English adolescent boys. English girls' lower performance in fitness tests compared with Canadian girls was partially explained by English girls' lower PA. As these patterns were not observed for boys, it is unlikely that environmental factors (i.e. season, weather, facilities) contributed. Paradoxically, Canadian girls performed better than English girls in the running test despite their greater BMI, which suggests that youth health monitoring should not solely rely on measures of body composition.

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SATURDAY 3 NOVEMBER PAPERS AT A GLANCE

Time	Session	Title	Presenter	Room	Paper
0815 – 0915	Workshop	Breast and bra fit: Optimising breast support during physical activity	Deirdre McGhee	103	791
0815 – 0915	Workshop	Imaging – Knee	David Connell	104	792
0815 – 0915	Workshop	The Athlete ECG	Maria Brosnan	105	793
0815 – 0915	Workshop	Imaging – Ankle	James Linklater	106	794
0815 – 0915	Workshop	Research, research everywhere – How do I get involved?	Jill Cook Warren Payne	201	795
0815 – 0915	Workshop	Taping for ankle instability – Treatment and prophylactic taping review	Kurt Robertson	202	796
0815 – 0915	Workshop	Handling the groin: Practical application of the treatment model	Andrew Wallis	203	797
0930 – 1030	Symposium	Footwear uncovered: Behind the scenes of footwear research in Australia	Chris Bishop Michael Kinchington Ross Clark	Terrace	798
0930 – 1030	Physical activity and weight interventions Chair: Pedro Teixeira Distinguished Discussant: Steven Blair			102	
		An RCT to compare the effectiveness of commercial and primary care led weight management programmes versus minimal intervention: The Lighten Up trial	Amanda Daley		799
		Physical activity outcomes from the SHED-IT RCT: An evaluation of theoretically-based, gender-sensitised weight loss programs for men	Philip Morgan		800
		Can professional soccer clubs help male fans lose weight and become more physically active? Preliminary evidence from the Scottish Premier League	Cindy Gray		801
		Childhood obesity prevention: A significant decrease of overweight and obesity in the VIASANO programme after 2 years of intervention	Jean-Michel Borys		802
		Preventing obesity among adolescent girls: Outcomes of the nutrition and enjoyable activity for teen girls cluster randomized controlled trial	David Lubans		803
		Community-based intervention approaches to change physical activity behaviour and health-related diet in order to prevent childhood obesity	Jean-Michel Borys		804
0930 – 1030	Physical activity and cancer Chair: Neville Owen Distinguished Discussant: Elizabeth Eakin			103	
		Physical activity and the risk of proximal colon and distal colon cancers: A systematic review and meta-analysis	Terry Boyle		805
		A home-based resistance training program for survivors of prostate cancer: A pilot randomized controlled trial	Erica James		806
		How does exercise improve cancer survivors' quality of life?	Laurien Buffart		807
		Living well after breast cancer: Changes in objectively-measured physical activity in a weight loss trial	Marina Reeves		808
		Five year follow up of an exercise intervention during breast cancer treatment	Anna Campbell		809
		Pre- and post-diagnosis physical activity and survival after prostate cancer	Christine Friedenreich		810

SATURDAY 3 NOVEMBER PAPERS AT A GLANCE

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		Concordance between referred conditions and diagnosis: How accurate are our referrals?	Bruce Mitchell		811
		The relationship between lumbar multifidus muscle function and performance on the single-leg squat task	Sharne Neill		812
		2 year follow up of a spinal stabilisation exercise regime in subjects with chronic non-specific low back pain – A case series study	Trish Wisbey-Roth		813
		Prolotherapy for sacroiliac joint pain	Bruce Mitchell		814
0930 – 1030	Upper limb			105	
		Ultrasound-guided versus blind subacromial corticosteroid injection for subacromial impingement	Lisa Briggs		815
		Effect of surgeon-sonographer interaction on ultrasound diagnosis of rotator cuff tears: A five-year cohort study in 775 shoulders	Adrian Kurz		816
		Factors predicting rotator cuff re-tear rate: An analysis of 1000 consecutive rotator cuff repairs	Brian Le		817
		A randomised doubled blinded clinical control trial evaluating the effectiveness of daily vibration followed arthroscopic rotator cuff repair	Patrick Lam		818
		Surgical treatment of lateral epicondylitis: A prospective, randomised, blinded, placebo controlled pilot study	Martin Kroslak		819
0930 – 1030	Symposium	Highlighting the impact of sports joint injury in the absence of national prevention programs: The Bone and Joint Decade	David Hunter	106	820
		The Bone and Joint Decade	Ruth Lilian		821
		The public health burden of sports injuries	Caroline Finch		822
		Management of acute knee injury – the role of the surgeon	Justin Roe		823
0930 – 1030	Physical activity in women Chair: Sylvie Titze Distinguished Discussant: Kylie Ball			201	
		Physical activity and maternal glucose and insulin in pregnant overweight and obese women	Mireille Van Poppel		824
		Exercise during pregnancy – Does it impact offspring birth weight parameters?	Lene Haakstad		825
		Physical activity during pregnancy and infant's neuromotor development in the first 4 years of life	Marlos Domingues		826
		Do active mothers have active preschool-aged children? An analysis of concurrently measured activity patterns	Kathryn Hesketh		827
		Impact of the REFRESH randomised controlled trial on the physical activity behaviours of mothers with young children	Sarojini Maria Dos Remedios Monteiro		828
		Is moderate-to-vigorous physical activity recorded on 7-day log correlated with accelerometer data in a sample of ethnic minority postpartum women?	Jennifer Elia		829
		FitFor2: Effects of an exercise training program on the incidence of gestational diabetes	Mireille Van Poppel		830

SATURDAY 3 NOVEMBER PAPERS AT A GLANCE

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		Physical activity interventions and depression in children and adolescents: A systematic review and meta-analysis	Helen Elizabeth Brown		831
		Is physical activity and body composition associated with neurocognitive function in children?	Scott Duncan		832
		Does habitual physical activity influence children's physical self-worth: A longitudinal assessment	Toby Pavey		833
		Structured and unstructured Wii play: What are the physical and psychological benefits for children?	Linda Rohr		834
		Improving physical self-perception in adolescent boys from disadvantaged communities: Psychological outcomes from the PALs intervention	Jordan Smith		835
		The impact of a sport-for-development programme on the mental health of young adolescents in Gulu, Northern Uganda	Justin Richards		836
		Adolescent girls with internalizing problems: Can dance intervention improve health? A randomized, controlled trial with cost-utility analysis	Anna Duberg		837
0930 – 1030	Intervention snapshots Chair: Kristiann Heesch Distinguished Discussant: Willem van Mechelen			204A	
		Should physical activity intervention efforts take a whole population, high-risk or middle road strategy?	Geeske Peeters		838
		Can sport reach inactive people? A review of literature and practice in the UK	Nick Cavill		839
		The role of physical activity in the rehabilitation of youth sexual offenders: An evaluation of the Fight with Insight programme	Catherine Draper		840
		A prospective, randomized study comparing the effectiveness of different types of incentives in increasing physical activity behavior on the Vitality health promotion program	Estelle Lambert		841
		The 'Physical Activity Loyalty Card Scheme': A RCT investigating the use of incentives to encourage physical activity	Ruth Hunter		842
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0930 – 1030	Promoting physical activity in primary care Chair: Tania Winzenberg Distinguished Discussant: Ben Smith			204B	
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		Prevalence of health promotion programs in primary health care units in Brazil	Luiz Ramos		845
		Physical activity on prescription; an education and training program for healthcare practitioners in Vietnam	Carl Johan Sundberg		846
		Physical activity counseling in primary health care in Brazil: Prevalence and barriers of the Physicians and Nurses	Alex Florindo		847
		Prescriptive medicine: The importance of preparing Canadian medical students to counsel patients toward physical activity (PA)	Victor Ng		848
		Physical exercise prescription by primary care nurses	Ana Queralt		849
		Characteristics of physical activity interventions in primary health care settings in Brazil	Grace Gomes		850

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		A review of current practice of cardiac screening in AFL football	Mark Fisher		852
		Findings of ECG's on 270 Australian athletes: Using the European Cardiology society guidelines and a consensus model the further investigation rate was 3%	Geoffrey Verrall		853
		Development of an epidemiologic registry for hypertrophic cardiomyopathy for adolescent athletes	Bill Kohl		854
1100 – 1230	Invited	Current guidelines, consequences and pitfalls of ECG screening	Maria Brosnan	Terrace	
1100 – 1230	2020 vision: Understanding physical activity and sedentary behaviour		John Spence	102	855
			Brian Martin		
			Ulf Ekelund		
			David Buchner		
			Stuart Biddle		
			Gareth Stratton		
			Nicola Burton		
1100 – 1230	2020 vision: Policy and practice in physical activity and sedentary behaviour		Nick Cavill	103	855
			Estelle Lambert		
			Fiona Bull		
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			Bill Bellew		
			Pedro Hallal		
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			Philip Morgan		
			Emma Adams		
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			Tracy Kolbe-Alexander		
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1100 – 1230	2020 vision: Physical activity and sedentary behaviour: Environments and transport		Jim Sallis	202	855
			Billie Giles-Corti		
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			Alex Rowlands		
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			Stewart Trost		
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			Nicola Ridgers		
			Genevieve Healy		
			Rick Troiano		
1100 – 1230	2020 vision: Health outcomes of physical activity and sedentary behaviour		Catherine Sherrington	204B	855
			Elizabeth Eakin		
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			Ken Powell		
			Christine Friedenreich		
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1100 – 1230	Invited	Identification of genetic risk factors for ACL ruptures: Implications for understanding molecular mechanisms and clinical relevance	Malcolm Collins	104	856
1100 – 1230	Anterior cruciate ligament			104	
		Relationship between knee confidence and physical function in people with knee osteoarthritis after ACL reconstruction	Harvi Hart		857
		The incidence of secondary pathology after anterior cruciate ligament rupture in over 5000 patients	Justin Roe		858
		Postural control and the influence of a secondary task in people with anterior cruciate ligament reconstructed knees	Brooke Howells		859
		A 15-year survival analysis of the anterior cruciate ligament graft and the contralateral ACL following reconstruction	Lucy Salmon		860
		Individuals with osteoarthritis after ACL reconstruction experience immediate improvements in knee pain and confidence with an unloader knee brace	Harvi Hart		861
		Live donor allograft for primary ACL reconstruction in the juvenile patient	Justin Roe		862
1100 – 1230	Sports science 3			105	
		World Cup soccer trends support common evolutionary drivers among field sports	Kevin Norton		863
		Healthy coach, healthy athlete: Targeting the needs of Special Olympics coaches	Justine Stynes		864
		Reliability of jump performance variables for repeated counter movement jumps and bilateral hopping obtained from accelerometry	Xanne Janse De Jonge		865
		Are masters athletes primarily motivated by ilntrinsic or extrinsic factors?	Ian Heazlewood		866
		Healthy club program: Evaluation of key health and policy outcomes	Debra Bow		867
		Can resistance training change the strength, body composition and self-concept of overweight and obese adolescent males? A randomised controlled trial	Natasha Schranz		868
		Sports coaches' self-efficacy and perceptions towards a novel campaign to promote tobacco free messages: SmokeFree Sports	Toni Hilland		869
		Project Energize: 550m run time and relation to fatness and asthma	Elaine Rush		870

SATURDAY 3 NOVEMBER PAPERS AT A GLANCE

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		Exercise capacity in renal transplant recipients with stable allographs	Michael Kingsley		871
		A randomized controlled trial assessing the effects of Tai Chi on indicators of health related qualify of life in adults with elevated blood glucose level	Xin Liu		872
		Gender and age-specific physical fitness targets to improve exercise prescription and disease prevention	Robert Robergs		873
		The blood pressure response of normal weight and obese women to sub-maximum aerobic exercise	Dale Lovell		874
		Comparison of static plantar pressure in patients with diabetes and healthy individuals	Sachit Basnet		875
		Efficacy of WBV to improve functional performance of people with COPD	Trentham Furness		876
		Age, the silent killer: An examination of the influence of age on the prevalence of disease in a regional Australian population	Patrick Tucker		877
1330 – 1500	Physical activity around the world			Auditorium A	878
1330 – 1500	Sports medicine and science in 2012 and beyond: Where have we come from and where are we going?			Terrace	879
1530 – 1630	2020 vision: Where to from here? ICPAPH Awards Welcome to Rio 2014			Auditorium A	
1530 – 1630	Best of the Best			Terrace	

Saturday 3 November

791 | Breast and bra fit: Optimising breast support during physical activity

WORKSHOP

D. McGhee¹* ▪ ¹University of Wollongong

Introduction: Insufficient breast support during physical activity leads to excessive breast movement. This has been found to be a barrier to females participating in physical activity due to both breast discomfort and embarrassment. Excessive breast movement and discomfort can also negatively affect sporting performance through changes in both the posture and movement of the upper limbs and trunk. Consequently, correct breast support is an important factor for all females to consider, and is an important educational issue to promote physical activity in females and optimise sporting performance in female athletes.

Methods: Sufficient breast support requires both a supportive bra design and correct bra fit. The level of breast support required varies with the age, bra size and the type of physical activity. This practical evidence-based workshop shows how to optimise breast support by providing simple guidelines of how to choose a supportive bra to wear during physical activity and ensure that it fits correctly. Educational strategies on how to inform specific sub-groups such as female sporting teams, patient populations and adolescents with mother/daughter sessions, will also be covered. Free educational resources that can act as an ice-breaker to bring up this important but sensitive topic will also be available.

Results: Participants will leave the workshop with both the skills and resources to optimise breast support in active women across a wide range of ages, bra sizes and activity levels.

792 | Imaging – Knee

WORKSHOP

An interactive workshop on imaging for knee injuries. This workshop will be led by sports physicians and a radiologist detailing the gold standard imaging for a range of knee injuries and pathology. There will be detailed learning on how to read and interpret these images.

793 | The Athlete ECG

WORKSHOP

M. Brosnan¹* ▪ ¹St Vincent's Hospital Melbourne

Exercise may act as a trigger for sudden cardiac arrest (SCA) in a small number of young athletes with unrecognised (usually genetic) cardiovascular disease. Many of the diseases which predispose to sudden cardiac arrest (SCA) in young athletes, such as hypertrophic cardiomyopathy (HCM) and arrhythmogenic right ventricular cardiomyopathy (ARVC), are often detectable on ECG. The European Society of Cardiology (ESC) endorse pre-participation screening (PPS) inclusive of an ECG for young (<35 yr old), competitive athletes, and institutions such as the International Olympic Committee, mandate such screening.

In a young athletic population, changes to cardiac structure and function as a result of intensive exercise training can cause significant overlap between physiological and pathological ECG findings, and often result in large numbers of "false positive" tests. The 2010 ESC guidelines for athlete ECG interpretation have improved the specificity of ECG screening, dividing ECG changes into Group 1 (common, training related) and Group 2 (uncommon, training unrelated). However, interpreter awareness of "normal" athletic ECG changes and also of the diseases responsible for SCD (which are all quite rare in the general population) will impact on the effectiveness of such screening. This workshop, which will be very interactive, will briefly outline the 2010 ESC athlete ECG interpretation guidelines, then go through a series of real athlete ECGs; both normal and abnormal. Whilst not aiming to create a group of experts of in one hour, it is hoped that the workshop will highlight some of the important "normal" athletic adaptations on ECG as opposed to "red flag" ECG changes, and (time permitting), touch on further investigation and management of athletes with Group 2 ECG changes.

794 | Imaging – Ankle

WORKSHOP

An interactive workshop on imaging for ankle injuries. This workshop will be led by sports physicians and a radiologist detailing the gold standard imaging for a range of ankle injuries and pathology. There will be detailed learning on how to read and interpret these images.

795 | Research, research everywhere – How do I get involved?

WORKSHOP

Clinicians, students and those already involved in research will gain valuable insight to the opportunities available within the sports medicine research area. An eminent panel of current researchers will discuss their beginnings in research and the best tips and strategies for those that want to be involved in research. This session will be especially useful for those clinicians that wish to expand into research but are unsure where to start.

| 796 | Taping for ankle instability – Treatment and prophylactic taping review |

WORKSHOP

K. Robertson[1]* ▪ [1]Newcastle Podiatry

Kurt Robertson will be presenting a hands on workshop on rigid taping for the ankle. Kurt is a Podiatrist at Newcastle Family and Sports Podiatry currently treating the Newcastle Knights NRL squad and the Newcastle Jets A-League squad. This workshop will include methods used at an elite athlete level for acute lateral ankle injury as a part of the early rehabilitation program. It will also encompass acute and chronic medial ankle injury, high ankle sprains and prophylactic ankle taping for chronic ankle inversion. All participants will be assured a practical component to ensure relevant clinical adaptations are achieved.

| 797 | Handling the groin: Practical application of the treatment model |

WORKSHOP

A. Wallis[1,2]* ▪ [1]St. Kilda Football Club ▪ [2]Malvern Sports Medicine Centre

This workshop is directly related to the model presented in the Groin Symposium – "Demystifying the Groin". The focus of the workshop is for registrants to understand the eight subgroup classifications and tailor treatment appropriately. It will allow registrants to utilize clinical reasoning in the application of this model to objective assessment and treatment of groin pathology. In this workshop, the presenter will demonstrate appropriate objective examination related to groin pathology. Manual application of treatment will also be displayed as will subgroup appropriate exercise prescription for rehabilitation. Practically there will be demonstration of myofascial release techniques, targeted mobilization, the do's and do not's related to stretching etc. Registrants can expect to gain an understanding of how treatment and return to sport guidelines will alter dependent on subgroup categorization.

| 798 | Footwear uncovered: Behind the scenes of footwear research in Australia |

SYMPOSIUM

C. Bishop[1]* ▪ **M. Kinchington**[2]* ▪ **R. Clark**[3]* ▪ [1]University of South Australia ▪ [2]Australian Catholic University ▪ [3]University of Melbourne

This symposium will present the research findings from three Australian universities currently conducting footwear research in Australia. A panel discussion with the presenters and international footwear designers will follow to provide delegates with the opportunity to further explore the landscape of footwear research and development as conducted by a global footwear company. Chris Bishop, University of South Australia: Analysis of the way the human body moves during activities of daily living is a large part of clinical practice and is often conducted with the patient wearing shoes. It is clear that the addition of shoes provides an unknown variable that is believed to change the structural properties and functionality of the foot and ankle. It is important to recognise an observational analysis of shod gait cannot provide a description of the motion of the foot inside the shoe. This presentation will present data produced from a custom in-shoe foot model to describe how the foot moves within the shoe, as well as identifying how an analysis based purely on the movement of the shoe, over estimates in-shoe joint angles. Applications where footwear may have proximal effects on other joints in the lower limb will also be considered to give a better appreciation of the role of footwear during gait. Dr Michael Kinchington, Australian Catholic University: Lower extremity injury in running based team sports is extensive and debilitating. Injury to the lower extremity ranges from 40–80% of all sporting injury in weight bearing sports and has significant impact on player welfare, career longevity and team performance. Footwear is vital equipment the athlete uses that may affect performance and injury. This presentation will explore the merits of a tailored footwear program as an intervention to minimise lower extremity injury. Such interventions are one method to address a common issue in professional sport; the high incidence of lower extremity injury. Dr Ross Clark, University of Melbourne: A typical ASICS shoe has been through multiple prototype and design stages, with a number of models never achieving commercialisation. Determining which shoes are worthy of release often involves both in-house research undertaken at the ASICS Institute of Sports Science and independent analysis performed by researchers at the University of Melbourne. This presentation will provide an insight into the research being performed at the University of Melbourne, including an overview of the testing protocols and a discussion of the unique challenges of performing footwear research.

| 799 | An RCT to compare the effectiveness of commercial and primary care led weight management programmes versus minimal intervention: The Lighten Up trial |

A. Daley[1]* ▪ **A. Lewis**[1] ▪ **J. Denley**[2] ▪ **P. Adab**[1] ▪ **P. Aveyard**[1] ▪ **K. Jolly**[1] ▪ [1]University of Birmingham ▪ [2]NHS South Birmingham

Introduction: Health professionals in primary care could lead treatment for obesity, but there are few trials of effective practicable interventions in this context. The Lighten Up trial aimed to compare the effectiveness of several weight loss programmes for obese patients in primary care responding to an invitation from their GP to attend a free weight management programme.
Methods: 740 obese patients (11.5% response rate) from primary care were randomised to one of seven intervention groups and a comparator group provided with 12-vouchers enabling free entrance to a local leisure centre: (69.5% female, 86.5% white British, mean BMI 33.4 kg/m^2). The weight management programmes were: Weight Watchers, Slimming World, Rosemary Conley, a group-based dietetics-led programme (Size Down); general practice one-to-one counselling, pharmacist-led one-to-one counselling or choice of any of the 6 programmes. The primary outcome was weight loss at programme-end (3 months). Secondary outcomes were weight-loss at 12 months, self-reported physical activity at 3 and 12 months follow-up and percentage weight-loss at 3 months and 12 months. At programme end (3 months) 88.9% participants were followed-up and 70.5% at 12 months. Missing weights were imputed with baseline weight.

Results: At 3 months, weight loss in the comparator group was 2.2kg, similar to that achieved in GP, pharmacy, and Size Down groups. Only Weight Watchers, Slimming World, and Rosemary Conley achieved significantly greater loss than the comparator group: extra 2kg. At 12-months, only those attending Weight Watchers achieved significantly greater weight loss than comparators: an additional 2.2kg. The proportion of participants in each arm achieving at least 5% weight loss at programme end ranged from 15.7% to 46% (between general practice and Weight Watchers respectively) and at 12 months this ranged from 14.3% to 31% (between pharmacy and Weight Watchers respectively). People choosing their weight management support programme achieved no greater weight loss than those allocated it randomly. Self-reported physical activity increased in all groups between baseline and follow up. The smallest increase in activity was in those allocated to the general practice arm. At 12 month follow-up, only those allocated to Weight Watchers reported more physical activity than the comparator, although this was not statistically significant.

Discussion: Weight management interventions provided by primary care showed no evidence of effectiveness. The only programme to achieve statistically significantly greater weight loss than comparators was Weight Watchers. Referral to commercial weight management services is the current best option for obesity treatment in primary care.

800 Physical activity outcomes from the SHED-IT RCT: An evaluation of theoretically-based, gender-sensitised weight loss programs for men

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Introduction: Obesity in men is a major public health issue, yet men are notoriously reluctant to participate in weight loss programs. Men may engage in male-only programs more readily, but there have been few such studies, with the findings mixed and study quality poor due to a lack of RCTs and objective physical activity (PA) measures. The primary aim of this study was to evaluate the impact of two Social Cognitive Theory-based weight loss programs for men on PA levels. A secondary aim was to determine if any PA changes were associated with improved health outcomes.

Methods: Assessor-blinded RCT in 159 overweight/obese men (mean [sd] age=47.5 [11.0] years; BMI=32.7 [3.5]), stratified by BMI category (overweight, obese class I & II) and randomised to one of three groups: 1) *Resources*: gender-sensitised weight loss materials (DVD, handbooks) + pedometer, tape measure; 2) *Online*: Resources materials plus study website to self-monitor diet and exercise with e-feedback provided on seven occasions. 3) wait-list control group. The 3-month intervention operationalised key SCT constructs. Assessments were made at baseline, 3-, and 6-months for objectively measured PA (7 days pedometry), weight (kg), BMI, % body fat (BIA), waist circumference (cm), blood pressure, resting heart rate, sitting time, quality of life (SF-12), and sexual function (IIEF-5).

Results: Generalised linear mixed models analyses demonstrated significant between group differences at 6-months for PA (p<.001) in both the *Online* (+1575 steps; 95% CI 753, 2397) and *Resources* (+1586 steps; 95% CI -796, 2376) groups compared to controls (+42 steps; 95% CI -703, 786). Relative to controls, significant intervention effects were also found for weight (p<.001) in both the *Online* (-4.7 kg; 95% CI -6.1, -3.2) and *Resources* (-3.7 kg; 95% CI -4.9, -2.5) group and for BMI, % body fat, waist, systolic blood pressure, and quality of life. An inverse association was found between change in PA and change in weight (r=-0.42, p<.001), % body fat (r=-0.24, p=0.02) and waist (r=-0.35, p<.001) at 6 months. A positive association was found between increased PA and improved sexual function (r=0.27, p=0.01)

Discussion: Two novel, gender-specific weight loss programs requiring no face-to-face contact resulted in improved PA and significant weight loss amongst men. Both intervention groups maintained an increase of ~1500 steps per day at 6 months. The programs are designed for large scale dissemination in a variety of formats.

801 Can professional soccer clubs help male fans lose weight and become more physically active? Preliminary evidence from the Scottish Premier League

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Introduction: The prevalence of overweight/obesity amongst UK men is amongst the highest in Europe. Modest (5–10%) weight loss can reduce risk of co-morbidity, but many men are reluctant to engage in traditional commercial and health service weight management programmes. Football Fans in Training (FFIT) is a gender-sensitized, weight loss, physical activity (PA) and healthy living intervention that aims to engage men in sustained positive lifestyle change by using Scotland's elite professional football (soccer) clubs as a vehicle for delivery.

Methods: A feasibility study involving a pilot trial in two Scottish Premier League clubs (one large, city-based; one smaller, town-based), with men (N=103) aged 35–65 and BMI≥27kg/m^{2} randomized to intervention (starting FFIT immediately) and comparison (starting FFIT in 4 months) groups. Objective weight measurements and self reported PA, eating habits and psychological outcomes [self esteem, positive affect, health-related quality of life (SF-12)] were collected from both groups at baseline and 12 weeks. The intervention group was followed up at 6 and 12 months. Participant focus groups and interviews with the coaches delivering FFIT explored experiences of involvement in the programme.

Results: The recruitment target (n=60) was achieved in the large, but not smaller, club. Men were attracted by the setting "…obviously being connected to the football club it was a no brainer for me" and attendance *at* programme sessions remained high. Participants appreciated the focus on lifestyle education *(rather* than dieting), they found the pedometers helpful and motivating for monitoring and increasing their activity levels, and valued the camaraderie of the group "… it was the banter and folk coming back and saying, I couldn't do as many steps this week, but somebody saying I took the dog out… shared ideas and experiences that really worked". Attrition was low; 83.5% of men took part in 12 week measurements. Men in the intervention group recorded a 4.6% weight loss at 12 weeks, significantly greater than the comparison group (p<.001); weight reductions were still evident at 12 months. Post-programme increases in self-reported PA and fruit and vegetable consumption, and decreases in self-reported sedentary time and chocolate, biscuits and chips consumption were maintained to 12 months. Sustained improvements in self-esteem, positive affect and SF-12 scores were also demonstrated.

Discussion: Professional soccer clubs can encourage men to lose weight, increase PA and make other positive lifestyle changes, many *of* which appear to be sustained until *12* months. A full-scale trial of FFIT is underway.

802 Childhood obesity prevention: A significant decrease of overweight and obesity in the VIASANO programme after 2 years of intervention

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Introduction: Childhood obesity is one of the main public health challenges of the 21st century. Worldwide, eighteen million children are overweight, most likely with future health problems in adult life as a consequence. Preventive efforts should include community based programmes (CBPs) that target the school context and the broader environment of the child.

Methods: VIASANO is a CBP in Belgium using the EPODE methodology. This methodology consists of interventions to empower the community in different towns to improve physical activity and nutrition behaviour in children and their families. Practically, a national coordination team trains a local project manager nominated by the local authorities and provides him/her with tools to mobilise local stakeholders, and this by the use of social marketing and organisational techniques. The effect of the CBP is evaluated by yearly weight and length measurement in the participating towns. This study included an evaluation of the overweight and obesity prevalence in the pilot towns of Marche and Mouscron in the south of Belgium in 2008 and 2010. In 2008, 1300 children's weight and length was measured and this was the case for 1484 children in 2010 (aged 3 to 7 years). Dutch growth curves were used to determine normal weight, overweight, and obesity.

Results: In 2008, in Marche and Mouscron, 123 children were overweight (9,46%) and 53 children were obese (4,08%). In 2010, 110 children were overweight (7,41%), and 56 children were obese (3,77%). There was a significant decrease of overweight from 2008 to 2010 in the pilot towns (p<.05). Obesity remained stable.

Discussion: The results of this community programme are supporting the encouraging results of EPODE methodology which show that the involvement of the whole community is effective to reduce the prevalence of childhood overweight.

803 Preventing obesity among adolescent girls: Outcomes of the nutrition and enjoyable activity for teen girls cluster randomized controlled trial

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Introduction: Although there is evidence to suggest that levels of obesity have plateaued in recent years, this trend has not been observed among youth living in low-income communities. The aim of this study was to evaluate the impact of a 12-month multi-component school-based obesity prevention program (NEAT Girls [Nutrition and Enjoyable Activity for Teen Girls]) among adolescent girls.

Methods: The study involved a group randomized controlled trial with 12-month follow-up. Adolescent girls aged 12 to 14 years (N=357) from 12 secondary schools in low-income communities in the Hunter and Central Coast regions of New South Wales, Australia were recruited. The multi-component school-based intervention was based on Social Cognitive Theory and included teacher professional development, enhanced school sport sessions, interactive seminars, nutrition workshops, lunch-time physical activity sessions, handbooks and pedometers for self-monitoring, parent newsletters, and text messaging for social support. Body mass index (BMI) was the primary outcome and secondary outcomes included BMI z-score, percentage body fat, physical activity (accelerometers), screen time (questionnaire), dietary intake (food frequency questionnaire) and self-esteem.

Results: After 12-months, changes in BMI (adjusted mean difference [95% CI]=-0.19, [-0.70 to 0.33]), BMI z-score (-0.08 [-0.20 to 0.04]), and percentage body fat (-1.09 [-2.88 to 0.70]) were in favor of the intervention, but were not statistically different from those in the control group. Changes in screen time were statistically significant (-30.67 mins/day, [-62.43 to -1.06]), but there were no group by time effects for physical activity, dietary behavior or self-esteem.

Discussion: A school-based intervention tailored for adolescent girls from schools located in low-income communities did not significantly reduce BMI gain. However, changes in body composition were of a magnitude similar to previous studies and may be associated with clinically important health outcomes.

804 Community-based intervention approaches to change physical activity behaviour and health-related diet in order to prevent childhood obesity

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Introduction: EPODE is a coordinated, capacity-building approach for communities to implement effective and sustainable strategies to prevent childhood obesity by increasing physical activity, decreasing sedentarity and improving diet.

Methods: A coordination team trains and coaches a local project manager nominated in each EPODE town by the local authorities. At local level, the project manager is provided with tools to mobilize stakeholders through a steering committee and networks. Besides of its primary target families with children aged 6–12 years old, an important secondary target group is the wide variety of local stakeholders who can initiative micro-changes within the ecological niche of children and their families through local initiatives fostering better and balanced eating habits and greater physical activity in everyday life.

Results: The EPODE methodology is used in more than 300 towns in 8 countries (France, Belgium, Spain, Greece, The Netherlands, South Australia, Mexico and Romania) and concerns more than 20 million people. At child level the prevalence of overweight and obesity in children aged 5 to 12 is monitored. In the 8 French pilot towns, the prevalence of children overweight including obesity decreased between 2005 and 2009 by 9.2% (p <0.0001). In the Belgium pilot towns, the prevalence of children overweight significantly decreased by 22% between 2008 and 2010 (p<0,04). Following a European project, the EPODE European Network, a book of recommendations has been published to enrich the methodology and facilitate the implementation of similar initiatives in other countries.

Conclusion: The multistakeholders approach to mobilise local resources to change life style, especially physical activity is successful in decreasing in a sustainable way the prevalence of childhood obesity.

805   Physical activity and the risk of proximal colon and distal colon cancers: A systematic review and meta-analysis*

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Introduction: Although there is convincing evidence that physical activity reduces the risk of colon cancer, it is unclear whether it has a different effect on the risk of proximal colon and distal colon cancers. It has been proposed that proximal colon and distal colon cancers may be two distinct types of cancers with different genetic and environmental risk factors. The results of studies that have examined whether physical activity has a different effect on the risk of proximal colon and distal colon cancers are inconsistent. A systematic review and meta-analysis was conducted to investigate this issue.

Methods: Medline and EMBASE were used to search the literature for studies that had investigated the association between physical activity and the risk of proximal colon and distal colon cancers. A random-effects meta-analysis was conducted to estimate the summary relative risk (RR) of physical activity on the risk of proximal colon and distal colon cancers. Sex-specific and physical activity domain-specific sub-group analyses were also conducted.

Results: A total of 19 studies met the inclusion criteria. The summary relative risk of the main results from these studies indicated that the risk of proximal colon cancer was 25% lower among the most physically active people compared with the least active people (RR=0.75, 95% Confidence Interval=0.68–0.83). A similar result was found for distal colon cancer (RR=0.74, 95% Confidence Interval=0.68–0.80). Sub-group analyses indicated that the results did not differ between males and females, and that physical activity performed in the recreational, occupational or household domains reduced the risk of colon cancer.

Discussion: The results of this systematic review and meta-analysis suggest that there is strong and consistent evidence that physical activity is associated with a reduced risk of proximal colon and distal colon cancers in both males and females, and that the association does not differ by subsite. Given this finding, future research on physical activity and colon cancer should focus on other aspects of the association that remain unclear, such as whether the intensity of physical activity matters, the effect of sedentary behaviour, and the effect of non-aerobic physical activity.

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806   A home-based resistance training program for survivors of prostate cancer: A pilot randomized controlled trial

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Introduction: Men with prostate cancer experience a range of disease and treatment-related physical effects. Trials of resistance training (RT) with prostate cancer survivors have demonstrated the potential to improve many of the most common and debilitating symptoms. However, these trials have mainly comprised supervised programs often conducted at hospitals, limiting access for rural participants and capacity for sustainability. Home-based RT programs have the potential to overcome these limitations.

Method: Get PHITT (Prostate Health Improved Through Training) was a 12 week, home-based RT program for men with prostate cancer. Men attended one face-to-face session to receive instruction from an exercise specialist and a home-based RT program (3 sessions/week), a behaviour-change support manual, and an elastic resistance device (Gymstick). The support manual incorporated evidence- and theory-informed behaviour change strategies aligned with social cognitive theory. The theoretical constructs operationalised within the support manual included self-efficacy, outcome expectations, social support, and intentions. We aimed to establish feasibility, acceptability and preliminary efficacy via a pilot wait-list RCT. Men (n=39) were recruited via local media and an existing prostate cancer support group. Participants provided patient-reported (quality of life, fatigue, depression/anxiety, acceptability [5 point likert scale SD-SA]) and objectively assessed (muscular strength, body composition, waist circumference, BMI, agility) data. We assessed recruitment and retention rate, and analysed RT log books to assess adherence.

Results: The recruitment target was met within 3 days. The program achieved good fidelity (72%) and retention (90%). Intervention participants (n=18) reported that the program was enjoyable ($\bar{x}$=4), informative ($\bar{x}$=4.6), useful ($\bar{x}$=4.5), relevant ($\bar{x}$=4.2), that using the Gymstick was enjoyable ($\bar{x}$=4.7), and that they would recommend the program to other prostate cancer survivors (100%). Preliminary analyses identified improvements in global quality of life and muscular strength, and decreased fatigue amongst intervention participants that were not observed amongst control participants. Findings of all outcomes will be presented.

Discussion: The Get PHITT program has demonstrated acceptability, feasibility and preliminary efficacy. The next step is evaluation in a fully powered trial.

807 How does exercise improve cancer survivors' quality of life?

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Introduction: For most patients, cancer survivorship is associated with long-term adverse physical and psychosocial symptoms including fatigue, distress, and reduced physical function and quality of life (QoL). Exercise may improve QoL of cancer patients during and after treatment. The working mechanisms through which exercise exerts its beneficial effect on QoL are still unclear. Knowledge of mediators provides information for further improvements of interventions. Therefore, we examined mediators of an 12-week exercise intervention on QoL in cancer patients post-treatment.
Methods: This study is part of a prospective randomized multicenter trial. In total, 209 cancer patients (57% breast cancer) aged 49.5 (SD 10.4) who completed curative treatment at least 3 months ago, were assigned to 1) physical training plus cognitive behavioural training (PT+CBT, n=76); 2) PT (n=71), or 3) a wait-list control group (n=62). Since we found no differences between PT and PT+CBT in any outcome variable, we combined the two intervention groups. QoL, fatigue, emotional distress, physical activity (PA), general self-efficacy, and mastery were assessed using valid questionnaires. Path analysis was conducted using Mplus. In the model, we hypothesized the intervention to improve PA, self-efficacy and mastery, thereby reducing fatigue and distress and consequently improving QoL.
Results: The intervention effect on QoL was indeed mediated by the hypothesized path. We found a significant effect of the intervention on PA (β=0.46, 95% CI=0.14; 0.59), self-efficacy (β=2.41, 95% CI=0.35; 4,73), and mastery (β=1.75, 95% CI=0.36; 2.78). Further, the intervention had both a direct effect on fatigue (β=-1.09, 95% CI=-2.12; 0.01), and an indirect effect via PA (β=-0.29, 95% CI=-0.64;-0.07) and self-efficacy (β=-0.25, 95% CI=-0.61; -0.05). The intervention had a borderline significant direct effect on reduced distress (β=-1.32, 95% CI=-2.68; 0.11), and a significant indirect effect via improved self-efficacy (β=-0.56, 95% CI=-1.17; -0.12), and mastery (β=-0.49, 95% CI=-1.06; -0.15). Reductions in fatigue (β=-1.33, 95% CI=-1.85; -0.83) and distress (β=-0.86, 95% CI=-1.25; -0.52) were associated with improved QoL. Further, improved PA was directly associated with improved QoL (β=3.37, 95% CI=1.01; 5.54).
Discussion: Exercise-based rehabilitation improves the QoL of cancer patients post-treatment. This effect on QoL was mediated by improved PA, self-efficacy and mastery, and subsequent reductions in fatigue and distress. Effective interventions should focus increasing PA, self-efficacy and mastery, since this may lead to reduced distress and fatigue, and consequently to improved QoL of cancer patients post-treatment.

808 Living well after breast cancer: Changes in objectively-measured physical activity in a weight loss trial

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Introduction: Weight management and physical activity are important for improving outcomes in women following breast cancer treatment. In this population, few weight loss trials have been conducted and very few physical activity intervention trials have used objective physical activity measures. This study evaluated the changes in accelerometer-derived moderate-to-vigorous physical activity (MVPA) in women with breast cancer participating in a randomised controlled weight loss trial.
Methods: Participants were overweight and obese women (25–40kg/m^2) diagnosed with breast cancer in the 9–15 months prior to being recruited from the Queensland Cancer Registry. Eligible, consenting women were randomised to either the 6-month, behaviourally-focussed telephone-delivered weight loss intervention group (MVPA target ≥30mins/day every day) or to usual care following baseline assessment. Physical activity was measured at baseline and 6-months by Actigraph GT3X+ accelerometers, worn during waking hours for seven days. Total MVPA each day was determined using the established Freedson cut-offs and daily lifestyle MVPA and walking/running MVPA were identified using Crouter's two-step regression. Intervention effects were examined using linear mixed models, based on n=983 valid days only (i.e. 10+ hours wear).
Results: Participants (intervention: n=45; usual care: n=45) had mean (SD) age 55.3 (8.7) years and mean BMI 31.0 (4.3) kg/m^2. Total MVPA was similar between groups at baseline (mean [95% CI]: intervention 21.3 [18.3, 24.4] mins/day; usual care 20.2 [17.2, 23.2] mins/day; p=0.613). Both groups significantly increased MVPA, with follow-up means [95% CI] being higher for the intervention group than the usual care group (32.0 [28.6, 35.4] versus 25.1 [21.6, 28.7]; p=0.007). Significant intervention effects (intervention – usual care) at follow-up were observed for walking/running MVPA (mean difference [95% CI]: 4.5 [1.8–7.1] mins/day; p=0.001) but not for lifestyle MVPA (p=0.122).
Conclusions: Significant intervention effects on total MVPA were seen in this highly motivated sample of women with breast cancer. At 6-months intervention participants were meeting the program goal of 30mins/day of MVPA, primarily due to increases in walking/running MVPA not lifestyle MVPA. Newer techniques for analysing objectively measured physical activity can be useful for understanding changes in physical activity.

809 Five year follow up of an exercise intervention during breast cancer treatment

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Background: Meta-analytic reviews support the use of exercise during and after breast cancer treatment to improve functional status and quality of life and to prevent or treat fatigue, weight gain and lymphoedema. Epidemiological studies also suggest that physical activity has a protective effect on survivorship and cancer recurrence. To date, the longest follow up with cancer survivors after an exercise intervention is two years. The aim of this study was to determine if the exercise intervention had contributed to long term health benefits 5 years later.

Methods: Breast cancer patients who were in the original randomised controlled trial were contacted 5 years after the exercise intervention. The original measurements of physical functioning, quality of life, depression and mood were repeated. The mortality and recurrence status of any participants was recorded and the current health status at five years with reference to lymphoedema, osteoporosis and cardiotoxicity were accessed.

Results: Of the 203 women in the original study, 114 attended the 18 months follow up and 87 at 5 years. At the five year time point those who self reported as engaging in sufficient physical activity recorded benefits on functional and psychological variables in comparison to those who self reported that they were not sufficiently active. No differences between activity or intervention groups were observed for long term treatment related side effects such as osteoporosis, lymphoedema or cardiotoxicity.

Conclusions: A supervised exercise programme incorporating behaviour change techniques provided lasting benefits for women in terms of higher levels of activity and positive mood. Regular activity should be encouraged for all women with breast cancer as this can have lasting implications for physical and psychological functioning. Larger randomised controlled trials are required to look at the effect of exercise on outcomes such as morbidity and mortality.

810 Pre- and post-diagnosis physical activity and survival after prostate cancer

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Introduction: One previous prospective cohort study reported that higher levels of pre- and post-diagnosis physical activity improve survival after prostate cancer.

Methods: We investigated how lifetime physical activity as well as activity measured at three separate time points after diagnosis was related to disease outcomes in a population-based sample of prostate cancer survivors. A cohort of 987 men diagnosed with Stage II or higher prostate cancer between 1997 and 2000 in Alberta, Canada was followed for a minimum of 8.1 years for any cancer progressions, recurrences, and other primaries; and a minimum of 11.9 years for deaths. During this follow-up period there were 492 deaths including 214 from prostate cancer. The first two assessments of physical activity were done by interviews and the second two by self-administered questionnaires. All treatment and follow-up care received was abstracted from medical records. Data on physical activity including type (occupational, household, recreational) and dose (frequency, intensity and duration) performed before and after diagnosis were examined in Cox proportional hazards models as well as with cumulative incidence curves.

Results: An average of 169 and 89 MET-hrs/wk/yr were reported, respectively, for pre-diagnosis total physical activity and post-diagnosis activity. Some risk reduction for pre-diagnosis occupational activity and prostate cancer specific death was observed (hazards ratio (HR)=0.55 (95% Confidence Interval (95% CI)=0.36–0.86 for the third versus lowest quartile of lifetime occupational activity). The risk of a recurrence, progression or other primary cancer was also reduced for men in the third quartile for occupational activity (HR=0.72, 95% CI=0.55–0.94). Risk reductions were more evident for recreational and total activity done after diagnosis. For prostate specific mortality, a trend of decreasing risk with increasing activity was found for recreational activity (p=0.04). For all cause mortality, men in the highest versus the lowest quartiles of total physical activity experienced the most benefit (HR=0.58, 95% CI=0.41–0.82). All types of activity were associated with a risk decrease for all cause mortality but the greatest decrease was for recreational activity (HR=0.63, 95% CI=0.46–0.88).

Discussion: Physical activity done before and after prostate cancer diagnosis conferred a survival benefit that was particularly strong for post-diagnosis activity. For men with prostate cancer, physical activity is associated with lower overall mortality and prostate-cancer specific mortality. Analyses in different populations will provide additional evidence for clinical and public health recommendations regarding the exact type, dose and timing of physical activity needed to improve survival after prostate cancer.

811 Concordance between referred conditions and diagnosis: How accurate are our referrals?

Sports Medicine Australia NSW Branch Sponsored Session

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Background: A staggering 80% of the population will at some point of their lives experience low back pain. This results in billions of dollars lost in productivity and through expenses incurred for anti-inflammatory drugs and analgesics to physical therapy, chiropractic and other alternative therapies and often surgical intervention. Irrespective of this, mainstream medical practices in general have a limited understanding of the real causes of low back pain and the possibility of referred pain from the pelvis, sacrum, buttocks etc. For example, force imposed on the low back from a pelvic imbalance or the sacrum initiating torque force on the lower back. In most cases these causes are not considered, let alone addressed. This often results in greater cost to the patient in pain, debility and increased medical fees. In this study we investigated the accuracy of low back pain referrals to an interventional pain specialist facility.

Method: We retrospectively compared the low back pain diagnoses proposed in referral letters from General practitioners (n=43), Neurologist/Neurosurgeon/Orthopedic Surgeons (n=24), Osteopaths (n=3), Physiotherapists (n=4) and Sports Physicians (n=20), with the outcome of pain charts used by the specialist pain unit following evidence based algorithms. Concordance rates were calculated with SPSS Version 18 using Kendall's coefficient for concordance. A p value of <0.05 considered statistically significant.

Results: Results showed that health professional diagnoses of low back pain in referral letters when compared to patients pain charts, where more often than not, to have no component of low back pain at all. Sports physicians and Neurologists/Neurosurgeon/Orthopedic surgeons were the most likely to correctly refer patients for low back pain approximately 50% of the time (W=0.550, p=0.003, W=0.500, p=0.001, respectively). General practitioners demonstrated a unanimity with the pain specialist 40% of the time (W=0.442, p=0.00). Small sample numbers for Osteopath and Physiotherapist referrals prevented conclusive results, however the trend suggested that Osteopaths were the least concordant of all the referral groups (W=0.00, p=0.830), whilst physiotherapists demonstrated the greatest agreement (W=0.750, p=0.317).

Discussion: These findings suggest that low back pain is often misdiagnosed, and can result in in increased costs to both the patient and society with limited therapeutic benefits. Improvements in low back pain education are imperative for enhanced patient care across the medical specialties.

Saturday 3 November

812 The relationship between lumbar multifidus muscle function and performance on the single-leg squat task

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Introduction: Clinical tests such as a single-leg squat are used to evaluate control of the trunk, pelvis, hip and knee during functional weight bearing tasks. One important function of the kinetic chain is effective load transfer and distribution of forces. Deficits in control of the trunk have been shown to be predictive of knee injuries in athletes. Furthermore, decreased size of the lumbar multifidus muscle at the lumbo-sacral junction was predictive of lower limb injuries in football players. The lumbar multifidus muscle plays an important role in weightbearing as it controls the lumbar lordosis. In the clinical situation, the size and ability to voluntarily contract multifidus can be assessed using ultrasound imaging. Researchers have not yet evaluated the relationship between the motor control assessments for the multifidus and the single leg squat test.

Methods: Twenty asymptomatic male military recruits (Age mean 22 years±2.9) performed three single-leg squat trials on their dominant leg. An experienced musculoskeletal physiotherapist rated the mediolateral position of the knee during these performances from frontal plane video, with a previously validated scoring system. Knee position ratings were "over-foot" or "medial-to-foot". Bilateral ultrasound images of lumbar multifidus were captured and measured to determine muscle size, symmetry and function (ability to voluntarily contract the muscle in prone lying) Using knee "over-foot" and "medial-to-foot" groups, repeated measures MANOVA for upper lumbar (L2-L3) and lower lumbar (L4-L5) multifidus were performed to determine differences in muscle size, symmetry and function between "over-foot" and "medial-to-foot" groups.

Results: Individuals who performed the single-leg squat inappropriately (medial-to-foot) were less able to voluntarily contract their upper lumbar multifidus (L2-L3) on the non-weight bearing side, compared to appropriate performers ($p=0.05$).

Discussion: Possible explanations for this finding may relate to the proprioceptive role of the multifidus muscle and its ability to control the lumbar lordosis in weightbearing. Combining these two clinical tests may be useful for pre-season screening, and may direct the clinician to treatment of the trunk muscles. Future studies could investigate the effects of training the multifidus muscle on the performance of the single leg squat.

813 2 year follow up of a spinal stabilisation exercise regime in subjects with chronic non-specific low back pain – A case series study

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The aims of this study were to investigate the short-term and long term outcomes of a specific spinal stabilisation exercise regime (BOUNCE back classes) in subjects with non-specific low back pain. Five physiotherapy clinics that offered the BOUNCE Back exercise regime agreed to participate in this study. Data was collected from 75 participants with non-specific low back pain. Outcome assessments for pain intensity (11-point Pain Numerical Rating Scale) and function (24-point Roland Morris Disability Questionnaire) were collected at baseline, after 8 weeks of intervention and at 2 years follow up. At 2 years follow up, 44 of the original 51 Chronic subjects (>12weeks) responded giving an 88% follow up rating. Overall 60 of the original 75 subjects responded giving an overall 80% follow up rating. BOUNCE back classes improved pain intensity and function in the chronic population (>12 weeks) in both short term and long term follow up. Immediately after the 8 week group intervention, the pain intensity mean effect was 1.5 points (95% CI, 0.9 to 2.0, p<0.001). At 2 years post intervention the mean effect of the group exercise intervention compared to week 1 on pain intensity was 2.0 (95% CI, 1.2 to 2.8, p<0.001). Immediately after the 8 week exercise intervention the mean effect on function in the chronic population (>12 weeks) was 31.3 points (95% CI, 27.7 to 41.0 p<0.001). At 2 years post intervention the mean effect on function was 47.3 points (95% CI, 42.6 to 52.0 p<0.001). Preliminary evidence of the effectiveness of BOUNCE Back classes in pain intensity and function in patients was found over both the short and long term with non specific low back pain. This study has important implications for the management of chronic low back pain and represents an additional step towards the identification of those patients most likely to benefit from a spinal stabilisation rehabilitation approach.

814 Prolotherapy for sacroiliac joint pain

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Background: Prolotherapy is a non-surgical treatment for chronic musculoskeletal pain in damaged ligaments or tendons. Prolotherapy involves injecting a soluble solution such as dextrose into the ligament and tendon sites. This causes the body to produce a localised inflammatory response, which stimulates the growth of collagen fibres and connective tissue. This process is thought to thicken, tighten and strengthen the weakened tissue, and consequently decrease the amount of pain. Although prolotherapy has been used for many years, few controlled studies have properly evaluated the efficiency of this therapy. However, there is good evidence supporting the specific use of prolotherapy around the sacroiliac joint, with one study reporting a functional improvement in 76% of treated patients. This study assessed the treatment outcomes of patients who underwent sacroiliac joint prolotherapy.

Methods and Materials: Over a 2.5 year period, we assessed 77 patients who underwent prolotherapy treatment around the sacroiliac joint. This process involved outlining the deep interosseuos ligament with contrast material under direct fluoroscopy, which was then injected with 1.5ml Narapin 0.75% and 10ml 50% glucose over multiple sites. This procedure was repeated on average three times, at six week intervals. Outcome measures assessed via surveys and patient histories were; pain relief, back/ hip/ pelvis strength, Oswestry disability index, patient satisfaction and analgesic use.

Results: Over 70% of patients reported some form of improved stability following their series of Prolotherapy injections, with 54% of patients describing an average improvement of 70%. Similarly, over half of the patients reported some form of pain relief following prolotherapy, with 38% of patients describing an average improvement in pain of 75%. Pain relief is dependent on improved stability r=0.61 (p=0.00). Whilst no patients reported pain relief without improved stability, 10/70 patients reported improved stability without pain relief. Where patients reported an improvement in both pain relief and strength, percentage of improvements directly correlated with one another r=0.82 (p=0.00). No statistically significant changes in the Oswestry Disability Index following prolotherapy was observed, however a downward trend was observed. Patients reporting pain relief also scored lower on their Post-prolotherapy ODI questionnaire r=0.74, p=0.024.

Discussion: These findings suggest that prolotherapy can be an effective treatment for increasing strength and decreasing pain in patients with sacroiliac pain.

815   Ultrasound-guided versus blind subacromial corticosteroid injection for subacromial impingement

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Introduction: Subacromial corticosteroid injections are frequently performed for impingement syndrome of the shoulder. To improve accuracy of injection, ultrasound can be used. The aim of this study was to assess the clinical outcome of ultrasound guided subacromial injection compared to blind subacromial injection for subacromial impingement syndrome.

Methods: A prospective, randomized, double blinded trial was conducted. Fifty-six patients with subacromial impingement syndrome were randomized into 2 groups: 28 patients received a subacromial corticosteroid injection with ultrasound guidance (ultrasound group) and 28 patients received a subacromial corticosteroid injection without ultrasound guidance (blind group). The Visual Analog Scale (VAS) for pain with overhead activities and the American Shoulder and Elbow Surgeons (ASES) score were obtained before injection and at 6 weeks post injection.

Results: The VAS for pain with overhead activities decreased from 59±5 mm (mean±SEM) pre-injection to 33±6 mm six weeks post-injection in the ultrasound group (p<0.001) and from 63±4 mm to 39±6 mm in the blind group (p<0.001). The mean VAS decrease was not significantly different between the groups (p=1). The mean ASES score increased from 57±2 pre-injection to 68±3 six weeks post-injection in the ultrasound group (p<0.01) and from 54±3 pre-injection to 65±4 post-injection in the blind group (p<0.01), with no significant difference in mean increase between the groups (p=0.7). Four patients (14%) in the ultrasound group and six patients (21%) in the blind group eventually needed surgery (p=0.7). Conclusions: No significant differences were found in clinical outcome when comparing ultrasound guided subacromial injection to blind subacromial injection for subacromial impingement syndrome.

816   Effect of surgeon-sonographer interaction on ultrasound diagnosis of rotator cuff tears: A five-year cohort study in 775 shoulders

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Introduction: Using ultrasound as an imaging technique for the diagnosis of rotator cuff tears has been a topic of debate for years. Some studies show that community-based ultrasound is unsatisfactory for diagnosis of rotator cuff tears, while others show strong, but variable diagnostic utility.

We hypothesized that the accuracy of office-based ultrasound for the diagnosis of rotator cuff tears could be enhanced by a surgeon-sonographer interaction.

Methods: This study was a temporal cohort analysis of the diagnostic accuracy of ultrasound at predicting a rotator cuff tear. The surgeon-sonographer interaction had three components: 1) site the ultrasound machine and ultrasonographer within a shoulder clinic, 2) have the ultrasonographer attend shoulder surgeries, and 3) have the ultrasonographer review the patients pre- and post-operatively. The study was a cohort analysis of 775 patients who had an arthroscopic rotator cuff repair by a single surgeon after establishing a pre-operative in-house ultrasound by a single experienced musculoskeletal ultrasonographer. The subjects were stratified into five chronological groups. Comparisons of two variables (presence of a tear, and size of the tear) were made between the pre-operative ultrasound findings with arthroscopic findings (gold standard).

Results: The diagnostic utility for the detection of rotator cuff tears by ultrasound at the start of the study was 93% sensitive and 68% specific, while at the end of the study is was 99% sensitive and 93% specific. At the end of the study, in group 5, the positive likelihood ratio was 14 and the negative likelihood ratio was 0.01, describing a clinically very useful tool. There was a significant improvement in the correlation of the ability to estimate the size of rotator cuff tears from ultrasound to surgery, in both full thickness and partial thickness tears.

Discussion: The surgeon-sonographer interaction significantly improved the diagnostic utility of an office-based ultrasonographer over time, particularly with respect to the overall accuracy of ultrasound for the detection of rotator cuff tears and for the ability to predict the size of full thickness and partial thickness rotator cuff tears. Office based ultrasound proves to be a clinically very useful tool for diagnosis of rotator cuff tear pathology.

817   Factors predicting rotator cuff re-tear rate: An analysis of 1000 consecutive rotator cuff repairs

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Introduction: The rate of re-tear following rotator cuff repair varies from 11–94%. Re-tear is associated with poorer subjective and objective clinical outcomes than intact repair but, to date, the factors contributing to re-tear remain unclear. This study was designed to determine which pre-operative and intra-operative factors held the greatest association with re-tear and to produce a predictive model for re-tear.

Method: A retrospective analysis was conducted on 1000 consecutive patients who underwent a primary arthroscopic rotator cuff repair by a single surgeon and received ultrasound evaluation six months post-surgery to assess repair integrity. All patients completed a modified L'Insalata Questionnaire and clinical examination prior to surgery. Measurements of tear size, tear thickness, associated shoulder pathology, tissue quality and tendon mobility were made intra-operatively.

Results: The overall re-tear rate at six months was 17%. A number of pre-operative and intra-operative factors were significantly associated with re-tear. Logistic regression analysis showed that the best independent predictors of rotator cuff re-tear were antero-posterior tear length (correlation coefficient r=0.41, p<0.0001), tear size area (r=0.40, p<0.0001), medio-lateral tear length (r=0.34, p<0.0001), tear thickness (r=0.29, p<0.0001), patient age at surgery (r=0.27, p<0.0001) and operative time (r=0.18, p<0.0001). When combined, these factors produced a predictive model for re-tear. Other factors that correlated significantly with re-tear but which did not contribute to the predictive model included the number of suture anchors used, repair quality, tissue quality, tendon mobility, rupture of the long head of biceps tendon, glenohumeral osteoarthritis, history of a shoulder dislocation or contralateral shoulder problem and pre-operative clinical examination findings of a positive drop arm sign or weakness in external rotation or supraspinatus (abduction in the scapular plane) movements.

Discussion: Measures of rotator cuff tear size, such as antero-posterior and medio-lateral tear length, tear size area and tear thickness, showed stronger associations with re-tear six-months post-surgery than measures of tissue quality, such as patient tissue quality, tendon mobility and concomitant shoulder pathology. Furthermore, whereas medio-lateral tear length (tear retraction) has traditionally been viewed as critical in re-tear, our findings suggest that antero-posterior tear length is more predictive. Our findings indicate that rotator cuff tear size is an important parameter to consider prior to rotator cuff repair. Given that patients with smaller tears tend to do better following repair in terms of structural integrity, consideration should be given to repairing small tears prior to disease progression and tear expansion.

818 A randomised doubled blinded clinical control trial evaluating the effectiveness of daily vibration followed arthroscopic rotator cuff repair

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Introduction: Surgical repair of rotator cuff tears has improved patient outcomes however post operative re-tears rate remain high. High frequency low magnitude vibration(HFLM) has been demonstrated to promote new bone formation in both animal models and in humans. We speculated this type of mechanical stimulation applied post operatively would enhance tendon to bone (footprint) healing by accelerating new bone formation at the tendon to bone interface.
Aims: The primary aim of this clinical trial was to evaluate the effectiveness of (HFLM) vibration at reducing re-tear at six months after arthroscopic rotator cuff surgery. The secondary aims of this trial was to evaluate whether HFLM vibration provide any additional benefit such as increase post operative shoulder range of motion or shoulder strength and provide additional relief for shoulder pain severity and frequency.
Methods: A randomised double blinded clinical trial was conducted to investigate the effects of vibration on post operative rotator cuff healing. Two groups of 60 patients (120 total) were recruited for this trial, half of them received a vibration device (80Hz) and the other half received a placebo device. Patients and examiners were blinded with respect to the vibration device. Patients used the device for five minutes daily in addition to rehabilitation exercises which began one day after surgery and continued for six months.
Results: This clinical trial showed vibration did not improve post operative re-tear rate. Re-tear rate of both groups were 8.3% at six months as determined by ultrasound imaging. Six months after surgery, both groups had significant reductions in pain with overhead activities, pain at rest, during sleep and overall shoulder pain compared to before surgery. Both the vibration and the placebo group had significant increases in shoulder strength with abduction in the scapular plane, adduction, lift-off, internal and external rotation six months after the surgery. Statistical analysis showed that vibration was not a contributing factor at improving these parameters in these periods. Vibration did provided acute pain relief six weeks after surgery.
Conclusion: High frequency low magnitude vibration did provide acute pain relief upon application six weeks after arthroscopic rotator cuff repair surgery. However, vibration did not improve tendon to bone healing, shoulder range of motion, shoulder strength or shoulder pain with activities, at rest and at night when compared to placebo.

819 Surgical treatment of lateral epicondylitis: A prospective, randomised, blinded, placebo controlled pilot study

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Introduction: Tennis elbow (lateral epicondylitis) is a common condition with a community prevalence of 1–3%, resulting in pain at the elbow and weakness extending the wrist. It is associated with overuse and if it progresses to a chronic stage, it shows degeneration at the insertion of extensor carpi radialis brevis (ECRB) macroscopically and microscopically. While there is no universally effective management for chronic tennis elbow, a common surgical technique as described by Nirschl & Pettrone involves cutting out the degenerated portion of ECRB. Although the results of this procedure have been reported as excellent, no surgical procedure for tennis elbow has been compared with placebo surgery.
Methods: This study was a prospective, randomised, double-blinded, placebo controlled clinical trial investigating the Nirschl technique (surgical excision of the macroscopically degenerated portion of ECRB; n=11) compared with a sham operation (skin incision and exposure of ECRB alone; n=11) to treat chronic tennis elbow. The primary outcome was defined as patient rated elbow pain with activity at 6 months. Secondary outcome measures included patient rated pain and functional outcomes, elbow stiffness and range of motion, epicondyle tenderness and strength.
Results: The two groups were matched for age, sex and duration of symptoms. Both the Nirschl and sham procedures improved patient rated pain frequency and magnitude, elbow stiffness, difficulty with picking up objects and twisting motions and grip strength over 6 months (p<0.01). There was, however, no difference between the Nirschl and sham procedure in all outcomes, with the exception of patient ranked pain with activity at 2 weeks. Patients who underwent the Nirschl procedure for tennis elbow had more pain with activity at 2 weeks when compared with sham surgery alone (p<0.05). No side effects or complications were reported.
Discussion: This pilot study demonstrates that, in the short term, surgical excision of the degenerative portion of ECRB confers no additional benefits to patients with chronic tennis elbow over and above a skin incision alone.

820 Highlighting the impact of sports joint injury in the absence of national prevention programs: The Bone and Joint Decade

SYMPOSIUM

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Introduction: Sport injuries, particularly joint injuries, place a great burden on Australian society because of the need for serious medical attention and impacts on ongoing sport participation. Despite the demonstrable public health impact of joint injury and the known efficacy of prevention trials, program dissemination and implementation has been limited in Australia. The absence of prevention programs has considerable impact at an individual and societal perspective. The purpose of this symposium is to appraise the impact of sports joint injury from an individual and health perspective. Roundtable discussion pursuant to policy implications and barriers to change will follow.
Methods: A series of presentations will inform the discussion. An opening introduction and brief of the Bone and Joint Decade mission will initiate proceedings. This will be followed by a presentation on the epidemiology of sports joint injury in Australia. The impact of injury from a personal level will be provided by an ex-elite athlete. The health consequences will then be appraised from the viewpoint of acute sports injury recovery and then the long term sequelae. A proposal for a national sports injury prevention initiative will be proposed for further discussion.
Results: ACL injuries have an incidence of at least 81 per 100,000 persons annually aged between 10 and 64 years. Whilst the reasons for the disparity are unclear, the rate of knee reconstructions in Australia is much higher than most other developed countries with an incidence of 53 per 100,000 persons annually. In NSW, sport/leisure injuries account for almost 60% of all knee reconstructions. Knee injury has also been identified as the most important modifiable risk factor for subsequent knee OA in men, and is second only to obesity in women. It is estimated that 25% of incident symptomatic knee OA could be prevented by preventing knee injuries among men (women, 14%).

Discussion: A modestly successful national sports injury prevention program would likely reduce health care costs dramatically along with preventing unnecessary morbidity on those affected.

Paper 1:   The Bone and Joint Decade
Paper 2:   The public health burden of sports injuries
Paper 3:   Management of acute knee injury – the role of the surgeon

821   The Bone and Joint Decade

R. Lilian[1]* ▪ [1]The Bone and Joint Decade

The Bone and Joint Decade was initiated because of the epidemic of musculoskeletal disease that is occurring worldwide as the population ages. The concept of the Decade commenced in 1998 in Lund, Sweden, when orthopaedic surgeons, rheumatologists and other health professionals determined to increase the profile of these conditions in the community. The Bone and Joint Decade was launched in Geneva by the World Health Organisation in January 2000. In Australia musculoskeletal disorders are the second most common condition presented to a general practitioner and the third leading cause of health system expenditure, with an estimated total cost of over $24 billion in 2007. The mandate of the Bone and Joint Decade has been renewed for another 10 years (2010–2020) with the vision of a society where prevention, treatment and care of people with musculoskeletal disorders is of a high standard and consistently accessible in order to improve the health-related quality of life for people with, or at risk of, musculoskeletal disorders. The mission is to reduce the burden and cost of musculoskeletal disorders to individuals, carers and society and to promote musculoskeletal health and musculoskeletal science worldwide. To achieve this, musculoskeletal disorders and injuries should be among the leading major health concerns in the minds, actions and funding priorities of international health agencies, governments, non-governmental organisations, medical and research communities, funders, media and the general public. The Bone and Joint Decade is dependent on the activities of all the professional, scientific and patient organisations relevant to all conditions that impact on musculoskeletal health working together at national, regional and international levels. The success is dependent on the contribution by individuals like yourself, variously physicians, nurses, therapists, patients and other volunteers, often above and beyond expectations.

822   The public health burden of sports injuries

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Introduction: Sports injuries are a recognised problem in Australia but there is a lack of good population-wide figures about their incidence, costs and burden on the health care system, particularly relative to other significant injury issues such as road trauma. The aim of this talk is to present current data about the epidemiology of sports injury in Victoria and to compare its public health burden to that of road trauma both overall and in adults and children separately.
Methods: Routinely collected data on all admissions to Victorian hospitals and presentations to 38 Victorian public hospital emergency departments (EDs) were analysed for the period 2002/03–2010/11, inclusive. Sport-related hospitalisations and ED presentations were identified through activity codes on each dataset (admissions: ICD-10-AM activity codes U50-71; ED presentations: activity code 'S'). Trends in incidence rates were assessed by log-linear regression. Injury burden was assessed in terms of years lost to disability (YLDs), hospital bed-days and direct hospital costs.
Results: Over the 9-year period the frequency of hospital-treated sports injury increased significantly from 23,107 to 32,129, an estimated annual increase of 4.3% (95% CI:3.4%–5.4%) and an overall increase of 47% (95% CI:35%–57%). In contrast, hospital-treated road trauma trends were stable (18,193 to 16,952) with a non-significant overall decrease of -4% (95% CI:-9%–1%). Overall, there were 283,377 hospital-treated sports injury cases, associated with 34,160 YLDs, 211,354 bed-days and direct hospital costs of $397.2m. In contrast, there were 168,100 road trauma cases, associated with 40,432 YLDs, 557,964 bed-days and direct hospital costs of $547.7m. When restricted to children aged <15 years, sports injury accounted for 3.1X the number of YLDs, 1.9X the number of bed-days and 2.6X the direct hospital costs than did road trauma. Data focusing on lower limb injury in particular will also be presented.
Discussion: There has been a significant increase in the incidence of hospital-treated sports injury in Victoria, compared to a stabilisation of road trauma rates. The fact that the injury incidence and burden are so much larger for sports injury than for road trauma for people in Victoria aged <15 years provides additional incentive for addressing sports injury prevention in this age group. The burden estimates presented here are almost certainly an underestimate of the problem because of the known under-enumeration of sports injuries in hospital data and the fact that the longer term consequences of sports injuries were not costed.

823   Management of acute knee injury – the role of the surgeon

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ACL injury results in functional instability and the risk of increasing intra-articular pathology. In over 5000 ACL reconstructions, the incidence of secondary pathology with respect to the time between injury and surgery was examined. We found that the incidence of chondral damage and medial meniscal tears increases with increasing time after injury. Ideally and particularly in younger patients, ACL reconstruction should not be delayed beyond 4 months from injury. Acute surgical management of ACL injuries involves arthroscopic anatomic reconstruction using 4-strand hamstring tendon autograft. In long term studies we have found that after ACL reconstruction the incidence of further ACL injury is equivalent between the reconstructed and opposite knee. Males have higher incidence of injury to the ACL graft than females, and a family history of ACL rupture doubles the odds of both ACL graft and contralateral ACL rupture. Recent injury prevention programmes are showing promising results for reducing primary ACL injury and may also assist in preventing reinjury after reconstruction. These findings have significant clinical implications for rehabilitation and return to sport guidelines after ACL reconstruction.

824 Physical activity and maternal glucose and insulin in pregnant overweight and obese women

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Introduction: The effect of physical activity (PA) in pregnancy on maternal glucose metabolism seems to be dependent on the timing. PA before and in early pregnancy has been reported to reduce risk of gestational diabetes, whereas PA in the second half of pregnancy was not found to have an effect in normal-weight women. It might be that, in later pregnancy, maternal insulin sensitivity is regulated to achieve optimal fetal growth and is not sensitive to increases in PA. In this study, the effects of objectively measured PA in both early and late pregnancy on maternal glucose and insulin were assessed in overweight and obese women at risk for gestational diabetes.
Methods: A total of 55 women were prospectively followed throughout pregnancy. At 15, 24 and 32 weeks of gestation, PA and glucose, insulin, HbA1c and C-peptide were assessed in the fasting state. At 24 and 32 weeks, an 100 g oral glucose tolerance test was performed in addition, with samples taken at 30, 60, 90, 120 and 180 minutes. The number of minutes in moderate-to-vigorous PA per week were calculated based on data derived from the ActiTrainer accelerometer (ActiGraph™). Effects of PA on fasting glucose, insulin, HbA1c, C-peptide, insulin sensitivity, first-phase insulin response and beta cell function were assessed.
Results: PA at 15 weeks was related to a reduction in fasting insulin levels at 32 weeks. Changes in PA from 15 weeks to 24 weeks of gestation were not related to any of the outcomes. However, changes in PA from 15 weeks to 32 weeks of gestation were related to reduced fasting insulin, increased insulin sensitivity, and reduced first-phase insulin response. No relations between PA and glucose levels or HbA1c were observed at any time point.
Discussion: In contrast to earlier studies, we found that in overweight and obese women, insulin sensitivity can apparently be improved with PA. Therefore, for this group of pregnant women, PA throughout pregnancy will have a positive effect on maternal metabolism, which could reduce the risk of infants born large-for-gestation.

825 Exercise during pregnancy – Does it impact offspring birth weight parameters?

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Introduction: Individually, both low and high birth weight plays an important role in infant mortality and morbidity, childhood development, and adult health. As long as pregnancy is normal and healthy, the current American College of Obstetrics and Gynecology (ACOG) recommend that sedentary women should start exercising during pregnancy. However, previous studies investigating the effect of exercise on birth weight have included both exercisers and non-exercisers, and pre-pregnancy physical activity may be a confounding factor linked to birth weight when groups are not comparable at baseline. Thus, the aim of the current study was to include inactive women to a randomized controlled trial investigating the effect of regular maternal exercise on offspring weight parameters at birth.
Methods: In total, 105 women pregnant with their first child were assigned to regular exercise (n=52) or controls (n=53) following a computerised randomization program. The weight bearing exercise included 60 min of group aerobic plus strength training performed 2–3 times weekly for at least 12 weeks. Moderate intensity was measured by Borg rating scale and the program followed the ACOG guidelines.The newborns weight was assessed immediately following delivery, and registered 6–12 weeks after labor (postpartum visit) from hospital records. The main outcome was infant birth weight measured in grams and for statistical analysis grouped according to <10th percentile and >90th percentile.
Results: In total, 85.7% of the participants met at the postpartum visit, at mean 7.7 (SD 1.7). According to ITT-analysis, we did not find statistically significant differences between the two groups in infant weight parameters, including small and large offspring, birth length, head circumference, gestation weeks or prematurity.
Discussion: The strengths of the present study were use of an assessor blinded RCT design, few losses to follow-up and implementation of an exercise program following ACOG recommendations, conducted by certified personnel in a supervised setting. In addition, we aimed at integration of exercises into daily life activities, a focus not reported in other studies. Adherence to the training protocol was registered, and all follow-up procedures were done by the same investigator. A limitation is that the participants were healthy nulliparous with a high educational level, and may therefore not be representative for all eligible women. To conclude, these data give support that for previously inactive women, beginning regular exercise appeared to be safe and did not impact offspring birth weight parameters.

826 Physical activity during pregnancy and infant's neuromotor development in the first 4 years of life*

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Introduction: Physical activity (PA) during pregnancy is known to result in many health benefits. Evidence also shows that child may benefit from maternal exercise. However, similar to the general population, PA level during gestation is below the recommended by health guidelines. Many reasons are reported by women to not exercise, and even among those who were previously active, unexplained fear of harming herself or fetus is observed. The aim of this study was to evaluate if leisure-time PA during pregnancy in Brazilian women could alter offspring's neurodevelopment.
Methods: A birth cohort was started in 2004 in the city of Pelotas (Brazil). All hospital births during 2004 (January, 1st to December, 31st) were included. Mothers provided information about socio-demographics, behavior and antenatal care. Follow-up interviews and measurements took place when children were 3, 12, 24 and 48 months. PA type, frequency and duration during each trimester of pregnancy were assessed retrospectively. Eight PA-related variables were generated (based on trimester and amount of PA). Neurodevelopment was evaluated by Battelle's Development Inventory and Weschler's Intelligence Scale for children (IQ at 48 months). Besides, the following variables were included in the analysis: family income, mother's age, schooling, skin color, smoking and depression. And for the newborn: preterm birth, sex and low birth weight.

Results: The first interview (at hospital, soon after birth) included 4231 children. From birth to 48 months, sample size decreased to 3792. Crude analysis showed that for the Battelle's results at 12 and 24 months, most results favor active women but none was statistically significant. At 48 months all results are better among children from active women and two are significant: PA (yes/no) in the first trimester (p=0.01) and PA above 90 min/week in the first trimester (p=0.03). IQ was higher (4 points) among children from active women. After controlling for confounders, IQ at 48 months was not associated to PA, although all results favor active women and PA>90 min/week in the first trimester presented borderline association (p=0.05). For the Battelle's Inventory, no significant result was observed.

Discussion: PA during pregnancy does not seem to affect negatively children's neurodevelopment and children from active mothers presented better results for most of the outcomes. After controlling for confounders, results in favor of active women were not significant. PA should be advised to pregnant women based on all benefits already known, and neurodevelopment does not seem to be affected negatively by PA.

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827 Do active mothers have active preschool-aged children? An analysis of concurrently measured activity patterns

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Introduction: Physical activity (PA) from a young age is likely to confer long-lasting health and developmental benefits. Parents have a significant influence over their young children's behaviour but little is known about the association between maternal and preschool-aged children's PA. This study aimed to determine whether patterns of mothers' objectively measured PA are associated with those of their children and whether this association differed by demographic and temporal factors.

Methods: In a UK population-based cohort study, the Southampton Women's Survey, PA levels of 553 4-year-olds (51% female) and their mothers were measured concurrently using accelerometry for ≤7 days (mean 4.9±1.6). The association between maternal and children's activity patterns was analysed using hourly data in a three-level mixed-effects regression analysis (hour, day, child). Three outcome (and maternal exposure) variables were used: total PA (counts per minute); minutes spent in moderate-to-vigorous PA (MVPA) and sedentary. Models were adjusted for child's sex, weight status and time at preschool; age mother left full-time education; time of day; and weekday vs. weekend. Effect modification by each of these factors was investigated.

Results: Maternal and child patterns of total PA (β=0.29, 95% CI: 0.28,0.31), time spent in MVPA (β=0.32; 0.30,0.34) and sedentary (β=0.27; 0.26,0.28) were significantly associated (p<0.001), where β indicates the minute/hour increase in child's activity for each 1 minute/hour increase in maternal activity. The strength of association between maternal and child PA patterns differed by several demographic and temporal factors (p<0.001 unless stated). For example, for all outcome measures, the association was stronger for those attending preschool part-time vs. full-time (total PA: β for interaction=0.14; 95% CI: 0.04,0.19; MVPA: β=0.12; 0.06,0.18 and sedentary time: β=0.05; 0.02,0.09). For total PA and MVPA the association was stronger in girls (total PA: β=0.03; 0.01,0.06; p=0.035; MVPA: β=0.08; 0.05,0.12) and for those of normal weight vs. overweight (total PA: β=0.10; 0.06,0.14; MVPA: β=0.11; 0.06,0.16). Furthermore, associations were strongest in the afternoon for total PA (β=0.14; 0.11,0.17) and MVPA (β=0.04; 0.01,0.08) and in the evening for sedentary time (β=0.08; 0.06,0.10).

Discussion: PA patterns of mothers and their four-year-old children are significantly associated. This is particularly true for those children who attend preschool part-time, who are of normal weight and for girls. The afternoon appears to be when mothers and children's activity patterns are most similar. This work highlights the complex association between maternal and child PA and provides support for actively including mothers in interventions to increase PA in young children.

828 Impact of the REFRESH randomised controlled trial on the physical activity behaviours of mothers with young children

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Introduction: Lifestyle factors relating to unhealthy diets and lack of physical activity have been implicated in excessive weight gain during pregnancy, interpregnancy weight gain, weight retention 12 months postpartum and long-term weight retention among women. Physical inactivity and unhealthy diets are among the modifiable risk factors that are associated with the major chronic diseases and are the risk factors which explain the vast majority of chronic disease deaths in the world. The aim of this abstract is to demonstrate the impact of REminder for Food Relaxation Exercise and Support for Health (REFRESH), a community based randomised controlled trial on mothers with young children's physical activity behaviours.

Method: Mothers with young children were recruited via playgroups and randomly assigned to either the control group (n=400) or the intervention group (n=400). The intervention group received a six month behaviour change theory based tailored program which was delivered via playgroups. The multi-strategy intervention included physical activity resources tailored to the target group, face-to-face workshops and a home based component. Self-reported physical activity data was collected using the International Physical Activity Questionnaire at baseline and post-intervention. The general linear model was applied to assess the intervention effect.

Results: All analysis controlled for baseline values and age of mothers. univariate analysis was conducted using SPSS. Significant effect sizes were found on mothers' moderate and vigorous physical activity behaviours after the 6 month minimalistic intervention. No significant effect sizes were found on mother's strength exercises or sitting behaviours.

Conclusion: The REFRESH program showed promise for improving mothers with young children's physical activity behaviours.

829 Is moderate-to-vigorous physical activity recorded on 7-day log correlated with accelerometer data in a sample of ethnic minority postpartum women?

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Introduction: New mothers, especially racial/ethnic minority women, are at risk for decreased physical activity (PA) after having a baby, with 60% of new mothers failing to meet national guidelines for Moderate-to-Vigorous Physical Activity (MVPA). Accelerometers used to measure PA have limitations for postpartum women, for example, they can underestimate intensity resulting from walking while pushing a stroller or walking while carrying a baby. While PA Logs can measure such factors that affect intensity, as well as PA done while not wearing the accelerometer (e.g, swimming).
Methods: Within a randomized trial designed to increase MVPA in new mothers, both 7-day PA logs and accelerometers were used to measure MVPA over a 12-month intervention. Women were randomly assigned to a PA intervention tailored to new mothers, or general PA materials. PA logs and accelerometers were completed 4 times: baseline, 3, 6, and 12 months. Participants recorded the time/type/intensity of PA lasting ≥10 min for 7 days on log and specifically noted PA when pushing a stroller. Physical activities reported on the log were assigned MET values, with MVPA defined as MET ≥3.
Results: Sample size=278, mean age=32±5.6 years, mean age baby=5.7±2.8 months, 84% ethnic minority (31% Asian, 33% Native Hawaiian/Pacific Islander, 17% Mixed, 3% Other), 38% primiparous, and mean BMI=27.9±5.3 kg/m^2 (range: 17.5–43.6). Overall 77.7% of the PA logs were completed/returned with useable data and 78.7% of accelerometers were worn/returned with useable data. Minutes of MVPA recorded on logs and accelerometers were significantly correlated (p<001 all timepoints), with Spearman's rank correlation coefficients (rho): baseline r=.27, 3mo- r=.34, 6mo- r=.46, 12 mo- r=.31. PA log data found 20% of running and 34% of walking was while pushing a stroller, 3% of MVPA was while carrying the baby, and 2% water sports. The percentage of participants who met MVPA recommendations (≥150 min/wk) increased significantly over 12mo (X^2(3, N=765)=26.47, p<.0001); from 24.7% at baseline to 35.5% at 3mo, 44.4% at 6mo, and 47.1% at 12mo. with no condition differences.
Discussion: In a sample of postpartum minutes of MVPA collected via PA logs and accelerometers were significantly correlated over a 12-month intervention, but accelerometers failed to capture intensity levels related to pushing a baby stroller. Using PA logs and accelerometers in combination may improve the quality of PA data in new mothers.

830 FitFor2: Effects of an exercise training program on the incidence of gestational diabetes

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Introduction: The prevalence of gestational diabetes (GDM) is increasing worldwide. GDM is a risk factor for maternal and perinatal morbidity. Furthermore, it puts both mother and infant at risk for developing diabetes type 2 later in life. Prevention of GDM is therefore important. In this study, the effectiveness of an exercise training program for overweight or obese pregnant women at risk for GDM was evaluated.
Methods: A randomized controlled trial was conducted, for which overweight or obese pregnant women at risk for GDM were recruited in The Netherlands between 2007 and 2011. Usual care was compared to an exercise training program. The training consisted of two sessions per week with aerobic and strength exercises, each session lasting one hour. The sessions were supervised by a physiotherapist. The intervention was initiated around 15 weeks of gestation and continued until delivery. The intervention was aimed at improving maternal fasting blood glucose, insulin sensitivity and birth weight. Outcomes were assessed at baseline (around 15 weeks), and at 24 and 32 weeks of gestation. Linear regression analyses were performed to determine the effects of the intervention.
Results: 121 participants were randomly allocated to either the control (n=59) or intervention (n=62) group. Intention-to- treat analysis showed that the exercise program had neither an effect on maternal fasting blood glucose nor on insulin sensitivity. Also no effect was found on birth weight. Compliance with the exercise training program was low.
Discussion: The exercise intervention performed over the second and third trimester of pregnancy had no effects on fasting blood glucose, insulin sensitivity and birth weight, most likely due to low compliance. The high prevalence of women at risk for GDM calls for further research on possible interventions that can prevent GDM and other types of interventions to engage this target group in physical activity and exercise.

831 Physical activity interventions and depression in children and adolescents: A systematic review and meta-analysis

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Introduction: Evidence suggests chronic physical activity (PA) participation may be both protective against the onset of and beneficial for reducing depressive symptoms. The objective of this study was to assess the impact of PA interventions on depression in children and adolescents using meta-analysis.
Methods: Published English language studies were located from manual and computerised searches of the following databases: PsycInfo, The Cochrane Database of Systematic Reviews and The Cochrane Central Register of Controlled Trials, Trials Register of Promoting Health Interventions (TRoPHI; EPPI Centre), Web of Science and MEDLINE. Studies meeting inclusion criteria 1) reported on interventions to promote or increase PA; 2) included children aged 5–11 years and/or adolescents aged 12–19 years; 3) reported on results using a quantitative measure of depression; 4) included a non-physical control or comparison group; 5) were published in peer-reviewed journals written in English, up to and including May 2011. Studies were coded for methodological, participant, and study characteristics. Comprehensive Meta-Analysis version-2 software was used to compute effect sizes; with sub-group analyses to identify moderating characteristics. Study quality was assessed using the Delphi technique.

Results: Nine studies were included (N=581); most were school-based RCTs randomized by individual. The summary treatment effect was significant (Hedges' g=-0.26, SE=0.09, 95% C.I=-0.43, 0.08, p=0.004). Sub-group analyses showed that methodological (ie. studies with both education and PA intervention; those with a higher quality score; and than three months in duration) and participant characteristics (ie. single gender studies; those targeting overweight or obese groups) contributed most to the reduction in depression.

Discussion: There was a significant overall effect of PA on depression. More outcome-focused, high quality trials are required to effectively inform the implementation of programs to reduce depressive symptoms in children and adolescents.

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832   Is physical activity and body composition associated with neurocognitive function in children?

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Introduction: There is emerging evidence suggesting that physical activity and body size may be related to neurocognition in children. The purpose of this study was to investigate the associations between physical activity, body size, and neurocognitive function in a multiethnic sample of primary-aged children. Methods: A total of 209 boys and 244 girls aged 6–10 years were randomly selected from 10 diverse primary schools in Auckland, New Zealand. Physical activity was assessed using sealed seven-day-memory pedometers over three weekdays and two weekend days. Body mass index (BMI) and waist-to-height ratio (WHtR) were calculated from height, weight, and waist circumference. Eight neurocognitive domains (psychomotor speed, reaction time, processing speed, verbal memory, visual memory, composite memory, cognitive flexibility, and executive function) were measured and expressed as percentiles of an age-specific reference population using a computerized cognitive testing platform. Age, sex, and ethnicity were collected from the school rolls, while socioeconomic status (SES) was estimated from the national socioeconomic decile rating of participating schools. Multiple linear regression was used to evaluate associations among neurocognition, physical activity, and body size before and after adjustment for demographic variables. Results: Positive associations between weekday activity and both cognitive flexibility (P=0.010) and executive function (P=0.014) were detected after adjustment for age, sex, ethnicity, but not after adjustment for SES. No significant associations were detected for weekend activity. Both BMI and WHtR were inversely associated with all neurocognitive domains (P<0.05) except verbal memory, which was only significant in models without the ethnicity and SES terms. Inspection of the beta coefficients in the fully adjusted models indicated that a hypothetical 1 standard deviation (SD) increase in BMI (2.81 kg.m^{-2}) was associated with percentile decreases in neurocognitive domains ranging from 3.50 (95% CI: 0.35, 6.64) to 5.60 (95% CI: 2.68, 8.52). Similarly, percentile decreases in neurocognitive domains ranged from 3.37 (95% CI: 0.78, 5.96) to 5.25 (95% CI: 2.18, 8.32) with a 1 SD increase in WHtR (0.05). Discussion: The results of this study indicate that there is a link between body size and multiple neurocognitive domains in children regardless of sociodemographic background. It is therefore possible that reducing or preventing obesity in children could enhance brain function; however, longitudinal evidence is required to establish the causal direction of these associations. The confounding effects of SES on the associations between weekday activity and executive function highlights the importance of accounting for sociodemographic variation in future research.

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833   Does habitual physical activity influence children's physical self-worth: A longitudinal assessment

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Introduction: Research indicates positive associations between children's physical self-worth, total physical activity and time accumulated in moderate and vigorous intensity physical activity. Conversely, a negative association has been reported for physical self-worth and very light intensity physical activity. However, these findings are based on cross-sectional studies. The aim of this study was to examine longitudinally the influence of children's habitual physical activity on physical self-worth.

Methods: Physical activity was assessed by triaxial accelerometry (RT3) for three 7-day data collection periods over 12 months in fifty-nine 9–11 year old children (Male, n=24; Female, n=35). Total activity and time spent in very light (up to 1.9 METs) light (1.9–3 METs), moderate (3–6 METs) and vigorous (>6 METs) intensity activity were recorded. The children completed the Children's and Youth's Physical Self-Perception Profile at each 7-day period. The physical self-worth domain was measured at the apex of the hierarchy, with sport/athletic competence, strength competence, stamina/condition competence, and attractive body at the next level (sub-domain). For the longitudinal analysis, the repeated measurements (Level 1) were grouped within the individual (Level 2). Associations were assessed via two multi-level regression models.

Results: After adjusting for the effects of gender and body fatness, the first multi-level regression model assessed the influence of physical activity on the physical self-worth sub-domains. The analysis identified a significant negative effect for time spent in very light intensity activity on attractive body (-0.022, *SE* 0.009) and a significant positive effect for time spent in vigorous intensity activity on sport/athletic competence (0.055, *SE* 0.017) and strength competence (0.054, *SE* 0.017). The second model assessed the influence of physical activity on the physical self-worth domain. The results identified a significant negative effect for time spent in very light intensity activity on physical self-worth (-0.016, *SE* 0.005).

Conclusions: The data indicates that time spent in vigorous intensity physical activity positively influences the physical self-worth of children, with time spent in very light intensity physical activity providing a negative influence. Intervention research manipulating the balance of time spent at different activity intensities, decreasing time in very light and increasing time in vigorous, may elicit a positive impact on children's physical self-worth.

834 Structured and unstructured Wii play: What are the physical and psychological benefits for children?

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Introduction: Young people who lack fundamental movement skills often dread traditional physical education programs. As a result, missing out on participation can hinder development of confidence and movement competence, create feelings of exclusion, and negatively impact self-esteem and academic performance. Attributes of low physical competencies and social isolation are linked to sedentary behaviour, a contributing factor in the rising overweight and obesity epidemic. Exergaming, new technology that integrates physical activity (PA) in video games, may counteract sedentary lifestyles and enhance health behaviours. Active video games offer the possibility of increasing *PA;* thus providing a *unique* intervention to address declining activity rates. Nintendo's Wii is a leader in exergaming and encourages full body movement while claiming to enhance physical function. Exergames are intended to be played in an active fashion; however it is possible to minimize their energy output while playing. To date research examining the effects of exergame play have been primarily limited to lab based assessment where play methods have been dictated by researchers in order to control performance variability. No research information about how children play exergames during at home use exists.
Methods: To help understand the physical and socio-psychological effects of exergaming, we assessed enjoyment and rate of perceived exertion (RPE) for a group (N=16) of healthy children between 6–12 years. Each child played the Wii game of their choice for 15 minutes in an unstructured (free play with no instructions provided) and structured (required to be active) environment. During play sessions heart rate (HR) was continuously monitored. The two play sessions were spaced at least 24 hours apart.
Results: Average HR during unstructured sessions (116 bpm) was significantly less than during structured sessions (126 bpm) $p<0.05$. RPE was also lower during the unstructured play (1.69) compared *to* the structured play (3.56) sessions, $p<0.05$. Wii play enjoyment levels were rated high based on the Physical Activity Enjoyment Scale (PACES).
Discussion: Although children enjoyed the Wii play sessions RPE values were higher when playing the game in the structured environment. When external motivation was present the children played more actively as evident from the increased HR. Although there is much evidence to suggest that structured exergames can have a positive impact on HR, energy expenditure and enjoyment, a note of caution must be included as, without external motivation it seems that children may opt to use potentially active video games in a more sedentary fashion.

835 Improving physical self-perception in adolescent boys from disadvantaged communities: Psychological outcomes from the PALs intervention

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Introduction: Physical self-worth has been identified as an important index of psychological health in adolescents and it has been discussed that muscular strength and masculinity are particularly important for western males. There is remarkably limited evidence regarding the impact of resistance training on physical self-perception of adolescents, despite the established physiological benefits of this form of training. The aim of this study was to evaluate the effect of a school-based obesity prevention program on physical self-perception and key physical-activity related cognitions in adolescent boys from disadvantaged secondary schools. A secondary aim was to determine if any psychological changes were associated with improved weight status.
Methods: Participants (n=100, age=14.3[0.6]) were randomized to the PALs (Physical Activity Leaders) intervention (n=50) or a control group (n=50). The PALs program was a multi-component school-based intervention and included enhanced school sport sessions, interactive seminars, lunch-time activities, physical activity and nutrition handbooks, leadership sessions and pedometers for self-monitoring. Participants were assessed at baseline, 3- and 6-month follow-up. Measures included BMI, BMI z-score and % body fat (bioelectrical impedance analysis). Students also completed the Children's Physical Self-Perception Profile and a physical activity-related cognitions questionnaire.
Results: Relative to the controls, the PALS group significantly increased their physical self worth (p=0.01), perceived physical condition (p=0.02), resistance training self efficacy (p<0.001) and their use of physical activity behavioural strategies (p=0.02). An inverse association was found between change in physical activity behavioural strategies and change in BMI (r=-0.29, p<0.01) and change in BMI and change in perceived physical condition (r=-0.24, *p*=0.04).
Discussion: A school-based obesity prevention program that targeted leadership skills improved psychological health in the physical domain in adolescent boys from disadvantaged schools. The findings from this study suggest that school-based interventions focusing on resistance training may be beneficial in improving the psychological health of young males.

836 The impact of a sport-for-development programme on the mental health of young adolescents in Gulu, Northern Uganda*

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Introduction: It is estimated that, in any given year, at least 20% of adolescents experience mental health (MH) disorders that are consistent across cultures. High levels of psychological distress are common in post-conflict settings and MH disorder rates tend to double. The sport-for-development (SfD) sector is rapidly emerging and claims to positively influence MH in this context. This study examined the impact of a SfD programme on the MH of young adolescents in Gulu, Uganda.
Methods: Voluntary male registrants for a SfD programme in Gulu aged 11–14 years were randomly allocated into an intervention (T, n=73) or wait-list (W, n=71) group. All voluntary female registrants aged 11–14 years were allocated into group T (n=79). A non-registered control (O) group was also formed for both boys (n=450) and girls (n=727). The intervention comprised a 9-week competitive sport league (1x40 minute football match and at least 1x1.5 hour training per week). All groups undertook MH measurements before and after the intervention. The Acholi Psychosocial Assessment Instrument (APAI) was used to assess local depression-like (DL) and anxiety-like (AL) syndromes. Within-group changes (△) were assessed using paired t-tests. The between-group comparisons of △ were analysed using a repeat measures ANOVA adjusted for differences at baseline.

Results: The deterioration in MH of the boys in T was not statistically significant for DL [0.076] or AL [0.344]. This contrasted with the boys in W and O who experienced significant improvements in DL and AL [p<0.01]. There was a significant between-group difference in the adjusted data for boys △T vs. △W [p<0.01] and △T vs. △O [DL: p<0.05]. There was no significant change for the girls in T for DL [p=0.155] or AL [p=0.223]. Although the girls in O experienced significant improvements for DL and AL [p<0.01], there *were* no significant between-group *differences* in the △T vs. △O after adjusting the data [DL: p=0.836, AL: p=0.819].

Discussion: The SfD intervention appeared to negatively affect the MH of boys in T. This may have been caused by exposure to new emotional pressures and stress associated with competition. Girls in T did not experience the same deterioration in MH. This may be explained by an apparently less intense focus on winning by the girls and their coaches. The MH benefits experienced by the wait-listed boys may have been because they were exposed to improved local capacity for sport without the negative effects of a competitive league.

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837 Adolescent girls with internalizing problems: Can dance intervention improve health? A randomized, controlled trial with cost-utility analysis

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Introduction: The increasing prevalence of psychological health problems among adolescent girls is alarming. Knowledge of beneficial effects of physical activity on psychological health are widespread. Dance is a popular form of exercise also known to increase a sense of self-control which can contribute to reduced stress. The purpose of this study was to investigate if dance intervention for adolescent girls with internalizing problems influenced self-rated health. A secondary aim was to assess the cost-effectiveness of the intervention in addition to usual school health services, compared with usual school health services alone.

Methods: Randomized controlled intervention trial with follow-up measures of self-rated health at 8, 12 and 20 months after baseline. A total of 112 girls, 13–18 years old, with internalizing problems, i.e. stress and psychosomatic symptoms, were randomized to intervention group or control group. The intervention comprised dance classes twice weekly during 8 months. Each dance class lasted 75 minutes and the focus was on the joy of movement, not on performance. Costs for the stakeholder of the intervention, treatment effect and healthcare costs were considered. Gained quality-adjusted life-years (QALY) were used to measure the effects. Quality of life (QOL) was measured with the Health Utility Index Mark 3 (HUI 3). Cost-effectiveness ratios were based on the changes in QALY and net costs for the intervention group compared with the control group. Net monetary benefit (NMB) was also calculated.

Results: A year after baseline 65% of the girls in the intervention group and 32% of the girls in the control group had increased their self-rated health. The differences in change score between groups were significant at all follow-ups. After 8-months U=895.5 (P=.037), after 12-months U=680.0 (P=.001), and after 20-months U=801 (P=.022).

Cost effectiveness showed that after 20 months, QOL had increased by 0.083 units more in the intervention group than in the control group (P=.04), translating to 0.095 gained QALY. The cost-effectiveness ratio was $7187.4 and the NMB was $3846.0 (Willingness to pay $50 000 for a gained QALY).

Discussion: This study suggests that an 8-month dance intervention can improve self-rated health for adolescent girls with internalizing problems. The improvement remained a year after the intervention. The intervention in addition to usual school health services showed cost-effectiveness compared with usual school health services alone. The cost-effectiveness ratio was far below the recommended threshold value.

838 Should physical activity intervention efforts take a whole population, high-risk or middle road strategy?

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Introduction: Physical inactivity is estimated to account for approximately 20–30% of the cancer, diabetes and heart disease burden globally. Physical activity (PA) interventions traditionally target either the whole population or 'high-risk' groups. Although evidence supports the effectiveness of both approaches, it is unclear how each impacts on the incidence of non-communicable diseases in the population. A strategy that unites the benefits of the whole population and high risk approaches is the middle road approach. The aim of this study is to compare three strategies for changing PA to reduce the incidence of chronic conditions in mid-age women: 1) whole population: +30 minutes/week in all; 2) high-risk: +60 minutes/week in the lowest 25% of the PA distribution; and 3) middle road: increase PA in all those not meeting guidelines, to a level commensurate with meeting guidelines.

Methods: 10,854 participants (50–55 years) in the Australian Longitudinal Study of Women's Health completed mail surveys between 2001 and 2010. PA was calculated as MET.minutes/week spent in walking, moderate and vigorous leisure PA in the previous week. Incidence rates per 1000 person-years for diabetes, heart disease, hypertension, cancer and depression were calculated for the actual distribution, as well as after modelled shifts in PA.

Results: The incidence rates were 10.6 for diabetes, 7.0 for heart disease, 30.7 for hypertension, 8.0 for cancer and 28.4 for depression per 1000 person-years. After modeling shifts in PA, the greatest reductions in incidence were found for the middle road approach, with reductions ranging from -6.3% for cancer to -12.3% for diabetes. The whole population strategy resulted in smaller reductions than the middle road strategy, but was more effective than the high-risk strategy.

Discussion: The middle road strategy was superior to the whole population and high-risk strategies: encouraging those not meeting guidelines to a level commensurate with meeting guidelines is the most effective strategy for reducing incidence of chronic disease.

839 Can sport reach inactive people? A review of literature and practice in the UK

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Background: Sport is typically seen as an important component of total physical activity, and sporting agencies are viewed as critical partners in any approach to increasing total activity. But are the objectives of promoting public health and promoting sport necessarily mutually compatible? Can sport be used effectively to reach the groups of the population who have the greatest potential health benefit, namely those who are currently physically inactive?
Aim and objectives: The project aimed to review existing research in order to determine how Sport England (the national governing body for sport in England) can best align their sporting programmes with health priorities. The objectives were: to review the on the effectiveness of interventions, economics and programme evaluations of sport promotion targeting inactive people; and to conduct a series of key informant interviews to identify case studies of sports promotion practice that recruited, targeted, and engaged inactive participants to sports programmes.
Methods: We conducted a purposive review of key published review-level research literature, focussing on identifying observational and experimental reviews of sports promotion interventions with inactive adults. We developed a questionnaire seeking examples of sports projects that had targeted inactive people; had collected data on activity levels pre and post programme; and had measured a decrease in inactivity following the programme. This was sent to over 200 national and local contacts. Promising leads were investigated in in-depth interviews.
Results: The literature review showed that there was evidence of some effective approaches to engaging inactive people in sport. The questionnaire received 132 responses outlining details of 64 projects, with a further 68 project reports sent by email. Applying the inclusion criteria resulted in a total of 9 case studies. These case studies shared a number of characteristics, including: careful targeting of inactive people; appropriate marketing and promotion of the sport; sympathetic coaching; and careful measurement of activity levels pre and post programme. The high number of programmes that were not included shows that many sport programmes may be intending to target inactive people but do not achieve this, either due to inappropriate targeting, or lack of measurement of physical activity.
Conclusions: This project lends support to the notion that sport can be used to reach inactive people, but only if used in a deliberate manner, with careful targeting, programme design, and monitoring.

840 The role of physical activity in the rehabilitation of youth sexual offenders: An evaluation of the Fight with Insight programme

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Introduction: The abuse of children is a concerning issue in South Africa. Interventions with the perpetrators of this abuse, especially young offenders, are vital in order to break the cycle of abuse. Apart from therapeutic methods, various alternative activities have been incorporated into the rehabilitation of youth sexual offenders, such as physical activity and sport. Fight with Insight (FWI) is a boxing project intended for children and youth who have committed a sexual offence, as part of a 12-week diversion programme. FWI comprises boxing sessions and Cognitive-Behavioural Group Therapy (CBT) sessions. The aim of this study was to qualitatively evaluate the effectiveness of the FWI programme. The objectives of the study were to: define programme effectiveness within the context of the FWI programme; describe the programme and mechanisms of its effectiveness; evaluate perceptions of the programme's effectiveness; and describe factors influencing the effectiveness of the programme.
Methods: Three focus groups were conducted with FWI participants (n=17), two with parents of FWI participants (n=7), and two with youth offenders who had only participated in CBT sessions, and did not take part in any alternative therapies (n=10). Key informants interviews were conducted with FWI programme staff involved in the management (n=3) and facilitation (n=3) of the programme.
Results: Central to the definition of programme effectiveness was the reduction of recidivism amongst participants, and this was supported by a number of intra- and interpersonal indicators of effectiveness. Participants' perceptions paint a generally positive picture about the programme and its effectiveness, and these were reinforced by key informants and parents' perceptions. FWI participants spoke of changes in behaviour, improved understanding and greater insight, such as being aware of consequences and taking responsibility.
Discussion: The findings highlight that it is not boxing on its own that can bring about change, but rather that the interplay between the physical activity and skills involved in boxing and the psychological principles and themes emphasised by programme facilitators. These combined help to develop the skills required by participants to bring about sustainable and meaningful change in their lives. Other key conditions for programme success include a helpful, non-judgemental environment for the programme, and facilitators who encourage personal growth and serve as role models for participants. This study provides insight into a programme that uses physical activity to impact on psychological outcomes and the kind of change that it helps to bring about in its participants.

841 A prospective, randomized study comparing the effectiveness of different types of incentives in increasing physical activity behavior on the Vitality health promotion program

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Introduction: Physical inactivity and sedentary behavior are amongst the major lifestyle factors that contribute to the growing burden of non-communicable diseases. In response, health plans have begun to implement incentivized health promotion programs, in an effort to change health behavior and reduce health care costs. Most studies have found that limited, well-defined incentives, offered for a short period, increase uptake of the desired behavior. However, there are few studies that have evaluated the role of incentives in influencing physical activity behavior, specifically. Vitality is a comprehensive, incentive-based health promotion program linked to Discovery Health, the largest private health insurer in South Africa. In a retrospective, longitudinal analysis over 5 yrs, amongst more than 300,000 members, we found that participation in fitness-related activities increased over time, and was associated with a significantly lower probability of hospital admissions and inpatient claims costs.

Aims: The current study aimed to prospectively compare the effectiveness of diverse incentives on physical activity behavior, in a cohort of newly-enrolled, adult members of the Vitality health promotion program.

Subjects and Methods: Over a 5 month period,12,121 new, members of the Vitality health promotion program were invited to enroll in the study by email communication. Of these, 10,907 were randomly allocated to six intervention arms as follows: 2,031 to Control, 1,742 to Communication, 1,808 to Direct Payment, 1,782 to Lottery, 1,791 to Charity, and 1,746 to Choice. In all but the Control arm, subjects received bi-weekly informational and motivation communications on accumulating "fitness points". The outcome of interest was 'fitness points', reflecting accumulated gym visits.

Results: We found a significant effect of the overall intervention on the likelihood of earning any points (p=0.013) but not on number of points earned. Except for Choice, each group had a significantly higher proportion of subjects earning points when compared to the Control group (p=0.001, 0.005, 0.024, and 0.026 for Lottery, Charity, Direct Payment, and Communication, respectively). In sub-group analyses, only the combined incentives compared to control showed a significant effect on the likelihood of earning any points (p=.0083).

Conclusion: Whilst the rate of engagement, defined as the proportion of subjects earning any fitness points was positively influenced by all interventions compared to control, the total level of activity was not significantly different between groups. This study underlies the importance of further research to address the problem of behavioral inertia and status quo bias in changing complex health behaviors such as physical activity.

842   The 'Physical Activity Loyalty Card Scheme': A RCT investigating the use of incentives to encourage physical activity

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Introduction: A recent Public Health White Paper in the UK highlighted the Government's support of incentives or 'nudges' to encourage healthy behaviour changes. However, evidence supporting their effectiveness, particularly for physical activity (PA), is sparse.

Methods: To test the effectiveness of providing non-cash incentives to encourage adults to increase their PA, we recruited 406 adults from a workplace setting (office-based) to take part in an assessor-blind cluster randomised controlled trial with six-month follow-up.

We developed the 'Physical Activity Loyalty Card (PAL) Scheme' which integrates a novel PA tracking system with web-based monitoring and nudge initiatives (www.palcard.co.uk). Sensors (using NFC technology) were placed along footpaths, in the gym and exercise studio, in the surrounding workplace environment and participants scanned their PAL card (using RFID tags) at the sensor when undertaking PA (e.g. walking).

Using the concept of a 'loyalty card' to collect 'points' and earn rewards for PA, participants (n=199) monitored their PA levels and received incentives (high-street vouchers) for minutes of PA completed over a 12-week intervention period (Incentive Group). Participants (n=207) in the control group (No Incentive Group) used their 'loyalty card' to self-monitor their PA levels but were not able to earn 'points' or receive incentives. Change in PA was measured as self-reported minutes of moderate-vigorous PA (MVPA) using the Global Physical Activity Questionnaire (GPAQ) and objectively measured using the PA tracking system over the 12-week intervention. Other outcomes included health (SF-8), quality of life (EQ5D) and PA self-efficacy scale. Outcomes were collected at baseline, week 12 and 6 months. Independent samples t-tests were performed to assess change between the groups.

Results: The mean age of participants was 43.32 ± 9.37 years (mean±SD), and 67% were female. Participants in the Incentive Group increased their MVPA by 19.55 mins/week [95% CI -23.45, 62.56] compared to 13.16 mins/week [95% CI -48.72, 75.05] in the No Incentive Group at week 12 (p>0.05). There were no significant differences between groups for PAL card usage (p>0.05). Individuals who were sedentary at baseline in both groups increased their MVPA by 90 mins/week at week 12 [95% CI 63.27, 119.12], which was a significant increase from baseline (p<0.05).

Discussion: The extrinsic incentive did not encourage participants to undertake more PA than self-monitoring PA alone. The positive findings and high uptake rate in the sedentary population is encouraging. Further research investigating the optimal incentive-based approach is required including level, type and timing of incentive.

843   Community interventions for physical activity: The role of a new Cochrane systematic review

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Introduction: Systematic reviews are essential in summarising the results of a range of research studies on a specific topic into a single report. They serve as a key source of evidence-based information to support and develop policy and practice for healthy communities. This presentation will examine a new review of community-wide strategies to increase population levels of physical activity and compare it to an earlier Community Guide Review (CGR) of Community-wide campaigns to increase physical activity which recommended community wide interventions.

Methods: We registered a Cochrane Systematic Review (CSR) title, published a protocol and recently completed the review of Community-wide interventions to increase physical activity. We compared the definitions, design and findings of the CSR to the CGR.

Results: The two reviews differed remarkably in their conclusions with the CGR recommending "strong evidence exists that community-wide campaigns are effective in increasing levels of physical activity", and the new CSR stating "The body of evidence in this review does not support the hypothesis that multi-component community wide interventions effectively increase population levels of physical activity". We observed that both reviews examined multi-component interventions as a "combined package". Possible explanations for the different conclusions may be due to the definition of community (CSR defined community as "comprising those persons residing in a geographically defined community, such as a village, town, or city", excluding interventions which were whole of state or country, and CGR as "a group of individuals who share one or more characteristics. The CSR utilised a logic model at various stages of the review process and explicitly defined a combination of strategies encompassed within the intervention. The CSR included 25 and CGR 10 studies, respectively. Six of the 10 studies that were included in CGR were excluded from the CSR due to issues relating to study design, intervention definition or duration. The two reviews also differ in function as the CSR seeks to summarise global evidence and included 7 studies in low-income countries, where as the CGR contained only studies deemed relevant to the USA context.

Discussion: Differences in the findings between older and newer reviews can be due to a variety of factors. For example, in updating a review the definition of an intervention can be changed. Further, differences may also be due to improvements in the standards and methodologies for systematic reviews as well as the inclusion of newer studies. These factors need to be understood whenever differences between newer and older reviews are considered.

844 Health care providers promoting physical activity in primary care: Disconnect between knowledge, attitudes and practice

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Introduction: Physical activity has a primary role in the prevention of chronic disease. However, primary care services in Canada do not provide the multi-level supports necessary for patients to adopt and sustain a physically active lifestyle. To better understand the limited delivery of physical activity as a health intervention, health care providers (HCP) were interviewed during the preliminary phase of a one-year intervention to integrate a kinesiologist into the primary care system of an urban health authority.

Methods: HCP in two primary care clinics took part in personal interviews and focus groups. These clinics have interdisciplinary teams who provide comprehensive care to address physical, psychological, and social factors. Interviews were conducted with 15 HCP (3 males, 12 females), including physicians (8), nurse practitioners (3), nurses (3), and a dietitian (1). Average time in practice was 11.6 ± 10.7 (mean$\pm$SD) years. Questions examined knowledge of physical activity and health, personal physical activity values and practices, provision of physical activity supports to patients, awareness of physical activity supports in chronic disease prevention and management, and recommendations. Focus groups were conducted at each clinic (n=7 and n=6) after the interviews.

Results: HCP were knowledgeable about the health benefits of physical activity ($4.2/5\pm0.9$), and believed it to be important to their patients ($4.8/5\pm04.4$) and to their own ($4.9/5\pm0.3$) health. A majority (80%) were aware of physical activity recommendations. This knowledge and valuation did not necessarily translate into health care practices, with fewer HCP inquiring about their patients' physical activity levels ($3.8/5\pm0.8$). Although 80% of HCP were aware of professionals who provide physical activity support, other than wellness/rehabilitation institutes and physiotherapists few were mentioned. Respondents would refer clients to physical activity specialists if they existed ($4.3/5\pm0.9$). HCP believed that introducing a kinesiologist into primary care clinics would assist with chronic disease management. However, they identified ease of referral (time it takes) as a potential impediment. They also identified lack of community support and infrastructure, client motivation, and patient financial constraints as primary impediments.

Discussion: There appeared to be a disconnect between HCP knowledge of physical activity recommendations, valuation of physical activity in relation to their patients' health, and clinical practices. This disconnect between values and practices warrants further research as it may offer insight into the development of effective clinical physical activity interventions. Barriers at the individual, clinical and community levels must be addressed if integration of a kinesiologist into primary care is to be successful.

845 Prevalence of health promotion programs in primary health care units in Brazil

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Introduction: Although regular physical activity (PA) practice, tobacco cessation and prevention programs, alcohol and drugs control, healthy diets and healthy environments have been identified by the Brazilian Ministry of Health as important public health priorities, little is known on whether these health promotion interventions have been included in the agenda of primary health care (PHC) settings in Brazil. Objectives: To identify health promotion programs in PHC units in Brazil, looking at: PA interventions and the referred barriers for implementation; tobacco control and its different actions; alcohol and drugs control; nutrition recommendations; and recommendations for a healthy environment.

Methods: A telephone survey was conducted in PHC settings in Brazil. From 42,486 eligible units, we sampled 1600 PHC units and its coordinators. A questionnaire was successfully administered by trained interviewers to 1269 coordinators (79% response rate).

Results: In 60.2% of PHC units there were no PA promotion program. The main referred reasons for that were: lack of space (74.3%); limited resources (60.7%); little involvement of the community (49.9%); and lack of expertise of the health team (43.9%). There were important regional differences though, with the percentage of PHC units without PA promotion program varying from 81.7% in the North, to 48.8% in the Southeast region. Only 54.4% of PHC units had a tobacco control program – 51.6% referred work in groups, 66.2% conducted campaigns, and 32.8% used medications. Alcohol and drugs were controlled in only 41.6% of the PHC units. Nutrition recommendations were practiced in 72% of the PHC units and 77.7% were making recommendations for a healthy environment – 80.6% in the PHC unit, 49.5% in schools, and 23.3% in the community.

Discussion: Although nutrition and the living environment receive a fair attention of the PHC units regarding health promotion, actions towards the control of tobacco, alcohol and other drugs are less prevalent. Unfortunately, promotion of PA appeared as the most neglected health promotion action, more so in the north when compared to the south of the country. The main alleged reasons were lack of space and resources. Health policies should strengthen infrastructure of the PHC units and improve health education among health workers, to properly implement the health promotion agenda of the Brazilian government.

846 Physical activity on prescription; an education and training program for healthcare practitioners in Vietnam

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Introduction: The rapid rise of Non-communicable diseases (NCDs) such as cardiovascular disease, cancer, diabetes, chronic respiratory disease, mental disorder and osteoporotic fracture make up the largest contribution to mortality in low and middle income countries. The present cooperation project between Vietnam and Sweden addresses the rights perspective of all people regardless of socio-economic conditions and should therefore contribute strongly to the development of a more pluralistic society in which all citizens can be empowered through better health. Physical activity (PA) in disease prevention and treatment helps individuals, their family and the entire community to combat poverty. Similar to other developing countries, Vietnam is faced with a double burden of disease: high levels of communicable disease and a rapid rise of non-communicable diseases. According to the health statistics, the prevalence of NCDs from hospital reports in Vietnam increased while communicable diseases decreased. The NCDs share of disease prevalence and contribution to crude fraction of death causes in hospitals was 42 and 45% in 1976 and 60 and 60% in 2007, respectively.

Methods: This is a Swedish aid agency funded, multi-component international cooperation project including 1) Workshops on "Promoting Physical Activities in NCDs prevention", 2) Study visits to Sweden, 3) Selective translation of a handbook of PA prescription from English to Vietnamese, 4) Development of curriculum and training material, 5) Training of trainers (TOT courses) in Sweden, 6) Training courses (partly case-based) for health care practitioners in Vietnam, 8) Mass media campaign, 9) Evaluation of effectiveness after training for patients and health care providers, 10) International Conference in Hanoi in November 2012 and 11) Process to help introduce National Guidelines on PA for NCDs Prevention.

Results: Of the 120 healthcare practitioners that will be trained, 50 have provided feed-back on the perceived value and significance of the education and training. The practitioners report that they after the training sessions 1) Have a markedly greater understanding of the relation between life style and disease, 2) Have made implementation plans in their own clinical setting.

Discussion: The project shows that structured training of healthcare practitioners in Vietnam can increase interest, knowledge and willingness to change clinical practice in the field of physical activity on prescription. Also, the project is an example of international collaboration in this field.

847 Physical activity counseling in primary health care in Brazil: Prevalence and barriers of the Physicians and Nurses

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Introduction: Studies have shown that physical activity counseling is effective for physical activity promotion in primary health care settings in developed countries. However, little has been studied on this topic in low and middle-income countries, and Brazil is no exception. The aim of this study was to measure the prevalence of physical activity counseling among of primary health professionals in Brazil.

Methods: The study used data from a representative sample of physicians and nurses working in primary health care units in Brazil. The interviews were conducted by telephone and administered to physicians and nurses in the primary care unit. The study sample comprised 529 professionals (65.6% nurses, 70.5% women).

Results: The prevalence of regular physical activity counseling was 68.9% (81.2% for Physicians and 61.4% for Nurses). The main barrier for counseling was the lack of adequate places for people to practice physical activity (77.8%), followed by lack of time during medical consultations (64.2%) and low knowledge about physical activity promotion (41.3%). Most of the professionals (94.6%) agree that physical activity promotion should be prioritized in the public health setting (75.7%). Physical Education teachers were considered the main professional responsible for physical activity promotion in the primary health care setting (58.5%).

Discussion: The results showed that physical activity counseling in primary health care in Brazil is viable and highly prevalent. However, interventions are needed to improve knowledge about physical activity and to overcome barriers reported by health professionals. The actions should be coordinated by the Ministry of Health and partner organizations, and should include Physical Education Professionals.

848 Prescriptive medicine: The importance of preparing Canadian medical students to counsel patients toward physical activity (PA)

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Introduction: Physical activity (PA) is powerful for preventing and treating many chronic diseases. Physicians' own PA behaviors are correlated with their likelihood to counsel patients regarding PA. Medical students' PA-related attitudes and behaviors reflect what can be expected from our future physicians, but to date no Canadian study has investigated their PA-related behaviors, attitudes, and counseling practices. The two-fold objective of this study was to: 1) assess the percentage of medical students meeting the Canadian recommendation of engaging in at least 150 minutes of moderate to vigorous physical activity (MVPA) per week; and 2) investigate the self-reported perception of relevance and frequency of exercise counseling during patient encounters.

Methods: Participating medical schools were asked to electronically send the web-based and anonymous questionnaire to their students. A 27-item online survey was used to determine the percentage of Canadian medical students meeting the recommendation of engaging in at least 150 minutes of moderate to vigorous physical activity (MVPA) per week, and their self-reported perception of relevance and frequency of exercise counseling during patient encounters. We generated cross-tabulations with the independent covariates and our statistical comparison was based on the generalized estimating equation (GEE) algorithm to adjust for schools (clusters).

Results: While 64% (969/1510) of medical students met the MVPA recommendation, only 25% discussed PA counseling with patients. Those intending to pursue family medicine reported a higher frequency of PA counseling, compared to all other specialties (p=0.0018). Most (80% and 90%, respectfully) believed physicians should adhere to a healthy lifestyle to effectively encourage their patients to do so, and that there credibility increased if they stayed fit themselves.

Conclusion: Medical students are interested in and receptive to the importance of PA. However, given physicians' own PA behaviors are correlated with their likelihood to counsel patients regarding PA, and given that counseling is associated with increased PA uptake, improvement is needed for the one third of medical students who are insufficiently active themselves, and substantial change is needed regarding the vast majority of students' current counseling behaviors.

849 Physical exercise prescription by primary care nurses

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Introduction: Primary healthcare staff are well placed to engage in disease prevention. Primary care-based nurses have been identified as having a key role in improving the health to their communities. The main aim of this study was to analyse the opinions, barriers and knowledge associated with advising patients about physical activity and describe the characteristics of this advice.
Methods: This cross-sectional study consisted of 76 primary care nurses (80% female, mean age 48.9) from 11 primary health care centres (Castellón, Spain) who completed a self-administered questionnaire. Test-retest reliability for each measure was acceptable.
Results: Regarding physical exercise advice, 100% of the nurses recommended their patients to get involved in some physical activity. Nurses reported to spend almost 5 min during their consultation when advising patients about physical activity. The exercise prescription consisted of 39.1±14.6 min per session, 4.5±1.6 times per week. The type of exercise most frequently recommended was walking (94.7% of the nurses) and those nurses who specified the intensity mainly recommended taking moderate exercise (82.9%). Those nurses who received education about *physical activity and health* during their nursing studies had more positive opinions towards prescribing exercise, perceived fewer barriers and showed more knowledge about the existence of evidence of beneficial effects of physical activity. However, differences were only significant in relation to the opinions (p<0.05). In addition, nurses who were insufficiently active (less than 600 MET·min/week) tended to perceive more barriers when advising exercise.
Discussion: This study shows the importance of education about physical activity and health during health studies and the positive influence that being physically active may have in exercise prescription.

850 Characteristics of physical activity interventions in primary health care settings in Brazil

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Introduction: Although physical activity (PA) promotion has been identified by the Brazilian Ministry of Health as an important strategy for health promotion, there is no evidence whether physical activity promotion has been included in the agenda of primary health care units (PHC), in Brazil.
Objectives: The aim of the present study was to describe PA intervention and its characteristics in health care settings in Brazil.
Methods: We sampled 1600 health units and its coordinators. There were 42.486 eligible units. The final sampling was 1269 (79.0% of response rate). A random-digit-dialing telephone survey was conducted. A questionnaire was administered by trained interviewers to PHC coordinators including questions such as PA promotion interventions in their units.
Results: The PA intervention has been carried out in less than half of the PHC of Brazil (39.8%). The percentage of PHC units with PA promotion program varied from 18.3% in the North to 51.2% in the Southeast. From all units, 495 (39.8%) have physical activity intervention. The most reported physical activity interventions reported were supervised walking (81.1%), stretching and relaxing (77.3%), physical fitness evaluation (67.1%) and gymnastics (41.6%). Usually, the activities happen once a week (33.1%) or twice a week (29.4%) during an hour at least (51.4%). Physical Education Professional (48.8%), Physiotherapist (17.6%), Nurses (15.7%), Nutritionists (3.4%), Health Community Agents (3.0%) and others health professionals are responsible to supervise the activities. The interventions are performed in the PHC (55.5%), community centers (53.1%), parks/squares (45.6%) or on the streets (43.7%). Physical activities for children were reported in 28.2% of the PHC, most of them are carried out in the opposite turn of the school and more prevalent in the southeast (35.9%) region of the country.
Discussion: Less than half of the PHC include PA interventions in their activities schedule. PE professionals are responsible to carried out the interventions in the most PHC. It is recommended to expand PA interventions to the all PHC and to improve its operational characteristics through health promotion policies.

851 Sudden cardiac arrest in sport

SYMPOSIUM

Sports Doctors Australia

This is a very hot topic in world-wide sports medicine, with sudden cardiac arrest being a relatively rare event, but potentially catastrophic when it happens. This symposium consists of 3 papers presented on the following areas:
Paper Title 1:   A review of current practice of cardiac screening in AFL football
Paper Title 2:   Findings of ECG's on 270 Australian athletes: Using the European Cardiology society guidelines and a consensus model the further investigation rate was 3%
Paper Title 3:   Development of an epidemiologic registry for hypertrophic cardiomyopathy for adolescent athletes
Abstracts for these papers have been submitted independently.
Following these presentations, Dr Maria Brosnan, cardiologist with expertise in athlete cardiology, will provide a brief overview of the cardiology issues in young adults/athletes commenting on the above presentations touching on areas such as screening, current evidence and guidelines, pitfalls of screening and common dilemmas related to differentiation of pathological vs physiological ECG findings. Following this there will be approximately 30 minutes of panel and audience interaction with the panel consisting of the speakers listed above.

852 | A review of current practice of cardiac screening in AFL football

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There have been strong recommendations from recent overseas research regarding sudden cardiac death (SCD) in young athletes. Although not currently universally accepted, these recommendations suggest the minimum standard for cardiac screening should include a basic cardiac history, examination and resting ECG. Following a review of the findings and recommendations arising from the extensive research in Italy by Pelliccia et al. and as a consequence of the IOC Injury Prevention Conference held in Monaco in April 2011, the relevant Australian organisations such as the Australian College of Sports Physicians and the AFL Medical Officers Association have sought to adopt policy positions on this issue.
However, as there was currently limited research on the Australian experience of this potentially tragic phenomenon, a pilot study, in the form of a questionnaire, was undertaken evaluating the current practice of medical officers in the Australian Football League in season 2011. This study asked the respective AFL club medical officers what their current practice (if any) is regarding cardiac screening, how many club medical officers do NOT screen for cardiac conditions and what proportion of athletes in whom abnormalities were detected required followup. This questionnaire reported 360 AFL footballers were screened during season 2011, with the incidence of referral for further investigation based on ECG abnormality averaging 6.1 % within a range of 0 to 25% per club. As a result of this screening 2 current AFL footballers were discovered to have Wolfe Parkinson White Syndrome (WPW) and underwent successful ablation procedures. The study, although limited, revealed a strikingly similar incidence of ECG screening abnormalities to that found in previous international studies and, although there is currently no consensus regarding the cost effectiveness and success rate of preventing sudden cardiac death, there was enough encouraging information to support the need to continue the current recommended practice of baseline ECG screening to help prevent SCD in young athletes.

853 | Findings of ECG's on 270 Australian athletes: Using the European Cardiology society guidelines and a consensus model the further investigation rate was 3%

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Introduction: ECG's in athletes have been recommended as a tool in assessing the suitability of the athlete to undertake sports participation with the goal of presenting Sudden Cardiac Death (SCD). Although SCD is rare it is currently considered that pre-participation ECG's may be useful in predicting the likelihood and thereby prevent SCD. Those athletes that do have positive ECG findings are, after further investigation, usually deemed safe to participate in sport. The purpose of this study was to undertake an ECG in a group of Australian athletes to determine the morphology of the ECG in comparison to other studies on overseas athletes. Then by using defined ECG criteria and a consensus model the further aim was to determine how many athletes warranted further investigation and then following this, if required, restrict ongoing sports participation. In this manner this is a first with respect to an Australian study.
Method: 270 South Australian Sports Institute (SASI) scholarship holders were enrolled in this study. Mean age was 18.9 years (range 14–46, median 18). All subjects had complete cardiac history taken by questionnaire followed by a 12-lead ECG. All ECG's were assessed by a sports physician and three cardiologists. Following assessment further investigation were performed on athletes that were deemed to warrant further investigation. The 2010 European Society of Cardiology guidelines and consensus agreement with the ECG assessors were used to determine whether further assessment would be warranted.
Results: The principal ECG findings in this study were 63 athletes had a completely normal ECG, an additional 68 had only bradycardia and/or sinus arrthymia with 51 having incomplete right bundle branch block a known normal in the athletic population. Right axis deviation and early repolarization were the other two most common athletic normal findings. In all it was considered that 8 athletes required further investigation for their ECG finding. Following further investigation no athlete needed to have their ongoing sports participation restricted. The pre ECG cardiac questionnaire was of no value in predicting those athletes that required further investigation.
Discussion: By using robust ECG criteria and a consensus model to establish the need for further investigation we were able to demonstrate a small (3%) followup rate, when compared to other similar studies where the further investigation rate ranged from 9–25%. Other explanations for the low requirement for further investigation include that these athletes were Australian, and no previous study on Australian athletes has been performed, and the younger age, compared to similar overseas studies, of this studied population. Further research is needed

854 | Development of an epidemiologic registry for hypertrophic cardiomyopathy for adolescent athletes

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Introduction: Cardiovascular screening of adolescent athletes is a controversial topic. Questions of sensitivity, specificity, practicality, costs as well as appropriate protocols remain unanswered. Perhaps more importantly, little is known about the natural history of factors that predispose young athletes to sudden cardiac death before and even after a diagnosis has been made.
Methods: Beginning in 2010, the Texas (USA) Adolescent Athlete Heart Screening Registry (TAAHSR) project has conducted community-based cardiovascular screenings for adolescent athletes aged 14–18 years and of multiple ethnicities. Between May 2010 and December 2011, 24 screening events were conducted (n=3,219). Routine data collected included demographics, cardiac history and 12-lead ECG and limited 2D echocardiography.
Results: In this cohort, 80 possible cases of hypertrophic cardiomyopathy (HCM) (2.7%) and 198 cases (6.2%) of other conditions, some related to sudden cardiac death (i.e. other CM, WPW, long QT), were identified and referred for follow-up to date. Prevalence of abnormalities was higher in males (10.2%) compared to females (5.1%) (p<0.05). Electrocardiograhic abnormalities accounted for the largest proportion of screening referrals (80%). Standardized registry protocols were developed to follow-up and confirm assessments from screening and included telephone tracking of patients and medical record retrieval from attending cardiologists. Up to five attempts were made to contact all adolescents who screened positive. To date, 55% of referrals in the Registry have been contacted and followed-up regarding disposition; 35% are in process and 10% have been lost to follow-up.
Conclusions: Establishing a follow-up registry for community-based adolescent cardiovascular screening is feasible and results to date suggest that the vast majority of referrals can be tracked for diagnosis confirmation.

Saturday 3 November

855 | 2020 vision panels

The ICPAPH Conference Organising Committee decided to host this symposium to consider the future of physical activity practice, policy and research. This will be a speculative 'live discussion', using the experience and expertise of esteemed and senior conference delegates. Physical activity needs to be considered in relation to a future global trends in information technology, urbanisation, socio-political and economic trends, and climate change. This symposium will consider the future of physical activity and public health research and practice, and experts identified in six discrete theme areas will speculate on the next generation of PAPH activities. The six theme areas will be i) discussing the future of physical activity measurement, ii) understanding the correlates and determinants of activity, iii) debating future settings and types of physical activity intervention, iv) understanding the future role of environments and transport, v) speculating about future policy and practice to promote physical activity, and finally, vi) contemplating new health outcomes research that might be undertaken in relation to physical activity. These areas of consideration will then be summarised in a plenary conclusion, to present Congress perspectives on our 'visions of the future'. The focus will be to debate barriers and facilitators to future progress, identify emerging themes and methods, and speculate about new technologies, questions and problems.

856 | Identification of genetic risk factors for ACL ruptures: Implications for understanding molecular mechanisms and clinical relevance

DJO Global Sponsored Session

INVITED

M. Collins[1,2]* ▪ [1]MRC/UCT Research Unit for Exercise Science and Sports Medicine of The South African Medical Research Council (MRC) [2]Department of Human Biology, University of Cape Town (UCT), Cape Town, South Africa.

Anterior cruciate ligament (ACL) ruptures have been well described at the clinical level. Although various intrinsic and extrinsic risk factors have been indentified, the exact aetiology of these injuries remains poorly understood. Recent evidence suggests that a familial predisposition, and specific genetic sequence variants, such as variants within the COL1A1 COL5A1 and other genes, are intrinsic risk factors for ACL injuries. The COL1A1 and *COL5A1* genes encode for the α1 chains of type I and V collagen respectively. Type I collagen is the major protein component of the collagen fibril, which is the basic building block of the ACL. Type V collagen is involved in the assembly and lateral growth of the fibril. Rare mutations within both these genes cause severe collagen disorders such as Ehlers Danlos syndrome and oestogenesis imperfecta. This suggests that there appears to be limited redundancy within collagen fibril biology and that common DNA dequence variants within these genes can, at least partially, modulate the risk for ACL ruptures. The genetic risk factors associated with ACL ruptures will therefore be reviewed. The results of these genetic association studies have important implications for our understanding of the molecular mechanims that cause ACL ruptures. Determining the biological mechanisms is an important prerequisite before we can fully understand and effectively prevent or treat these injuries. The use of genentic association studies as a tool to investigate the molecular mechanisms of ACL ruptures will therefore also be reviewed. Finally the identification of genetic risk factors associated with ACL iruptures could also have important clinical implications. The clinical implications of including genentic risk factors in ACL rupture models will therefore be reviewd.

857 | Relationship between knee confidence and physical function in people with knee osteoarthritis after ACL reconstruction

H. Hart[1]* ▪ **N. Collins**[1] ▪ **D. Ackland**[1] ▪ **K. Crossley**[1,2] ▪ [1]The University of Melbourne ▪ [2]The University of Queensland

Introduction: Post-traumatic knee osteoarthritis (OA) is common after anterior cruciate ligament reconstruction (ACLR), and can have a substantial negative impact on participation in sport, exercise, and daily and work activities. Given that post-traumatic knee OA tends to occur in younger individuals, this has important implications for quality of life, and general and mental health. Previous research has identified that low knee confidence is related to physical function in people with knee OA. As such, those with knee OA following ACLR may also exhibit low knee confidence, which may be related to functional performance and physical function. The aims of this study were to: i) compare knee confidence in people with and without knee OA after ACLR; and ii) evaluate the relationship between knee confidence and physical function in those with knee OA after ACLR.
Methods: 50 participants who were 5–12 years post-ACLR were recruited: 30 with radiographic knee OA (14 males, mean±SD age 45±11, body mass index (BMI) 26±4), and 20 without OA (14 males, age 40±8, BMI 27±4). Participants completed the Knee Injury and Osteoarthritis Outcome Score (KOOS), with knee confidence assessed using item Q3, which asks how much the individual is troubled by a lack of confidence in their knees. The Tampa Kinesiophobia Scale evaluated fear of movement, while physical function was evaluated with three functional tasks (hop for distance, side to side hop, and one leg rise). Independent t-tests evaluated between group differences, while linear regression investigated relationships between variables (age, gender, BMI as covariates). Significance was set at 0.05.
Results: Those with knee OA had significantly lower knee confidence than those without ($p<0.001$). Lower knee confidence was associated with a lower KOOS-activities of daily living subscale score ($p=0.001$) and Tampa score ($p=0.038$), and reduced performance on the hop for distance ($p=0.007$), side to side hop ($p=0.01$) and one leg rise ($p<0.001$).
Discussion: Individuals with knee OA 5–12 years after ACLR report lower knee confidence than those without knee OA. Knee confidence is associated with greater fear of movement, and lower physical function on self-report and functional tests. Findings suggest that knee confidence may be an important aspect to address in rehabilitation programs. Future studies should investigate the effect of strategies to improve knee confidence on fear of movement and physical function in those with knee OA after ACLR.

858 The incidence of secondary pathology after anterior cruciate ligament rupture in over 5000 patients

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Introduction: It is accepted that the incidence of secondary pathology after ACL rupture increases with time, and to prevent this it may be better to perform a reconstruction as soon as possible after injury. The exact timing of reconstruction of the ACL, however, still remains debatable, particular with respect to how long one can safely wait. The aim of this study was to determine the incidence of secondary pathology (meniscal tears and chondral damage) in anterior cruciate ligament (ACL) deficient knees with respect to the time between injury and reconstruction.

Method: A review of 5086 patients undergoing primary ACL reconstruction, using hamstring graft, carried out between January 2000 and August 2010. Data collected included the interval between injury and surgery, types and location of meniscal tears (requiring meniscectomy) and location and severity of chondral damage (ICRS grading system), gender and age.

Results: There were 3251 (64%) male and 1835 (36%) female patients, with a mean age of 30 years (9 to 69 years). The median time to surgery was 3 months (0.25 to 480). Overall, an increasing incidence of medial meniscal surgery and chondral damage occurred with increasing time to surgery. The incidence of lateral meniscal tears did not increase significantly. The odds of requiring medial meniscal surgery was increased by a factor of 2 if ACL reconstruction was delayed more than 4 months and increased by a factor of 6 if surgery was delayed more than 12 months. The effect of delaying surgery on medial meniscal status was also pronounced in the <17 year age group where a delay of 5–12 months doubled the odds of medial meniscal surgery (OR 2.0, p=0.001) and a delay of >12 months quadrupled the odds of medial meniscal surgery (OR 4.3, p=0.001). Increasing age was associated with a greater odds of chondral damage (OR 4.6, p=0.001) and medial meniscal injury (OR 2.9, p=0.001), but not lateral meniscal injury. When compared to females, males had a greater incidence of lateral meniscal tears (34% vs. 20%, p=0.001) and medial meniscal tears (28% vs. 25%, p=0.006), but not chondral damage (35% vs. 36%, p=0.104).

Conclusion: The incidence of chondral damage and medial meniscal tears increases with increasing time after injury. The incidence of lateral meniscal tears does not increase. Ideally and particularly in younger patients, ACL reconstruction should not be delayed beyond 4 months from injury.

859 Postural control and the influence of a secondary task in people with anterior cruciate ligament reconstructed knees

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Background: Previous studies have shown that postural control impairments may persist following anterior cruciate ligament (ACL) reconstruction. However, the effect of a secondary task on postural control has not been determined, despite the fact that most sporting environments require divided attention. The purpose of this study was to compare postural control in patients following ACL reconstruction with healthy individuals in static single limb stance, with and without a secondary task.

Participants: Forty-five patients (15 females, 30 males) participated at least six months following primary ACL reconstruction surgery. Participants were individually matched by age, gender and sports activity level to a healthy control group.

Materials: Postural control was measured using a Nintendo Wii™ Balance Board and customized software during static single leg stance and with the addition of a secondary task. The secondary task required participants to match the movement of a consistently oscillating marker on a computer monitor, by holding a Nintendo Wii Remote controller and adducting and abducting their arm.

Main Outcome Measures: Centre of pressure (CoP) path length in both medial-lateral and anterior-posterior directions, and CoP total path length.

Results: A significant increase (12%) in the anterior-posterior CoP path length for the ACL reconstruction group was observed in the single task condition when compared to the control group (p=0.02). There were no within group differences, between the operated and contralateral limbs. The addition of a secondary task significantly increased CoP path lengths in all measures (p<0.001), although the magnitude of the increase was similar in both the ACL reconstruction group and the control group. No significant between-group differences were found in the medial-lateral direction or total path length in either the single task condition or the secondary task condition.

Discussion: ACL reconstruction patients showed a reduced ability to control movement of the body in the anterior-posterior direction. Despite this, there were no differences between the ACL reconstructed limb and the non-operated limb which may suggest postural control is centrally mediated. The addition of a secondary task appeared to affect postural control by comparable amounts in patients after ACL reconstruction and healthy controls. The Nintendo Wii™ Balance Board utilised in this study may have clinical utility as an inexpensive and portable objective assessment/treatment tool.

860 A 15-year survival analysis of the anterior cruciate ligament graft and the contralateral ACL following reconstruction

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Introduction: The risks for primary ACL rupture have been established. What is less well known is the risk of graft rupture following reconstruction and also the risk of a primary ACL rupture in the contralateral knee. The purpose of this study was to determine the long-term survival of the ACL graft and the contralateral ACL (CACL) after reconstruction and to identify factors which increase the odds of subsequent ACL injury.

Methods: All patients having primary ACL reconstruction in 1993 or 1994 by a single surgeon in a single unit were considered. Patients were contacted to complete a subjective interview by phone or email questionnaire at a minimum of 15 years after surgery.

Results: 755 patients met the inclusion criteria. ACL reconstruction was performed using a single incision, endoscopic technique with either autologous bone-patellar tendon-bone (BPTB)(n=314) or hamstring tendon (HT)(n=359) and metal interference screw fixation. 673/755 (89%) patients completed the questionnaire. 23% had sustained either a graft rupture or CACL rupture. Expected survival of the ACL graft was 95%, 93%, 91% and 89% at 2, 5, 10 and 15 years after reconstruction. Expected survival of the CACL was 97%, 93%, 90% and 87%. ACL graft survival was less favorable in males compared to females (p=0.007). ACL graft survival was not significantly different between HT or BPTB grafts (p=0.149). CACL rupture occurred twice as frequently as graft rupture in the BPTB group (p=0.003). A positive family history of ACL rupture doubled the odds of both ACL graft and CACL rupture. The mean IKDC subjective score at 15 years was 85. 73% of patients reported return to their pre-injury sport and 51% of patients were still participating in strenuous or very strenuous activities at 15 years.

Conclusion: 15 years after ACL reconstruction expected survival of the ACL graft is 89% and expected survival of the contralateral ACL is 86%. Graft choice did not affect ACL graft rupture but using BPTB increased the risk of contralateral ACL rupture, compared to the HT graft. Males had less favorable survival of the ACL graft than females and a family history of ACL rupture increased the risk of both ACL graft and contralateral ACL rupture.

861 Individuals with osteoarthritis after ACL reconstruction experience immediate improvements in knee pain and confidence with an unloader knee brace

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Introduction: Anterior cruciate ligament (ACL) injury is a well-recognised risk factor for post-traumatic knee osteoarthritis (OA). Surgical reconstruction (ACLR) does not appear to reduce this risk. Pain and decreased knee confidence associated with post-traumatic knee OA can have a substantial impact on participation in sport, exercise and daily and work activities, and thus can affect quality of life and general and mental health. Considering that post-traumatic knee OA tends to occur in younger individuals, it is vital that targeted conservative interventions with the potential to improve pain and confidence are identified to reduce the burden of this increasingly common condition. The aim of this study was to investigate the immediate effects of an unloader knee brace on pain and confidence in the knee during functional tasks, in individuals who have developed post-traumatic knee OA after ACLR.

Method: A within-subjects repeated measures design was conducted with 28 participants with knee OA 5–12 years after ACLR (13 males, mean±SD age 45±12, body mass index 24.7±8, KOOS-pain 59±37, KOOS-symptoms 62±29, KOOS-ADL 59±42, KOOS-sport/recreation 61±29, KOOS-quality of life 59±26). Using 100mm visual analogue scales, participants were asked to rate their knee confidence and average level of pain experienced during hop for distance, side to side hop, single leg rise and step down tasks under three conditions applied in a random order: i) no brace; ii) OA Adjuster knee brace (Donjoy International) with frontal plane adjustment; and iii) brace with no adjustment.

Results: There was a significant bracing effect, with reduced pain during the step down task (p=0.035) and greater confidence during the hop for distance (p=0.004), side to side hop (p=0.004) and single leg rise (p=0.006) in the braced conditions. There were no significant differences between adjusted and unadjusted brace conditions, except for confidence during single leg rise, where greater confidence was observed when wearing the adjusted brace than the unadjusted brace (p=0.025).

Discussion: In those with knee OA following ACLR, the unloader knee brace improves knee confidence during hop and single leg rise tasks, and improves knee pain during a step down task, irrespective of frontal plane adjustment. While further studies are required to investigate longer-term effects, findings suggest that the unloader brace may represent a simple, noninvasive intervention that can be adjusted as appropriate to maximize effects, and may enhance physical function and quality of life in those with knee OA after ACLR.

862 Live donor allograft for primary ACL reconstruction in the juvenile patient

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Background: The management of juvenile (<17 years) patients with a ruptured Anterior Cruciate Ligament (ACL) presents a challenge to the orthopaedic surgeon as this group of patients are known to have a high rerupture rate of both the index and contralateral ACL. Choice of graft for the index procedure requires careful consideration.

Purpose: To examine the outcomes in a group of juvenile patients who underwent ACL reconstruction using a donated hamstring tendon graft from a live donor, in the short term (2 years) Study Design: Case series; Level of evidence, 4.

Methods: Thirty two consecutive juvenile patients underwent primary ACL reconstruction using donated hamstring tendon graft from a live donor for ACL deficiency between 2007–8. Patients were followed up for a minimum of two years and were assessed with full clinical examination including Lysholm, IKDC knee evaluations and instrumented ligament testing.

Results: Of the 31 patients who satisfied the inclusion criteria and were entered into the study, there were 2 graft ruptures, leaving 2 year data on 29 patients. The mean Lysholm knee score at 2 years was 97 (range 79–100) and mean IKDC subjective knee score was also 97 (range 84–100). 28 out of 29 patients reported their highest level of activity without swelling or giving way as very strenuous (89.7%) or strenuous (6.9%). 100% patients reported no pain performing very strenuous (93.1%) or strenuous (6.9%) activity. Objective assessment revealed an overall IKDC grade A or B (normal or nearly normal) in 93.1% of patients.

Conclusion: Primary ACL reconstruction in patients under 17 years using live donor allograft produces excellent 2 years clinical results and allowing for a successful return to strenuous activities.

863   World Cup soccer trends support common evolutionary drivers among field sports

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Introduction: There are very few performance analysis studies on field sports investigating how they evolve. Field sports such as soccer involve complex, non-linear dynamical systems yet consistent patterns of play are recognizable over time and among different sports. This study on soccer quantifies game trends over several decades and, together with other field sport studies, helps build a framework of potential causative mechanisms for these coordinated patterns.

Methods: Broadcast footage of World Cup finals between 1966 and 2010 was used to assess patterns of play and stop periods, type and duration of game stoppages, ball speed, player density and passing rates. This involved computer-based ball tracking and other notational analyses. These results were analysed using linear regression to track changes across time.

Results: Almost every variable assessed changed significantly over time. Play duration decreased while stoppage duration increased, both affecting the work : recovery ratios. Ball (game) speed increased by 15% over the 44 year period. Play structure changed towards a higher player density and this was accompanied by a 35% greater passing rate.

Discussion: Changes in soccer show similarities with other field sports and indicate common evolutionary pressures driving play structures. These are based around the advantage conferred by ball (and player) speed and the necessary anticipatory and physical skills to accompany these traits. Defensive pressures dominate over time as the increased player density found is a defensive mechanisms to increase the probability of attacking errors and turnovers. The higher play intensity in the contemporary game is both driven by and, in turn, promotes longer stoppage time. The changes in elite soccer show consistencies with other field sports such as the rugby codes and Australian football. The long-term pattern formations demonstrate successful coordinated states within team structures are predictable and have universal causative mechanisms.

864   Healthy coach, healthy athlete: Targeting the needs of Special Olympics coaches

J. Stynes[1]* ▪ **E. Aumand[1]** ▪ [1]Australian Catholic University

Introduction: Sport participation and physical activity can enhance the quality of life of individuals with an intellectual disability (ID). In Australia approximately 4000 individuals with an ID train and participate in Special Olympics (SO) sports. The goals of Special Olympics Australia include the provision of quality sporting experiences and increased participation opportunities. These goals cannot be achieved without the commitment, knowledge, and enthusiasm of volunteer coaches, yet there is limited research on the critical role of these coaches. The current research was designed to explore the needs, sources of stress and coping strategies of SO coaches leading up to and during the 2011 SO World Games in Greece. This research is based upon: 1) working with persons with an ID can be stressful and emotionally demanding; 2) stress can negatively impact coach performance (e.g. emotional fatigue, poor communication) and that of their athletes; and 3) an awareness of one's own psychological needs may impact performance and one's ability to manage stress.

Methods: Coaches selected in the Australian team to attend the 2011 SO World Games were invited to participate in this research project. Participants (n=27; age range 21–66 years) completed on-line surveys prior to (Pre-Games Survey) and following (Post-Games Survey) the World Games. The surveys assessed the participants' psychological needs, experienced and/or expected sources of stress, and coping strategies. In addition, prior to the World Games, the participants attended a workshop that focused on the importance of their own health and well being (including planning for stressful situations & understanding psychological needs) during the World Games.

Results: Qualitative analysis revealed various sources of stress that the coaches expected and experienced at the World Games (e.g. athlete behaviour & medical needs, travel, own health, lack of sleep, limited relaxation time). Coaches adopted a variety of coping strategies (e.g. exercise, visualisation, ignoring the situation) that they rated as effective or ineffective. The coaches reported experiencing varying levels of mastery (e.g. "my ability to assess a situation and respond"), self-worth (e.g. "the moment the athletes showed me respect") and belonging (e.g. "with the team at the opening ceremony") during the World Games.

Discussion: The findings of this research have implications for the provision of support and training for SO coaches leading up to and at international competitions. It is proposed that targeting the needs of the SO coach will benefit both the coach and athlete in terms of performance and continued sports participation.

865 Reliability of jump performance variables for repeated counter movement jumps and bilateral hopping obtained from accelerometry

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Introduction: Jump tests are frequently used due to their relevance to many sports and have also been suggested as a monitoring tool for neuromuscular fatigue. The most reported jump performance variable is height, but developments in accelerometry now allow for in field measurement of contact and flight times. Other jump performance variables that can be obtained from repeated counter movement jumps (CMJ) include Power and Reactive Strength Index (RSI). The bilateral hopping test has the advantage that it also allows for the calculation of leg stiffness. This study investigated the reliability of the different jump performance variables measured using accelerometers during both repeated CMJ and bilateral hopping tests.
Methods: Seven participants (4 females and 3 males, age 26.0±11.7 years, height 1.69±0.13m, weight 66.86±16.26kg) performed both types of jumps twice per week over an eight week period. At each session a small 1000Hz wireless 3D accelerometer was strapped to the participant's shoe. They then performed ten maximal bilateral hops, jumping as high as possible, with minimal bending of the knees and minimal contact time. Following one minute rest, they performed five repeated CMJ. Contact and flight times were derived from the accelerometer data. Power and RSI were then calculated for all jumps and stiffness only for the hopping test. Participants also completed physical activity logs.
Results: Repeated measures ANOVA showed no significant change over time for the physical activity logs. For all jump variables intra-class correlation (ICC) was strong ranging from 0.81 to 0.98. Except for CMJ contact time and hopping RSI and power, the jump performance variables showed good reliability with %CV smaller than 10%. The best reliability was found for CMJ and hopping flight time and for stiffness with %CV less than 5%.
Discussion: Even though most jump performance variables obtained through accelerometry were reliable according to their %CV, the reliability is most meaningful if the typical error is less than the smallest worthwhile change. This was only the case for hopping stiffness, indicating that this is the most reliable measure of jump performance. Flight time obtained through accelerometry also appears to be a very reliable measure of jump performance. CMJ contact time and hopping RSI and power, however, did not show high reliability. The high reliability of accelerometry flight time and stiffness measures creates opportunities for further research into repeated jump tests as a time effective, in field athlete monitoring tool.

866 Are masters athletes primarily motivated by iIntrinsic or extrinsic factors?

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Introduction: The Pan Pacific Masters Games are based on a philosophy that promotes and encourages mature athletes to compete in sport throughout life. Participating athletes have either pursued a sport for an extended period of time or have initiated sport involvement in later life. Pan Pacific Game's philosophy advocates competition, participation, and socialization in an environment rich in camaraderie. Due to health and functional implications, it is important to understand why this unique cohort of masters athletes participate in sport. Therefore the purpose of this investigation was to determine if competitors were motivated intrinsically (e.g. self improvement, self esteem) or extrinsically (e.g. admiration by others, recognition) to participate in the 2010 Pan Pacific Masters Games held in Gold Coast, Australia.
Methods: As part of an online survey, over 10,000 participants from 34 sports were asked to rate on a scale of 1 thru 7 the importance of 56 different reasons as to why they participate in their sport (1=item is not a reason, 7=item is a very important reason). From these 56 questions, 32 were chosen that represented either intrinsic (n=16) or extrinsic (n=16) motivators.
Results: A total of 1,824 participants responded (response rate=18%) with a mean age of 49.1yrs (range 25 to 83yrs). Competitors from 14 countries completed the survey. On a scale of 1–7, comparison between groups revealed no significant difference (p=0.700) between the motivating forces of intrinsic and extrinsic factors; mean (SD)=3.62 (0.8) and 3.48 (1.1), respectively.
Discussion: Athletes participating in the 2010 Pan Pacific Masters games were equally motivated by intrinsic factors such as "to improve my self esteem" as they were by extrinsic factors such as "to earn the respect of peers." Understanding the motivations of masters competitors to participate in sport may aid in developing strategies for promoting physical activity in older adults.

867 Healthy club program: Evaluation of key health and policy outcomes

D. Bow[1]* ▪ F. Boys[1]* ▪ [1]Sports Medicine Australia (WA Branch)

Introduction: A Healthy Club is a sporting club that provides and promotes a healthy and safe environment for players, coaches, officials and spectators. The Healthway funded program has been available since 2001 with over 2000 clubs participating over this period. The aim of this program is to provide financial support to local sporting clubs to develop, promote and implement Healthy Club policies and practises conducive to healthy and safe sporting environments. The purpose of the evaluation was to measure the degree to which sporting clubs met the program criteria across key health and policy outcomes.
Method: Data was collected via a self-administered questionnaire to 316 metropolitan and regional sporting clubs across a range of sporting codes. Questions related to the promotional, educational and environmental strategies developed and implemented to facilitate a comprehensive health policy at their club. Priority health areas included alcohol, injury prevention, smoking and nutrition. Each club was given a composite score as a measure of the degree to which the contractual obligations of the program were met.
Results: Score descriptives ranged from 3, fell short of program contractual obligations to 6, exceeded the contractual obligations by a large degree. The majority of clubs (82%) scored 4 indicating health and policy outcomes consistent with the program while 9% of clubs exceeded the benchmark criteria. A further 3% and 6% respectively experienced some difficulties or failed to meet the program criteria.
Discussion: Sporting Clubs applying for funding from the Healthy Club Program are required to meet key health and policy outcomes to fulfil their sponsorship obligations. This evaluation indicates that the majority of clubs are meeting or exceeding the program criteria and therefore meeting the Healthy Club Program objectives.

868 Can resistance training change the strength, body composition and self-concept of overweight and obese adolescent males? A randomised controlled trial

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Introduction: Resistance training is a mode of exercise for which overweight and obese adolescent males can excel while having the potential to positively affect both their physical and mental wellbeing. The purpose of this study was to determine the effect of a 6-month resistance training intervention for overweight and obese adolescent males on their self-efficacy, physical self-worth and self-esteem.

Methods: Using a randomised controlled trial design, 56 overweight and obese adolescent males (15.0±1.5 y) were randomly assigned to the intervention (n=30) or control (n=26) group. Intervention participants attended three 1-hour sessions of supervised resistance training per week while control participants continued on with their normal activities. Assessments were completed at 3 and 6 months with the effect of the intervention on strength, body composition and psychological measures determined using effect size differences and corresponding 95% confidence intervals between intervention and control group.

Results: There were no substantial differences in body composition between the two groups however there were moderate to large [effect size (ES) range (95% confidence interval): 0.65–0.96 (0.02–1.53)] and substantial increases in strength for the intervention group relative to controls at both 3 and 6month assessments. Positive and substantial intervention effects were also shown for exercise self-efficacy [ES range: 0.83–0.88 (0.24–1.44)] at 3 and 6 months and global self-esteem [ES: 0.86 (0.26–1.43)] at 6 months. Neither changes in strength nor changes in body composition mediated changes in psychological outcomes.

Discussion: Given the potential psychological benefit resistance training has for this at-risk population, this study provides a proof of concept for future studies and programs.

869 Sports coaches' self-efficacy and perceptions towards a novel campaign to promote tobacco free messages: SmokeFree Sports

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Introduction: Smoking is one of the leading causes of preventable morbidity and death in England. Many children undertake smoking for the first time in childhood; therefore early prevention strategies are crucial. The US state of Maine utilises sport within their 'tobacco-free athletes' initiative, which provided the foundations of Liverpool's SmokeFree Sports (SFS) campaign. This pilot study evaluated the coaches' perceptions of the SFS campaign, and determined the influence of the brief intervention training on their self-efficacy to deliver smoke free messages.

Methods: Coaches within Liverpool City and North were invited to take part in a free Level 1 brief intervention training workshop delivered by a community based stop smoking service. This 3 hour workshop aimed to provide coaches with a) key messages on smoking and its impact on health and sport performance, b) practical tools to encourage children and young people to adopt a healthier lifestyle. Eight professional coaches (4 male), from a number of sports attended the workshop. A questionnaire was used to assess the impact of the brief intervention training on coaches' self-efficacy. Interviews were used to explore the views and opinions of the coaches with regards to the SFS campaign.

Results: There was a significant increase in coaches' self-efficacy to deliver smoke free messages to children and young people after the training. Numerous themes emerged from the interviews including a) brief intervention training (positives, negatives & improvements), b) messages and delivery (how & key messages), c) influence and impact of the SFS campaign (positive & lack), d) highlights and positives (children & coaches), e) challenges and barriers (children & environment) and, f) improvements and future (environment, dose, sport/activity & advertising).

Discussion: This is the first study in the UK to explore coaches' perceptions toward a campaign to promote tobacco free messages through sport and physical activity. The results of this study provide recommendations for future practise, which include that the training workshop should take into account different styles of learning (e.g. kinaesthetic, visual & auditory), that the campaign should be trialled in more structured settings, such as schools and also a variety/choice of activities are needed in which to promote SFS. Recommendations for future research include observing coaches' and young peoples' behaviour during SFS sessions, investigate which physical activities are most suitable for implementation of smoke free messages, and assess which method(s) of delivery are most effective.

870 Project Energize: 550m run time and relation to fatness and asthma

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Introduction: The District Health Board funded "Project Energize", is a through-school initiative to improve nutrition and physical activity, childhood obesity rates and cardiovascular risk factors in all primary schools in the Waikato region of New Zealand. The programme, running since 2005, now includes 40000 children, 244 schools, 27 "Energizers" and 1 dietician. Energizers are assigned 8–12 schools each and act as a "one stop shop" to support activities that promote and coordinate improved nutrition and physical activity within schools.
Method: In March 2011, 2665 7 year-old and 2589 10 year-old children (36% Māori) were measured of height, weight, waist, body fat by bioimpedance and time-to-run 550m (n=4182). Characteristics were compared by sex, age and ethnic group using a mixed model approach accounting for school cluster. Multiple linear regression was used to predict the relationship between time to run and age in month, body measurements (weight, height, waist, fat mass, blood pressure (systolic and diastolic), pulse, gender, ethnicity, schools' social economic status, region and asthma reported by the child and/or parent.
Results: We have previously shown a positive impact of the programme on weight, BMI, waist circumference, and time to run 550m, compared to external controls. Reported asthma prevalence was 17% in European and 18% among Māori children (overall 17%). Factors associated with a shorter run time were increasing age, height, body size and fat mass, higher socioeconomic status, rural residency and not having asthma. For each additional kilogram of body fat, adjusted for total body weight, the run time increased by 2 seconds. Each additional kilogram of weight added 1 second to run time and each additional cm of waist added 1 second. Boys ran on average 6 seconds faster than girls and European children ran faster than Maori, Polynesian and Other ethnic groups (by 2, 1, 6 seconds respectively). Children with asthma were on average 2 seconds slower. Children from lower socioeconomic schools were 4 seconds slower than deciles 4–7 and 9 seconds slower than 8–10 deciles.
Discussion: There is a known association between asthma and obesity. Slower running over 550m is independently associated with increased body fat and with asthma. However, programme children who were Māori had a slightly lower asthma rate than the national population (18% cf 20%) and lower obesity prevalence/faster running than external control groups. This suggests that Project Energize improved asthma, obesity and run speed which could have long-term positive health impacts.

871 Exercise capacity in renal transplant recipients with stable allographs

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Introduction: After kidney transplantation, renal transplant recipients often continue sedentary living, and experience reduced lean body mass and poor physical functioning. In-line with the exercise guidelines for apparently healthy populations, moderate-intensity physical activity (3–6 METs) is often advocated for transplant recipients. The purpose of this study was to measure exercise capacity and gas exchange threshold in renal transplant recipients with stable allograph and to determine the relative exercise intensity that is associated with the 3 MET intensity threshold.
Methods: Following ethical approval, 15 renal transplant recipients (8 female, 7 male: Mass mean 93, range 59–147 kg, Height mean 1.65, range 1.58–1.78 m) were recruited to the study. Participants completed body composition analysis (BodPod) and a symptom-limited maximal incremental cycling test using individualised ramp protocols. Breath-by-breath gas exchange data were collected continuously and averaged over 5-s intervals. These data were used to determine resting oxygen uptake, gas exchange threshold and peak oxygen uptake (10-s average). Gas exchange threshold was determined from a cluster of measurements, including 1) the first disproportionate increase in CO_2 production VCO_2 from visual inspection of individual plots of carbon dioxide production versus oxygen uptake, 2) an increase in the ventilatory equivalent for oxygen with no increase in ventilatory equivalent for carbon dioxide, and 3) an increase in end-tidal O_2 tension with no fall in end-tidal CO_2 tension.
Results: No gender differences existed in body composition, peak work rate, peak oxygen uptake or gas exchange threshold (P>0.29). Body composition was mean 46.1 %BF, range 28.6–61.6 %BF. Peak work rate was mean 61 W, range 25–115 W, peak oxygen consumption was mean 0.98 L·min-1 (4.0 METs), range 0.55–0.94 L·min-1 (1.5–6.0 METs) and gas exchange threshold was mean 1.22 L·min^{-1} (3.1 METs), range 0.61–1.87 L·min-1 (1.4–5.3 METs). Furthermore, 27% of patients (3 female, 1 male) could not exercise above the 3 MET threshold and gas exchange threshold was below 3 METs in 53% (4 female, 4 male) of patients.
Conclusions: Exercise capacity and gas exchange threshold were relatively low in renal transplant recipients with stable allographs. These findings suggest that the majority of renal transplant recipients would be unable to maintain prolonged exercise at the minimum recommended exercise intensity for health benefits. Therefore, individualised progressive exercise training programmes are warranted for patients following kidney transplantation.

872 A randomized controlled trial assessing the effects of Tai Chi on indicators of health related qualify of life in adults with elevated blood glucose level

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Introduction: There is growing evidence to suggest that Tai Chi/Qigong may improve quality of life in people with diabetes. The aim of this study was to assess the efficacy of a Tai Chi/Qigong based program on indicators of health related quality of life in adults with elevated blood glucose levels.
Methodology: 41 participants were recruited from the local community and randomly allocated to either a Tai Chi/Qigong intervention group (N=20) or a usual medical care control group (N=21). Tai Chi/Qigong intervention group attended 3 training sessions per week for 12 weeks. Each session lasted for approximately 1.5 hours. All study participants continued to receive usual medical care from their general practitioners. Indicators of health related quality of life (SF36), self-efficacy and social support for physical activity were assessed immediately prior to and after the intervention.

Results: There were significant between group differences in favour of the Tai Chi/Qigong intervention group in the SF36 sub-scales of physical functioning (mean difference=5.46, 95% CI=1.35; 9.57, p< 0.05), role physical (mean difference=18.60, 95% CI=2.16; 35.05, p<0.05), bodily pain (mean difference=9.88, 95% CI=2.06; 17.69, p<0.05) and vitality (mean difference=9.96, 95% CI=0.77; 19.15, p<0.05). There was also a significant improvement in the mental health subscale (mean difference=6.60, 95% CI=0.77; 12.43, p<0.05) and a trend towards significant improvement in the mental health components summary score (mean difference=2.22, 95% CI=-0.42; 4.85, p=0.095) in the intervention group, but not in the control group. There was no change in self-efficacy or social support for physical activity in either group.

Conclusions: The findings show that this Tai Chi/Qigong based program improves indicators of health related quality of life including physical functioning, role physical, bodily pain and vitality in adults with elevated blood glucose levels.

873 Gender and age-specific physical fitness targets to improve exercise prescription and disease prevention

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Introduction: Research indicates a greater role for physical fitness than accumulated physical activity in disease prevention. Similarly, there is mounting need for viewing 'exercise as medicine' in the prevention and rehabilitation of sedentary lifestyle diseases. Determining objective gender and age specific targets for physical fitness will improve the prescription of 'exercise as medicine'.

Methods: Data was acquired from prior published research for the decrement in the maximal rate of oxygen consumption (VO_2max) with increasing age for male and female subjects who were either sedentary (SED), or of elite Masters (EM) caliber who sustained training to late in life. From these data series, age at peak VO_2max was determined, as well as the linear decrement in VO_2max per year. Peak female VO_2max was assumed to occur at the same age as males, be 10% less than males, and have the same rate of decrement with aging. Based on the linear decrement in VO_2max per year, computations were completed for target VO_2max for men and women, for ages 30 to 72 years using resting metabolic rate as the zero percentile and 75% of the male and 70% of the female age-specific target VO_2max as 100% (VO_2max for optimal health benefit).

Results: Peak VO_2max was 71 mL/kg/min at 28 years. The VO_2max decrement with age was similar between SED vs. EM; -0.403±0.103 vs. -0.379±0.134 mL/kg/min/yr, respectively. For males 31 to 72 years, VO_2max decreased linearly as follows: VO_2max (mL/kg/min)=83.09–(0.4398 * age [yrs]); Syx=4.086 mL/kg/min, p<0.001; n=23. For males and females, VO_2max at age 70 years can be 52.3 and 42.3 mL/kg/min, respectively. For optimal health benefit, the target VO_2max values for 50 year old men and women are 47.3 and 38.5, mL/kg/min, respectively.

Discussion: The data revealed that physiologically and on average, males and females are capable of retaining a surprisingly high VO_2max into old age. Despite estimates for the gender specific health benefit fractions of VO_2max, the resulting 100% target VO_2max values for specific percentile scores are reasonable based on public health recommendations for at least 30 min/day of continuous moderate to vigorous physical activity. The fact that most elderly individuals do not have this physical fitness reveals the extent of detraining evident during aging in most western societies. Clearly, the frailty of aging is due to physical de-conditioning. The computed VO_2max data percentiles provide an objective target that will allow improved exercise prescription and training.

874 The blood pressure response of normal weight and obese women to sub-maximum aerobic exercise

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High blood pressure (BP) during exercise has been shown to increase the risk of developing hypertension later in life with BP during exercise rather than casual post exercise BP strongly related to mortality and morbidity from myocardial infarction. However few studies have examined the BP response of obese women with high resting BP during sub-maximum treadmill exercise. Twelve obese (BMI ≥30 kg•m²) and twelve untrained normal weight (BMI ≤24.9 kg•m²) women aged 18 to 50 years completed a maximal oxygen consumption (VO_2max) test and three days later completed a sub-maximal aerobic test at a fixed load of 4.5km/hr, and four relative intensities at 30%, 40%, 50% and 60% of VO_2max. Each stage was three minutes in duration with BP recorded by manual auscultation after two and a half minutes of each stage. Body composition was evaluated using dual-energy x-ray absorptiometry (DEXA). Body mass, percentage body fat and resting BP were significantly (p<0.001) higher in obese (104.4±18.4kg, 51.2±2.5% and 132/80 mmHg respectively) compared to normal weight (60.9±7.8 kg, 17.6±5.7% and 110/70 mmHg respectively) women. Maximal oxygen consumption was significantly (p<0.001) lower in obese (23.8±3.7 ml•kg•min⁻¹) compared to normal weight (38.3±7.2 ml•kg•min⁻¹) women. At each sub-maximal exercise stage the systolic and diastolic BP of the obese women were significantly (p<0.001) higher than the normal weight women. During the relative sub-maximal exercise intensities the change in BP from resting values for the obese women (20±3%) was significantly (p<0.001) greater at 60% of VO_2max compared to the normal weight women (16±4%). At the absolute load of 4.5km/hr the change in BP from resting values for the obese women (15±4%) was significantly (p<0.001) greater compared to the normal weight women (2±2%). Our results show that obese women with high resting BP have greater increases in BP during moderately high exercise intensities than normal weight women. Furthermore obese women have greater increases in BP at the same absolute exercise intensity as normal weight women. Large changes in exercise BP have been associated with increases in arterial stiffness and associated cardiovascular diseases. Additionally clinicians and health practitioners need to prescribe different exercise intensities and loads for obese women to avoid excessively high BP during sub-maximal aerobic exercise.

875   Comparison of static plantar pressure in patients with diabetes and healthy individuals

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Introduction: Benefits of regular physical activity in patients with diabetes have been well-documented. Plantar ulcers in patients with diabetes can limit their involvement in regular physical activity. Increased plantar pressure is one of the various risk factors for the development of diabetic foot ulcers. Measurement of plantar pressures in patients with diabetes has mainly been conducted during walking. As standing is also an important component of activities of daily living, this study aimed to investigate differences in static peak plantar pressure between patients with diabetes and healthy individuals, and differences in the distribution of peak plantar pressures while standing.

Methods: Three hundred and twenty participants (160 patients with diabetes and 160 healthy individuals) aged between 25 and 65 years volunteered to participate in this cross-sectional study. The groups were comparable with respect to gender distribution, body weight (p=0.13) and BMI (p=0.94). A pedobarometer (i-Step V.50) was used to measure mean peak plantar pressure, the forefoot peak pressure and the hind foot peak pressure. An independent t-test was used to compare the mean peak pressure between groups. Wilcoxon signed-ranked tests were used to compare the forefoot peak pressure and the hind foot peak pressure within groups. Data were analysed with SPSS version 16.

Results: Compared to healthy individuals, patients with diabetes had higher mean peak plantar pressures during standing (mean (SD): 0.59 (0.16) versus 0.44 (0.09) kg/cm^2; p<0.001). In healthy individuals, the hind foot peak pressure was higher than the forefoot peak pressure (1.36 (0.27) versus 0.96 (0.30) kg/cm^2; p<0.001). In contrast, in patients with diabetes, the forefoot peak pressure was higher than the hind foot peak pressure (1.52 (0.30) versus 1.44 (0.35) kg/cm^2; p=0.007).

Discussion: This study revealed that patients with diabetes have higher peak plantar pressures during standing than healthy participants. This finding cannot be attributed to body weight or BMI, and might reflect architectural changes in the foot related to diabetic neuropathies. In contrast to healthy individuals, the peak plantar pressure in patients with diabetes occurred in the forefoot, which is the most common location for diabetic foot ulcers. Future studies will have to investigate whether appropriate shoe wear or even shoe modification can normalise peak plantar pressures in static weight bearing activities. This may be important for the encouragement of safe physical activities in patients with diabetes.

876   Efficacy of WBV to improve functional performance of people with COPD

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Introduction: Chronic obstructive pulmonary disease (COPD) is a respiratory condition characterised by dyspnoea, excessive sputum production, chronic cough, and emphysema. Functionally, exercise tolerance is poor for people with COPD, resulting in for example, difficulty in performing daily tasks. Whole-body vibration (WBV) is a safe mode of exercise known to improve exercise tolerance by strengthening the muscles of the lower limbs. Gentle WBV was reported as a safe for people with COPD. However, long term effects of WBV on functional performance of the lower limbs remain unknown for people with COPD.

Methods: Following ethical approval, 16 adults with COPD (mean age=71.6±7.3 years, mean stature=1.71±0.09 metres, mean mass=85.7±20.4 kilograms, mean FEV_1/FVC=0.52±0.1, mean FEV_1=59% predicted±19%) consented to participate. All participants completed a six week WBV intervention consisting five 60 second bouts (25Hz, 2.0 peak-to-peak displacement, 2.5g) twice a week. After a two week washout, participants completed a six week placebo intervention (25Hz, 0.0 peak-to-peak displacement, 0.0g). The dependent variables were the; 1) timed up and go test (TUG), and, 2) 5-chair stands test (CHAIR). Data were collected in the home of each participant.

Results: Functional performance improved across the WBV intervention for TUG (F(2,94)=47.52, p=0.01) and CHAIR (F(1.41,21.11)=20.75, p=0.01). There was no improvement after the placebo intervention for TUG (F(2,64)=1.11, p=0.34) or CHAIR (F(1.29,12.88)=0.15, p=0.76).

Discussion: This was the first study to describe efficacy of WBV to improve functional performance of the lower limbs of people with COPD. Two major findings of this study emerged to support efficacy of WBV; 1) the intervention improved functional performance, and, 2) effects of WBV were maintained eight weeks after the intervention was completed. These results are supported by a recent study of combined inpatient pulmonary rehabilitation and WBV. This community based project supported efficacy of a long term WBV intervention for people with COPD. As a gentle mode of exercise for people with COPD, WBV can be easily completed in the comfort of the patient's home.

877 Age, the silent killer: An examination of the influence of age on the prevalence of disease in a regional Australian population

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Introduction: Elucidating the relationship between age and disease risk is important as reports estimate that between 2012 and 2050, the number of people aged 65–84 years and 85 years and over living in Australia will double and quadruple, respectively. Therefore, the aim of the present investigation is to better characterize the relationship between age and several prevalent disease states.

Methods: The Population Research Laboratory at Central Queensland University conducted a Computer-Assisted-Telephone-Interview survey (N=1289; male=635, female=654) during October–November 2010. Respondents were 18 years of age or older and could be contacted by a direct-dialed, land-based telephone service. A computer program containing telephone contact details was used to select, with replacement, a simple random sample of respondents. Separate bivariate logistic regression models were used to examine the associations between age (young: male: 18–34 yr, female: 18–34 yr; middle-aged: male: 35–44 yr, female: 35–54 yr; older: male: ≥45 yr, female: ≥55 yr) and self-reported health information relating to disease states. For all analyses the young age category was used as the reference group and significance was set at ($p<0.05$). Data are presented as raw and weighted odds ratios which were adjusted for age and geographic location.

Results: For weighted data, advanced age resulted in a significant increase in the presentation of diabetes (middle aged: 2.70, CI: 1.05–6.96; older: 9.21, CI: 4.00–21.20), arthritis (middle aged: 4.18, CI: 2.61–6.68; older: 11.96, CI: 7.66–18.68), heart disease (middle aged: 5.83, CI: 1.98–17.14; older: 34.95, CI: 12.75–95.77), cancer (middle aged: 2.38, CI: 1.24–4.56; older: 7.29, CI: 4.07–13.04), hypertension (middle aged: 4.96, CI: 3.34–7.37; older: 11.21, CI: 7.62–16.47), hypercholesterolemia (middle aged: 3.20, CI: 2.14–4.80; older: 4.96, CI: 3.37–7.32), hyperlipidemia (middle aged: 5.60, CI: 2.12–4.80; older: 4.95, CI: 1.87–13.10), and thyroid disorder (middle aged: 3.85, CI: 1.64–9.05; older: 3.21, CI: 1.39–7.41), when compared to young respondents. Raw data resulted in similar increases in disease risk except no significant differences were present between younger and middle-aged respondents for diabetes, heart disease, and cancer. No significant difference was noted for the presentation of depression in raw or weighted data.

Discussion: The prevalence and early onset of the diseases examined in this investigation, along with the predicted increase in Australia's older population, warrants concern. These findings highlight the need for health education programs that target younger adults in an attempt to delay disease onset.

878 Physical activity around the world

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The majority of all work published on physical activity emanates from North America, Europe, the UK and Australia. Increasingly, Brazilian researchers are publishing research in this area. Professionals from many other countries are working in 'physical activity and public health', but this work is only known locally or published in internal reports. This session aims to profile what is happening in physical activity in different regions that receive less coverage in the peer-reviewed press. Profiling these projects, and learning from them, is an important communication function of ISPAH; hence this session. Speakers from around the world will present examples of good practice in physical activity at the population level, identify challenges and barriers, and indicate where progress has been made. Examples will come from different regions: Africa, Asia, the Pacific and Latin American countries. Each of the speakers will be chosen as they have established examples of public health focused programs or policy implementation around physical activity. This will be followed by 1–2 internationally known discussants working globally in physical activity, who will summarise the 'state of the world', and indicate the major steps needed to profile and promote physical activity better in the next few years.

879 Sports medicine and science in 2012 and beyond: Where have we come from and where are we going?

This session will bring to the podium some of Australia and the World's leading sports medicine and science clinicians and researchers to take a light-hearted look at their careers and how past and present research has shaped the clinician/researcher they are today. Each presenter will overview their career pathway by considering important research in their area. The session will include:

1. the five most important papers that have defined their careers
2. the three most important papers published in the last 12 months in their field
3. the future of their field – where they think their field will be in 10 years' time.

A not to be missed session, the latest in research and evidence based practice will be presented as it directly applies to sports medicine and science practice in Australia and abroad. This session will provide delegates with a fun-filled, dynamic and informative end to be active 2012.

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