



ACTA KINESIOLOGIAE UNIVERSITATIS TARTUENSIS

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(SUPPLEMENT)**

**ABSTRACTS OF THE 24th PEDIATRIC
WORK PHYSIOLOGY MEETING
5–9 SEPTEMBER 2007
TALLINN (LAULASMAA), ESTONIA**

**EDITED BY
TOIVO JÜRIMÄE AND JAAK JÜRIMÄE**

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Dear Colleagues and Friends,

Welcome to Estonia for the Children and Exercise XXIV (24th Pediatric Work Physiology meeting). Laulasmaa is a little village in North Estonia, surrounded by beautiful beach at the Finnish Gulf. We are happy to host you in our country and hope that the time will be unforgettable for all of you.

The Pediatric Work Physiology Group was created in 1967 and this 24th meeting follows the tradition with an emphasis on issues related to children and exercise. The main objective of this conference is to highlight the link between physical activity and health in children and adolescents, and improve well-being of the new generations. We hope that this meeting will encourage scientists and pediatricians to initiate research programmes with the purpose to increase physical activity in youth.

The scientific programme includes oral and poster communications in important fields of Pediatrics Exercise Science given by international and national experts.

A unique social programme with a sightseeing trip to medieval Tallinn, capital of Estonia, evening events in Laulasmaa, and a special banquet à la Estonia will make your trip worthwhile.

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CONTENTS

J. RUTENFRANZ LECTURE	19
W. van Mechelen, G.-J de Bruijn, S. Kremers, A. Singh, H. Brug, M. C. A Paw. A behavioural and ecological perspective on energy-balance related behaviours in children	21
INVITED SPEAKERS	23
N. Armstrong. Exercise metabolism during growth and maturation.....	25
U. Ekelund. Activity, obesity and metabolic health in children	27
A. Eliakim, D. Nemet. Adipocytokines and exercise in children.....	29
A. P. Hills. The cause and effect of obesity: performing below your weight.....	31
R. Meeusen. The overtraining syndrome – are there clear markers?	34
V. Tillmann. How do children grow?.....	36
G. R. Tomkinson. The evolution of pediatric fitness test performance.....	37
ORAL AND POSTER PRESENTATIONS	41
L. Aberberga-Augskalne, M. Rumaka, B. Lace, L. Piekuse, A. Krumina. Relationship between cardiovascular parameters and ACE gene: pilot study	43
S. M. Almeida, D. L. de Freitas, J. A. R. Maia, G. Beunen, A. Claessens, A. T. Marques, M. Thomis, É. R. Gouveia, M. J. A. Almeida, J. Lefevre. Tracking of physical activity in children, adolescents and young adults from the autonomous region of Madeira – Portugal.....	44
L. B. Andersen, K. Froberg. Physical fitness in relation to transport to school in adolescents. The danish youth and sports study.....	45
L. B. Andersen, K. Froberg. Physical activity and clustered cardiovascular risk in children: a cross sectional study (the European Youth Heart Study)	46

A. R. Barker, J. R. Welsman, J. Fulford, D. Welford, N. Armstrong. Scle phosphocreatine kinetics during moderate intensity exercise in children and adults.....	47
O. Batutis, R. Malinauskas, A. Dumčinė. The correlation between physical self-education and mental health of schoolchildren aged from 14 to 16.....	48
A. D. G. Baxter-Jones, R. L. Mirwald, R. A. Faulkner, K. C. Kowalski, D. A. Bailey. Does the positive effect of physical activity during childhood and adolescence on bone mass accrual persist into early adult life?.....	49
S. Berntsen, L. B. Andersen, C. Karin, L. Carlsen, P. Mowinckel, S. A. Anderssen, R. Hageberg, K.-H. Carlsen. Comparison of energy expenditure recorded with sensewear™ Pro2 armband and indirect calorimetry during treadmill walking and running in adolescents with and without asthma.....	50
G. P. Beunen, R. M. Malina, D. L. Freitas, J. A. Maia, A. L. Claessens S. M. Almeida, E. R. Gouveia, M. A. Thomis, A. T. Marques, J. Lefevre. Validation of the Beunen-Malina method for the prediction of adult height.....	51
Bianba, S. Berntsen, H. Stigum, L. B. Andersen, E. Bjertness. Estimation of maximal oxygen uptake from maximal power output during bicycling among 9–10 year old children in Lhasa, Tibet.....	52
G. R. Biltz, V. B. Unnithan, J. H. Harmon, G. Witten, D. R. Dengel. RER variability analysis by sample entropy: a preliminary comparison of obese and lean children.....	53
A. Blaes, G. Baquet, E. Van Praagh, S. Berthoin, G. Lensele-Corbeil. Patterns of physical activity in 3–5 years old.....	54
L. M. Boddy, G. Stratton, A. F. Hackett. The prevalence of overweight, obesity and underweight and changes in grip strength, standing broad jump and 20m multi-stage shuttle runs performance in 9–10 year old Liverpool schoolchildren: 1998–2006.....	57
M. Brasholt, H. Bisgaard. Characteristics of objectively measured physical activity in children aged 4 to 6.....	58
L. A. Burt, G. A. Naughton, R. Lande, D. G. Higham. Comparison of training loads between two participation levels, apparatus and training phases of female gymnasts.....	59
Z. H. Butcher, S. J. Fairclough, G. Stratton. Can a 12-week, ‘whole school’ intervention increase primary school children’s physical activity?.....	61
J. Cairney, S. Veldhuizen, J. Hay, C. Missiuna, B. Faught. Motor proficiency, aging and participation in physical activities: is there an activity-deficit over time?.....	62

H. M. Carvalho, M. J. Coelho e Silva, A. J. Figueiredo, C. E. Gonçães, I. Rego, R. M. Malina. Maturity-associated variation in body size, functional capacities and sport-specific skill tests of male basketball players 14–15 years	63
F. Casolo, M. Mondoni, P. Vago, G. Frattini, F. Cereda, C. Galvani. Comparative analysis of ability to climb a pole in middle schools in northern Italy	64
Z. Cēderštrēma, J. Vētra, I. Duļevska. Sexual development disorders in school-age boys – the study of Riga Stradiņš University in the period of 2005–2007	66
W. Chalcarz, S. Merkiel, S. Sideravičiūtė. Analysis of body composition in preschool children from Poznan, Poland	67
E. Y. W. Chu, A. M. McManus, Y. Hu. Short-duration patterning of physical activity and biomechanical walking efficiency in lean and overweight children	68
A. Cicchella, A. M. Bassi. Perceived and measured fatigue of lumbar muscles in competitive, master, and fin swimmers	69
M. J. Coelho e Silva, J. P. Dias, A. J. Figueiredo, R. M. Malina. Correlates of motor talent in a sample of 12-year-old portuguese soccer players	70
C. Cordente, M. Sillero, P. Soidjn, J. Calderón, J. Domínguez. Epidemiology of the physical activity of secondary school students in Madrid	72
R. Dadeliene, K. Milasius, A. Raslanas. Characteristics of bodily adaptation in young female swimmers	73
M. B. A. De Ste Croix, M. A. Deighan. Age and sex differences in isokinetic knee muscle endurance between young children and adults	74
J. Domínguez, C. Cordente, M. Sillero, P. Soidjn, J. Calderón. The influence of peers and parents in the physical activity of the adolescents of Madrid	76
E. Dore, M. Bedu, E. Van Praagh. Jump power changes in girls and boys during growth and development	77
O. Emiroglu, N. Burgul. The evaluation of physical education teachers opinions for new physical education and health curriculum in North Cyprus	78
S. J. Fairclough, Z. H. Butcher, G. Stratton. Hour-by-hour weekday physical activity patterns of Liverpool boys and girls	79
J. Faludi, M. Zsidegh, A. Prókai, E. Völgyi, M. Uvacek, J. Mészáros. Relationship between classification labels of overweight or obesity and motor performance in boys aged 11–13	80

A. Farkas, S. Szászé-Csobànyi, M. Szmodis. Youths and the alcohol (Pilot study).....	81
N. J. Farpour-Lambert, Y. Aggoun, L. Keller-Marchand, V. Schwitzgebel, F. R. Herrmann, M. Beghetti. Effects of a 3-month exercise intervention on ambulatory blood pressure and cardiovascular disease risk factors in pre-pubertal obese children....	82
N. J. Farpour-Lambert, Y. Aggoun, L. M. Keller-Marchand, E. Golay, A. B. Maggio, M. Beghetti. Endothelial and smooth muscle dysfunctions appear before puberty in obese children and are associated with elevated ambulatory blood pressure.....	84
N. J. Farpour-Lambert, X. Martin, L. Keller-Marchand, B. Trigona, M. Hofer, M. Beghetti. Is physical activity level reduced in children with chronic diseases?.....	85
L. Fowweather, G. Stratton, J. Henaghan, N. McWhannell. Physical self-perceptions in non-overweight and overweight boys and girls ...	86
F.-X. Gamelin, G. Baquet, S. Berthoin, D. Thevenet, C. Nourry, S. Nottin, L. Bosquet. Effect of training intensity on heart rate variability in prepubescent children.....	87
A. Gaya, C. Martins, F. Silva, J. Ribeiro, J. Mota. Trends of cardiovascular risk factors clustering over time. A study in two cohorts of portuguese adolescents.....	88
R. Gruodyte, M. Saar, T. Jürimäe, J. Jürimäe. Bone mineral density, anthropometry and body composition in 13–15-year old physically active girls.....	88
E. Mata Gómez de Avilla, L. M. Ruiz Pérez, J. Hay. Motor competence and aerobic fitness in Spanish Secondary Schoolchildren.....	89
C. E. Gonçalves, A. Figueiredo, M. J. Coelho e Silva. Multidimensional analysis of drop out in youth basketball: 2-year follow-up among Portuguese initiates.....	90
R. Gorodnichev, R. Fomin, A. Chelnokov. Peculiarities of presynaptic inhibition of IA group afferent fibers in persons of different ages.....	92
L. Graves, K. Massey, G. Atkinson, W. Gregson, G. Stratton. Reliability of physical activity and heart rate measures in children during steady rate and intermittent treadmill exercise – the A-class project.....	94
L. Graves, N. D. Ridgers, N. T. Cable, G. Stratton. Adolescent energy expenditure whilst playing new generation and traditional computer games.....	95

A. Grøntved, G. S. Pedersen, L. B. Andersen, K. Froberg. Demographic factors associated with objectively measured physical activity in children attending preschool.....	96
T. Hartwig, G. Naughton, J. Carlson. Understanding participation in adolescent rugby union using motion analyses and training diaries..	97
J. Hay, J. Cairney, S. Veldhuizen, C. Missiuna, B. Faught. Tracking waist girth and BMI in children: the contribution of motor proficiency to overweight and obesity	99
J. Henaghan, N. McWhannell, L. Fowweather, N. T. Cable, A. M. Batterham, G. Stratton, K. P. George. The effect of structured exercise classes and a lifestyle intervention on cardiovascular risk factors in primary school children (the A-class project)	100
J. Hepples, G. Stratton. A process evaluation of a lifestyle intervention for 8–10 year old children: the A-class project	101
E. H. J. Hulzebos, M. G. Slieker, H. G. M. Arets, C. K. van der Ent. Differences in lung functions and physical performance in children with cystic fibrosis: the effect of ace polymorphisms	102
T. L. Hurbo. Overweight and obesity of 4–7 years of age in Belarus.....	103
T. Hurbo, T. Jürimäe, J. Jürimäe. Relationships between leg bone mineral density and jumping height in prepubertal children	104
S. Iivonen, A. Sääkslahti, J. Liukkonen. How much skilful and less-skilful children practiced fundamental motor skills during a preschool PE program?	104
C. Illescas, E. Van Praagh. Somatotype of weightlifting athletes infant-juveniles in Guatemala	105
J. Janowski, R. Strzelczyk, J. Konarski, K. Karpowicz. Physical fitness of children between the ages of 7 and 15 years from a rural background, in view of research from the years 1986, 1996 and 2006	106
T. Janson, A. Käosaar. The correspondence between physical activity of Estonian youth and health-related recommendations	107
M. N. Jawis, N. Armstrong, A. R. Middlebrooke. Acute exercise and microvascular function in 9–10 year old children	108
E. U. Jjiregui, J. T. Lopez, J. A. Jiménez, M. B. Villegas, M. Ramirez, J. S. Lopez, J. A. Ruiz, F. N. Torres. Implementation of an exercise program in families with obese children	109
T. Juhola, J. A. Salmi, H. Pekkarinen. Test battery for testing physical fitness of overweight children	110

J. Jürimäe, A. Cicchella, E. Lätt, K. Haljaste, P. Purge, M. Zini, C. Stefaneili, T. Jürimäe. Plasma visfatin concentrations are related to metabolic parameters in physically active adolescent boys.....	111
T. Jürimäe, M. Voracek, J. Jürimäe, A. Cicchella, E. Lätt, K. Haljaste, P. Purge. Relationships between ghrelin, testosterone and finger-length ratios in young boys	112
A. Kansizoglou, K. Hatzikotoulas, H. Kitsas, D. Patikas, A. Giannakos, C. Kotzamanidis. The effect of central and peripheral factors in adults and children fatigability	113
D. Kažoka, M. Sirmulis. Physical activity levels of children during schoolcamps playtime	114
L. Keller-Marchand, N. Farpour-Lambert, X. Martin, F. R. Herrmann, M. Beghetti. Health-related quality of life and physical activity level are reduced in pre-pubertal obese children ..	115
G. Knipshe, L. Cupriks. Isometric contraction differences in 12–15 years old boys and girls	116
A. Koka, Ü. Ernits. Perceived teaching behaviours and motivation in physical education: effect of age	117
E. Kolle, J. Steene-Johannessen, L. B. Andersen, S. A. Anderssen. Secular trends in objectively measured physical activity among 15-year olds in Oslo: changes from 2000–2006	118
J. Konarski, R. Strzelczyk, M. Matuszyński, Z. Rachwalski. Characteristics of heart rate and energy expenditure during indoor hockey match.....	119
S. Kriemler, L. Zahner, J. J. Puder, C. Braun-Fahrländer, C. Schindler, R. Rizzoli. Weight bearing bones are more sensitive to physical exercise in boys than in girls during pre- and early puberty.....	120
T. Kums, M. Pääsuke, M. Leht, A. Nurmiste. In tervertebral disc height, spinal curvature and low back pain in young rhythmic gymnasts.....	121
V. Larins, I. Pontaga. Termination of growth and sport training effect on young Latvian basketball players performance	122
J. D. Lee, L. E. Hanna, L. M. Guth, A. R. Konopka, A. D. Mahon. E effects of pre-exercise carbohydrate supplementation on anaerobic exercise performance in adolescent males.....	123
G. Leko, N. Grcic-Zubcevic. How to select the most talented children for swimming schools?.....	124
V. P. Lopes, J. R. Maia. Longitudinal changes in body coordination in children: a 4 years study in Azores Islands	125

E. Lätt, J. Jürimäe, K. Haljaste, A. Cicchella, P. Purge, T. Jürimäe. Biomechanics and bioenergetics of front crawl swimming in young female swimmers.....	126
A. D. Mahon, J. D. Lee, L. E. Hanna, L. M. Guth, A. R. Konopka. Pre-exercise carbohydrate consumption and perceived exertion in adolescent males performing high-intensity intermittent exercise ..	127
J. Maia, V. Lopes, S. Fernandes, A. Amorim, C. Alves, A. Seabra, R. Garganta. Physical activity in portuguese twins. A pilot study	128
J. Maia, C. Vasques, V. Lopes, A. Seabra, R. Garganta. Health-related physical fitness of portuguese siblings. A quantitative genetic study	129
A. Mamen, G. K. Resaland, D. A. Mo, L. B. Andersen. Comparison of peak oxygen uptake in boys exercising on treadmill and cycle ergometers	130
M. Matziridi, K. Hatzikotoulas, D. Patikas, H. Paraschos, H. Bassa, C. Kotzamanidis. Differences in voluntary activation between adult and prepubertal males.....	131
D. P. McKee, C. A. G. Boreham, G. Davison, M. H. Murphy, A. M. Nevill. Seasonal variation in objectively assessed physical activity in three and four year old children.....	132
A. M. McManus, R. S. W. Masters, R. Laukkanen, C. C. W. Yu, C. H. P. Sit, F. Ling. Using heart rate feedback to enhance physical activity in children.....	133
R. G. McMurray, F. Zaldivar, A. Eliakim, D. Nemet, D. M. Cooper. The relationship between the exercise-induced changes in stress hormones and immune responses.....	134
N. McWhannell, J. Henaghan, L. Fowweather, D. A. Doran, A. M. Batterham, T. Reilly, G. Stratton. The effect of a 9-week high-impact exercise programme on bone and body composition of children aged 10–11 years. The A-class project.....	135
R. Mellecker, A. McManus, J. Levine, L. Lanningham-Foster. The design and testing of an innovative activity contingent multi-media tool.....	136
S. Merkiel, W. Chalcarz. Assessment of physical fitness and its relation to anthropometrical indices in preschool children from a mountainous region in Poland	137
J. Mészáros, T. Király, M. Zsidegh, A. Prókai, M. Szmodis. Body fat and endurance of prepubertal boys	139
Z. Mészáros, P. Osváth, I. Vajda, A. Photiou, J. Mészáros. Primary school child development – issues of socio-economic differences in girls.....	140

A. R. Middlebrooke, C. Farr, N. Armstrong, D. M. Mawson, A. C. Shore. Exercise blood pressure and vascular function in 9–10 year old children	141
P. Mikulic, L. Ruzic. Rowing ergometer performance in 12–13-year-old rowers as the basis for talent identification.....	142
K. Milde, E. Sienkiewicz-Dianzenza, P. Tomaszewski, A. Wisniewski. Muscle and cardiorespiratory endurance of girls with Turner's syndrome	143
D. W. Morgan, E. A. Holbrook, S. L. Stevens, M. L. Bates, K. B. Emison, S. M. Otto, G. S. Evans, G. A. Mencio, E. E. Argo. Metabolic stability during treadmill walking in youth with diplegic and quadriplegic cerebral palsy	144
J. Mota, M. P. Santos, J. C. Ribeiro. Leisure time structure according to level of physical activity in adolescents	145
J. Mäestu, A. Cicchella, V. Tillmann, E. Lätt, K. Haljaste, P. Purge, T. Pomerants, J. Jürimäe, T. Jürimäe. Relationships between ghrelin concentration and metabolic parameters in boys	146
G. Naughton, C. Broderick, N. Van Doorn, L. Lam, G. Browne. A profile of paediatric sports injuries at three types of medical practice	147
D. Nemet, A. Eliakim. Osteopenia of prematurity – the role of exercise in prevention and treatment.....	148
N. Ng, J. Meszaros, I. Vajda, M. Zsidegh. Somatic and motor development of obese boys	148
A. S. Page, K. Froberg, N. Wedderkopp, A. R. Cooper, L. B. Andersen. Breakfast consumption and daily physical activity in primary school children. The European Youth Heart Study	149
G. Parfitt, K. Sheppard. Affective responses of sedentary boys to a maximal incremental exercise test: a test of the dual mode model.....	150
T. G. Pavey, C. G. Parfitt, A. V. Rowlands. Children's psychological well-being, habitual physical activity and sedentary behaviour	151
K. A. Pfeiffer, M. Dowda, K. L. McIver, R. R. Pate. Factors related to daily physical activity in preschool children	152
I. Pontaga, A. Konrads, V. Larins. Cardiovascular system peculiarities of young athletes trained in different sports.....	153
M. Pääsuke, J. Ereline, H. Gapeyeva, T. Kums. Contractile properties of plantarflexor muscles in pre- and post-pubertal girls ..	154
V. Rangul, T. L. Holmen, K Midthjel. What do self-reported questionnaires on physical activity really measure in adolescents? Reliability and validity of two different questionnaires	155

S. B. Ratel, A. Tonson, Y. Le Fur, P. Cozzone, D. Bendahan. Comparative analysis of skeletal muscle oxidative capacity in children and adults: a 31P-MRS study	156
L. Raudsepp, P. Päll. Stability and change of overhand throwing movements in elementary school boys	157
G. K. Resaland, A. R. Mamen, S. Anderssen, L. B. Andersen. Fitness and cardio vascular disease risk factors in a representative population of nine-year old children in rural Norway	157
N. D. Ridgers, G. Stratton. Contribution of recess to habitual physical activity levels in boys and girls: the A-class project	158
N. D. Ridgers, G. Stratton, S. J. Fairclough, D. J. Richardson. 12-month effects of a playground intervention on children's recess physical activity levels	159
D. M. Roche, S. Edmunds, T. Cable, G. Stratton. Influence of acute aerobic exercise on short term glycaemic control in youth with type 1 diabetes	161
E. Rocher, C. Chappard, C. Jaffre, D. Courteix, C. L. Benhamou. Effect of a 6-month aerobic training program on bone growth and biological factors in obese children	162
A. M. M. Rodrigues, A. J. Figueiredo, M. J. Coelho e Silva, J. A. Mota, R. M. Malina. Validation of the Bouchard 3-day diary with an uniaxial accelerometer among a sample of portuguese adolescents	164
A. V. Rowlands, E. Pilgrim, M. R. Stone, R. G. Eston. Frequency, intensity and duration of activity bouts in children	165
D. A. Rubin, R. G. McMurray, J. S. Harrell, A. C. Hackney, D. E. Thorpe, A. M. Haqq. Insulin resistance and cytokines in adolescence: weight status and exercise as moderators	166
M. Rumaka, L. Aberberga-Augskalne, I. Uptitis. Education longitudinal effect of swimming on lung function parameters	167
J. A. Salmi, M. Vähä, V. Linnamo. Effect of physical activity to the motor control in preschool children	168
C. Serbescu, D. Ianc, O. Straciuc, G. Carp, D. Courteix. Epidemiological study of scoliosis and postural faults of romanian prepubertal school children	169
L. B. Sherar, N. Gyrusik, L. Humbert, D. W. Esliger, A. D. G. Baxter-Jones. Understanding the decline in the physical activity of adolescent girls	170
S. R. Siegel. A descriptive look at Fitnessgram® for the state of California, 2006	171
E. Sienkiewicz-Dianzenza, K. Wnorowski, P. Tomaszewski, R. Stupnicki. Anaerobic endurance of young female subjects	172

M. Sillero, I. Refoyo, C. A. Cordente. Obesity prevalence among infants in Madrid	173
W. Skipka, P. Pagel, K. Wilke. Sexspecific differences of performance in 8 to 19 year old performance swimmers	174
J. Slinger, E. van Breda, J. Brouns, H. Kuipers. Serum leptin but not adiponectin changes during a 12 week community based diet and exercise intervention program	174
M. Soric., M. Misigoj-Durakovic. Gender differences in energy expenditure and physical activity among 11-year old children	175
E. Szczepanowska, D. Umiastowska. Metabolic and somatic results of a healthful training with elements of tourism and recreation in obese boys	177
M. Szmodis, A. Prókai, A. Kacsàndi, A. Farkas. Nutrition, physical activity and body fat in pre-school Hungarian children	178
J. Steene-Johannessen, S. A. Anderssen, E. Kolle, L. B. Andersen. Secular trends in physical fitness in 9 and 15 year old Norwegians.....	178
D. Stevens, P. J. Oades, N. Armstrong, C. A. Williams. Oxygen uptake responses in young patients with chronic chest diseases following simulated physical exercise.....	179
K. Støedfalke, J. Welsman. A longitudinal study to examine heart size, fitness and swim training in pre-pubertal children	180
M. R. Stone, A. V. Rowlands, R. G. Eston. The use of high-frequency accelerometry monitoring to assess and interpret children's activity patterns	181
G. Stratton, L. Boddy, A. F. Hackett, S. Taylor. Endurance performance of children with different modes of transport to school	182
R. Stupnicki, J. Czezelewski, P. Tomaszewski. Body mass expected for body height in schoolboys	183
A. Sääkslahti, P. Numminen, I. Välimäki. Do fundamental motor skills matter in increasing children physical activity?	184
T. Takken, R. H. H. Engelbert, S. Pater, J. van der Net, P. J. M. Helders. Sensitivity to change of aerobic exercise parameters in patients with juvenile myositis	185
T. Takken, M. van Bergen, R. Sakkers, P. J. M. Helders, R. H. H. Engelbert. Respiratory gas exchange and metabolic responses during exercise in children and adolescents with achondroplasia.....	186
D. L. Templeton, D. R. Dengel, L. Steffen, J. Steinberger, A. Moran, D. R. Jacobs, Jr., A. R. Sinaiko. Effects of adolescent obesity and physical inactivity on vascular structure and function in young adulthood.....	187

K. Tolfrey, A. Doggett, C. Boyd, S. Pinner, A. Sharples, L. Barrett, D. Stensel. Postprandial triacylglycerol (TAG) metabolism in adolescent boys: a case for moderate intensity exercise.....	188
P. Tomaszewski, V. Volbekiene, K. Milde, E. Sienkiewicz-Dianzena, R. Stupnicki. Physical fitness of Lithuanian schoolboys, extremely tall or short for age.....	189
N. Tournaire, C. Jaffré, M. P. Jacob, G. Ducher, C. L. Benhamoul, D. Courteix, A. Meddahi-Pellé. MMP2 and MMP9 plasma levels as markers of bone remodeling: a study on young male tennis players	190
M. S. Tremblay. Major PWP-related initiatives in Canada: the year in review.....	191
M. S. Tremblay, M. Shields. Applying the new WHO child growth standards in Canada: What is our prevalence of obesity?	192
M. S. Tremblay, M. Brownrigg, R. Deans. Active Healthy Kids Canada report card on physical activity for children and youth	193
D. Umiastowska, E. Szczepanowska. Physical and motoric development of children in younger school age participating in exercises of corrective gymnastics	194
C. Usselman, D. Gabriel, R. Dotan, L. Brunton, P. Klentrou, J. Shaw, B. Falk. Muscle force and activation pattern of boys vs. men in isometric elbow flexion	195
M. Uvacek, I. Vajda, M. Zsidegh, J. Mészáros. Somatic and motor development in more and less active boys.....	196
M. Van Brussel, T. Takken, C. Uiterwaal, H. J. Pruijs, J. Van der Net, P. J. M. Helders, R. H. H. Engelbert. Physical fitness in children with osteogenesis imperfecta: an RCT	197
T. Vanttinen, M. Blomqvist, S. Vanttinen. Physical performance characteristics of finnish youths aged 10 and 14 years – special reference to anthropometrics, hormonal levels and oxygen transport capacity of the red blood cells	198
S. Veldhuizen, J. Cairney, J. Hay, C. Missiuna, B. Faught. Fitness and fatness in children: examining risk over time in a large cohort of school-aged children	200
G. Veldre. Assessment of physical activity in adolescents.....	201
P. Ven ˆancio, F. Silva, C. Teixeira, C. Martins. Relationship between obesity and life style in children from Anapolis – Goias – Brazil	202
M. Visnapuu, T. Jürimäe. A new method for the measurement of hand dimensions in young sportsmen	203

- E. Völgyi, J. Faludi, M. Zsidegh, K. Sipos, Zs. Csende.** Body composition and psychological functions in Hungarian girls (2.5-year follow up).....203
- C. A. Williams, P. J. Oades, N. Armstrong, D. Stevens.** The relationship between early oxygen recovery and the Schwachman score in children with cystic fibrosis204
- R. J. Winsley, N. Armstrong, J. Fulford, A. C. Roberts, J. R. Welsman.** Heart size, lean body mass and the sex difference in peak oxygen uptake in prepubertal children.....205
- C. C. W. Yu, P. Chook, A. M. McManus, A. M. Li, R. Y. T. Sung.** Effect of strength training on body composition, resting blood pressure, and vascular endothelial function in adolescence.....206
- L. Zahner, T. Mühlbauer, B. Steffen, J. J. Puder, M. Schmid, S. Kriemler.** Participation in a sports club by children and their parents is associated with higher fitness of children.....207

A BEHAVIOURAL AND ECOLOGICAL PERSPECTIVE ON ENERGY-BALANCE RELATED BEHAVIOURS IN CHILDREN

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J. RUTENFRANZ LECTURE

The prevalence of obesity in children has increased markedly in many countries over the last few decades. This paper reviews the behavioural and ecological perspectives on energy-balance related behaviours in children and discusses the implications for the development of interventions to reduce the prevalence of obesity in children.

Over the last few decades, the prevalence of obesity in children has increased markedly in many countries. This increase has been observed in both developed and developing countries, and is now a global phenomenon. The prevalence of obesity in children is now a major public health problem in many countries, and is a leading cause of morbidity and mortality in children. The increase in obesity in children is a complex phenomenon, and is the result of a number of factors, including changes in diet, changes in physical activity, and changes in the environment. This paper reviews the behavioural and ecological perspectives on energy-balance related behaviours in children, and discusses the implications for the development of interventions to reduce the prevalence of obesity in children. The paper is organized as follows. First, the prevalence of obesity in children is reviewed. Second, the behavioural and ecological perspectives on energy-balance related behaviours in children are discussed. Third, the implications for the development of interventions to reduce the prevalence of obesity in children are discussed. Finally, conclusions are drawn from the review.

A BEHAVIOURAL AND ECOLOGICAL PERSPECTIVE ON ENERGY-BALANCE RELATED BEHAVIOURS IN CHILDREN

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In current society overweight and obesity are a major public health concern, which is increasing exponentially in importance in modern society. We are not only dealing with a problem in the adult population, but also in the paediatric population. The latter is witnessed for instance by the growing cases of type II diabetes mellitus in children. In the aetiology of this problem many factors play an important role. Next to genetic factors, behavioural factors also play an important role. Behavioural factors linked to overweight and obesity are nutrition and physical activity, nowadays referred to as 'energy-balance related behaviours' (EBRB's). In explaining behaviour many models have been applied so far, including models such as the Theory of Reasoned Action and the Theory of Planned Behaviour. Common denominator of such models is that they apply the principle that human behaviour is a function of cognitive behavioural principles in which behavioural intention is the strongest predictor of actual behaviour. However, there is increasing evidence that behaviour is not only directed by cognition, but also by a wide variety of environmental factors, as explained by so-called ecological models. Also, many behaviours are not based on cognition at all, but are 'automated' behaviours (i.e. habits). Bottom line is, that in order to change EBRB's effectively one needs to take into account all these determinants of behaviour. In this presentation examples on these issues will be given based on recent work by our group on behavioural determinants of EBRB's.

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EXERCISE METABOLISM, GROWTH AND MATURATION

14-15 November 2017

University of Exeter, Exeter, Devon, UK

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EXERCISE METABOLISM DURING GROWTH AND MATURATION

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Aim. This paper will review what is known about exercise metabolism during growth and maturation and explore new insights gained from the recent rigorous introduction of non-invasive techniques such as breath-by-breath respiratory gas analysis and magnetic resonance spectroscopy (MRS). **Methods.** Data from maximal exercise tests indicate that there are age, maturation and sex-related changes in anaerobic and aerobic power which are not synchronous. Both boys and girls experience a more marked relative increase in anaerobic metabolism than aerobic exercise metabolism as they move through adolescence. However, metabolic profiles derived from anaerobic and aerobic exercise tests require confirmation at the muscle level and do not provide the quality of data required to tease out changes in exercise metabolism during growth and maturation. Paediatric exercise physiologists are normally limited to blood and maximal or steady state respiratory gas markers of exercise metabolism and although studies of substrate utilization during exercise, hormonal responses to exercise, recovery from high intensity exercise and exercise blood lactates have indirectly enhanced our knowledge ethical considerations have restricted more informative studies at the level of the muscle cell. A limited number of muscle biopsy investigations of children's fibre types, energy stores and utilization, and enzyme activity have contributed to our understanding of the interplay of anaerobic and aerobic metabolism but the data are difficult to interpret and clouded by small sample sizes and methodological difficulties such as measurements being made at rest. Understanding of paediatric exercise metabolism is therefore far from complete and rigorous, non-invasive methods capable of interrogating muscle during exercise are required in order to progress knowledge.

The rigorous breath-by-breath determination of children's phase 2 pulmonary oxygen uptake response to a step transition in exercise has the potential to provide insights into the aerobic –anaerobic interplay during the change from rest to moderate and heavy intensity exercise. MRS enables the real time monitoring during exercise of pH and metabolites such as adenosine triphosphate, phosphocreatine (PCr) and inorganic phosphate (Pi) which play a central role in bioenergetics. Results. Evidence from traditional techniques is generally consistent and suggests that during exercise children have relatively higher oxidative activity than adolescents or adults, and that there is a progressive increase in glycolytic activity with age at least from childhood until adolescence and possibly into adulthood. Oxygen uptake kinetics studies have reported that children have a faster primary time constant, greater oxygen cost of exercise and smaller slow component of oxygen uptake than adults. This suggests the presence of an enhanced oxidative function during childhood. Sex differences have been identified in prepubertal children during heavy but not during moderate intensity exercise. MRS studies of exercising children are sparse but recent data have demonstrated good reliability of exercise domain markers, such as the Pi/PCr and pH intracellular thresholds (IT), thereby providing a sound framework for further study. Methodological differences confound direct comparison between studies but monitoring the Pi/PCr ratio and pH during progressive exercise to exhaustion indicates a similar rate of mitochondrial oxidative metabolism between children and adults during moderate intensity exercise ($< IT$) but higher glycolytic activity in adults during heavy exercise ($> IT$). Both children's and adults' phase 2 oxygen uptake kinetics at the onset of moderate cycle ergometer exercise have been showed to closely resemble PCr kinetics at the onset of knee extension exercise. Conclusion. The analysis of breath-by-breath respiratory gas kinetics and MR spectra during exercise has a huge untapped potential to provide insights into paediatric exercise metabolism. More research using MRS is required but in the absence of MRS data, the close relationship between PCr and oxygen uptake kinetics encourages the use of more child-friendly and less expensive oxygen uptake kinetics as a non-invasive window into muscle metabolism during growth and maturation.

ACTIVITY, OBESITY AND METABOLIC HEALTH IN CHILDREN

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Obesity is a problem of epidemic proportions in children. The increasing rates of overweight and obesity began approximately 20 to 25 years ago in the US and subsequently spread world wide. Recent data from UK using the International Obesity Task Force classification suggest that approximately one third of boys and girls aged 2 to 15 years are either overweight or obese. Childhood obesity carries an increased risk of adult obesity and there is strong evidence that adult obesity is a risk factor for type 2 diabetes, atherosclerotic disease, cardiovascular events, and other chronic diseases.

Although obesity is multi-factorial, involving early life exposures, genetic, physiological, social and economical factors, the secular gain in body weight is mainly a consequence of a positive energy balance. Thus, it has been suggested that the rise in the prevalence of excess body weight during the last decades is most likely due to environmental changes, such as easy access to large portion sizes of energy-dense foods and reduced levels of physical activity-related energy expenditure, or a combination of both. Although logical, there is limited evidence that the increase in the prevalence of overweight and obesity in children has occurred simultaneously with changing patterns of physical activity. Some ecological data suggest that this is the case but these data cannot be used to infer causality. Unfortunately, temporal trend data on physical activity using objective methods are unavailable.

Objective measurement of physical activity is necessary to examine associations between sub-dimensions of activity with a particular health outcome. The use of objective methods, such as accelerometry when assessing the associations between physical activity, and obesity with metabolic risk is likely to reduce measurement error. Furthermore, identifying the dimensions of

physical activity that are beneficial for a particular outcome is essential when designing preventive interventions. Interventions aimed at increasing activity may not produce the benefits predicted from observational studies if they focus on the wrong dimensions of physical activity.

Recent cross-sectional data using objective measurements of physical activity suggest a weak to moderate association between physical activity and overweight and obesity in children. The strongest associations have been observed between moderate and vigorous intensity of physical activity with measures of overweight and obesity. Few studies have addressed the prospective associations between objectively measured activity and the development of childhood obesity and results from randomised trials are not conclusive.

Despite the limited evidence that physical activity prevent unhealthy weight gain in children, data are emerging suggesting that physical activity have beneficial effects on many other metabolic risk factors independent of adiposity. Recent data from the European Youth Heart Study have suggested that physical activity is associated with clustered metabolic risk in children and adolescents and that the current recommendation of 60 minutes of moderate intensity activity per day may be too low. Furthermore, sedentary behaviour, defined as the amount of time spent watching TV, was positively associated with clustered metabolic risk but this association was explained by an association between TV viewing and adiposity. In contrast, physical activity was associated with individual metabolic risk factors including blood pressure, hyperlipidemia, and disturbed glucose regulation, and with clustered metabolic risk. Interestingly, these associations were independent of cardio-respiratory fitness and adiposity.

Taken together, recent studies suggest a weak association between physical activity and overweight and obesity in children. In contrast, physical activity seems to be associated with most metabolic risk factors independently of adiposity. Therefore, promoting increased levels of physical activity in childhood is likely to have a beneficial effect on many known cardio-vascular risk factors without an effect on obesity. Future longitudinal studies from early age before obesity develops, using accurate objective methods to assess physical activity and body composition, are needed to address issues of direction of causality and dose-response associations.

ADIPOCYTOKINES AND EXERCISE IN CHILDREN

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Physical activity or inactivity has a profound effect on children's health. These effects are mediated, at least partially, by the relationship between physical activity and circulating adipocytokines. These relationships are important not only for the chronically ill child, but also for the healthy child and adolescent, as well as for the young elite athlete. This paper will review the relationship between single exercise, exercise training, and inflammatory mediators in each of these conditions:

The young athlete The efficiency of exercise training depends on the intensity, volume, duration, and frequency of training, and on the athlete's ability to tolerate it. Thus, many efforts are made to quantify the balance between training load and the athlete's tolerance by objective parameters. Recent reports suggest, rather surprisingly, that exercise leads to a simultaneous increase in antagonistic mediators. On one hand, exercise stimulates anabolic components of the growth hormone (GH) → IGF-I (insulin-like growth factor-I) axis, and on the other hand, exercise elevates catabolic pro-inflammatory cytokines such as Interleukin-6 (IL-6), IL-1 and tumor necrosis factor- α (TNF- α). The net effect of exercise is determined by the balance between these growth factors and inflammatory mediators. Therefore, it is suggested that assessment of the changes in these circulating mediators following different types of exercise training may help to quantify training loads, and promote athletic training.

The chronically ill child In the last two decades childhood obesity has gained epidemic proportions in Westernized countries. Recent studies have shown that circulating levels of inflammatory adipocytokines (mainly IL-6) are elevated in obese children, indicating a state of chronic low-grade inflammation that may

contribute to the increased cardio-vascular risk of obesity later in life. Single exercise leads to a transient increase in these cytokines. In contrast, aerobic-type exercise training in obese children results in a decrease of these circulating cytokines, suggesting that the preventive role of exercise in obesity is mediated, at least partially, by attenuation of this inflammatory response.

The healthy child In recent years there is a decline in physical activity participation among children and especially adolescent. The question whether physical inactivity per-se is deleterious to children's health, or only if accompanied by overweight, has been difficult to answer. To begin to gauge independent effects of physical activity on health risk, we matched by BMI two groups of normal-weight adolescent females, one physically active – all participants in high school sports; and one sedentary. Active girls were fitter, had lower inflammatory cytokines levels (e.g. IL-6, TNF- α) and leptin, and higher levels of adiponectin. In adolescent girls, the choice of a lifestyle involving high-school sports is characterized by circulating mediators and a body composition pattern that, if sustained, is associated with generally lower long-term risk of cardiovascular disease.

In summary, the effect of exercise training on inflammatory adipocytikines is potentially beneficial for healthy children, children with chronic diseases and children involved in competitive sports.

THE CAUSE AND EFFECT OF OBESITY: PERFORMING BELOW YOUR WEIGHT

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Obesity is a complex chronic health condition with potentially serious social and psychological dimensions. The global obesity epidemic, once limited to Western societies, is now rampant in many developing countries. Obesity is a major contributor to the global burden of chronic disease and disability as the condition is associated with increased risk of type 2 diabetes, cardiovascular disease, hypertension, stroke, and certain forms of cancer. The major causes of the condition are an increased consumption of energy-dense foods (high in saturated fats and sugars), and reduced levels of physical activity. An unfortunate parallel to the obesity epidemic, mainly in developing countries, is the coexistence with under-nutrition. Of particular concern is the increasing global incidence of childhood and adolescent overweight and obesity.

The obesity epidemic is a consequence of profound and relatively recent changes in society including behavioural patterns of individuals and communities. Whilst genetic susceptibility or predisposition to weight gain explains much of the individual variability in size and shape, changes in energy balance (energy intake versus energy expenditure) are the key environmental driver. Rapid and sustained economic growth, modernization, urbanization plus the globalization of food markets, combined with significantly less physical activity in all sectors, have fuelled the obesity epidemic. Collectively, these factors have underpinned the worldwide nutrition transition and associated societal changes. One of the more problematic consequences in developing countries that are undergoing nutrition transition is that obesity (over-nutrition) often co-exists with under-nutrition. Further, under-nutrition early in life and subsequent obesity

in adulthood predisposes such individuals to high blood pressure, heart disease and diabetes at an earlier age and in a more severe form than those who were never undernourished.

Overweight and obesity potentially lead to adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance. Additional health problems associated with obesity include respiratory difficulties, chronic musculoskeletal problems, and infertility. Chronic diseases commonly develop over an extended period of time and clinical sequelae often occur many years after commencement of the underlying pathogenesis of the disease. The increasing prevalence of childhood and adolescent obesity is a serious public health problem due to elevated risk of associated chronic diseases such as type 2 diabetes and cardiovascular disease.

Physical activity is essential for the normal growth and development of children and youth and also contributes to a lower risk of obesity and the development of related health problems in adulthood. If we are to be successful in reducing the current obesity epidemic, the prevention of excess weight gain in normal weight individuals must commence during the growing years. Therefore, an understanding the factors that contribute to excess weight gain in young people is integral to the development of strategies for prevention, treatment and management. A logical starting point is to provide all children with the opportunity to develop the motor skills necessary to participate in physical activity and exercise in a meaningful fashion. Further, innovative approaches are required to encourage children to decrease inactive behaviours and this should be matched with a consolidated approach by parents, teachers and health professionals to influence the knowledge, attitudes and behaviours of young people. The early establishment of appropriate lifestyle practices must include the encouragement of all to participate in regular physical activity. Encouragement must be paralleled with opportunity, including making changes to ones' environment to support the incorporation of physical activity.

Despite the acknowledged health benefits of regular physical activity, relatively few scientifically-based guidelines exist for the optimal prescription of exercise in the obese. In the recent past, considerable attention has been given to components of exercise prescription such as the optimum level of exercise intensity to produce improvements in metabolic health, physical fitness and weight maintenance or weight loss in the obese. If one contends that there are

recognised benefits of a physically active lifestyle including regular exercise for the overweight and obese, what advice should be given to this population? More specifically, how might we determine the optimal volume, intensity and mode of exercise for weight management in the obese, particularly as many obese individuals will have a history of relative inactivity? Further, what method(s) should be employed to monitor exercise intensity to both maximize time on task and minimize risk of injury? This paper addresses the relative merits of a number of exercise approaches in the treatment and management of obesity. Particular attention is paid to specific approaches to monitoring and/or measurement of physical activity with an emphasis on exercise prescription in obesity management rather than physical activity promotion. Such an approach acknowledges that in order to attain maximum benefits in weight management, exercise prescription must meet the individual needs and expectations of the obese individual.

THE OVERTRAINING SYNDROME – ARE THERE CLEAR MARKERS?

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Successful training must involve overload but also must avoid the combination of excessive overload plus inadequate recovery. Athletes can experience short term performance decrement, without severe psychological, or lasting other negative symptoms. This Functional Overreaching (FOR) will eventually lead to an improvement in performance after recovery. When athletes do not sufficiently respect the balance between training and recovery, Non-Functional Overreaching (NFOR) can occur. The distinction between NFOR and the Overtraining Syndrome (OTS) is very difficult and will depend on the clinical outcome and exclusion diagnosis. The athlete will often show the same clinical, hormonal and other signs and symptoms. A key-word in the recognition of OTS might be 'prolonged maladaptation' not only of the athlete, but also of several biological, neurochemical, and hormonal regulation mechanisms. OTS occurs when excessive training load is not compensated with a sufficient amount of recovery for a sustained period of time. OTS is characterized by fatigue and severely reduced performance. One approach to understanding the aetiology of OTS involves the exclusion of organic diseases or infections and factors such as dietary caloric restriction (negative energy balance) and insufficient carbohydrate and/or protein intake, iron deficiency, magnesium deficiency, allergies, etc. together with identification of initiating events or triggers. In overtrained athletes, several signs and symptoms have been associated with this imbalance between training and recovery. However, reliable diagnostic markers of distinguishing between well trained (T), functional overreached (FOR) from non-functional Overreached (NFOR) and OTS athletes are lacking. A hallmark feature of OTS is the inability to sustain

intense exercise and recover for the next training or competition session. We, therefore, devised a test protocol utilizing 2 bouts of maximal work. With this test protocol we can register a difference in hormonal responses between T, FOR and NFOR and OTS athletes.

HOW DO CHILDREN GROW?

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Human growth is considered to be a relatively smooth and continuous process with steady increments of height and weight at regular intervals. However, as one examines growth more closely, then it becomes apparent how complex and non-linear the process is. Most investigators have agreed that normal growth over weeks and months is non-linear, while the actual pattern of short term growth is still disputed. Our own growth model describes growth as a biphasic process composed of growth spurts of variable amplitude lasting an average 56 days, separated by periods of very slow growth or stasis. We also found that prepubertal stature and the amount grown through the year are related to short-term changes in height and weight. Our data indicate that large but infrequent changes in weight with growth spurts of short duration are found in tall children. Good growth during the year is related to large but frequent gains in weight and large individual spurts in height. The mechanism that generates a non-linear growth is not known. Growth hormone (GH) is the principal hormone influencing mid-childhood growth. Subnormal growth rates are associated with low GH secretion over 24 hours (as in GH deficiency), but normal growth rates occurred over a wide range of GH output. The studies using urinary GH as approximate surrogate for GH circulating concentrations showed that not the amount of GH but its pattern from week to week is the most important determinant of growth. Increased variability in urinary GH excretion is associated with tall stature, while relative constancy of this variability is related to an increased growth rate. How is this relevant to clinicians? Presently GH treatment is given as an identical daily dose. In GH deficiency, this usually generates good growth, but their average adult height remains still 5–6 cm below the target height. Our data suggest that dose variation may be an important consideration.

THE EVOLUTION OF PEDIATRIC FITNESS TEST PERFORMANCE

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INTRODUCTION

Over the years, there has been much controversy regarding whether today's children and adolescents are fitter than yesterday's children and adolescents. Some believe that the pediatric fitness has declined in recent decades, while others doubt that it has changed at all or suggest that we do not know. Few, it seems, are willing to argue that it has improved.

This controversy is not surprising given the paucity of scientific studies explicitly commenting on secular changes in pediatric fitness. Of the available studies, most only make informal comparisons, with occasional rigorous statistical treatment. Compounding the problem further, is that these studies often provide only local, temporally limited snapshots, which are restricted to narrow age bands and a single fitness component (typically aerobic fitness). A lack of representative data for criterion measures of fitness has meant that secular comparisons cannot be confidently made. Nonetheless, analysis of fitness test performances may provide some clues. The aim of this study therefore, was to conduct an extensive review of the literature to quantify the secular changes in pediatric aerobic and anaerobic performance.

METHODS

Following an extensive review of the literature, 42 studies examining secular changes in pediatric power (single jump tests), speed (sprint running and sprint-agility running tests) and aerobic

(distance running and endurance shuttle running tests) performance were analysed. Only studies which explicitly commented on secular changes across at least two time points, spanning a minimum range of three years, on comparable populations were considered. Secular changes were calculated at the country x age x sex x test level using least squares regression weighted by the square root of sample size, and were expressed as a percentage of the weighted mean value for all data points in the regression. Negative values were used to indicate secular declines, and positive values secular improvements.

RESULTS

Secular changes in power ($n = 20,802,925$), speed ($n = 28,320,308$) and aerobic ($n = 25,455,527$) performance were calculated for 6–19 year olds from 32 countries (representing five geographical regions) between 1958 and 2003. Over the 45 year period, power and speed test performances improved at +0.03% and +0.04% per annum (p.a.), respectively, while aerobic performances declined at -0.36% p.a. Performance changes were strikingly similar for boys and girls, and children and adolescents, and reasonably similar for different geographical regions, and developed and developing countries. The secular changes however, were not always consistent over time. Changes for power and speed have been consistently small, with positive changes (i.e. improvements) observed initially. However, at about 1985 there was a crossover from positive to negative (i.e. declines) for power, and a drop from positive to zero (i.e. no change) for speed. Aerobic changes were also initially positive, from the late 1950s through to about 1970, where changes crossed from positive to negative, increasing in magnitude every decade thereafter.

DISCUSSION

This study offers an interpretation of the secular declines in aerobic performance, and speculates on why aerobic performances have declined and power and speed performances have remained relatively stable.

It is likely that a network of social, behavioural, physical, psychosocial and physiological factors have caused the recent declines in aerobic performance. Proximate causes of declines in maximal aerobic performance are essentially changes in maximal oxygen uptake, mechanical efficiency/economy and fractional utilisation. A reduction in affective (e.g. lack of motivation) and/or cognitive (e.g. inability to judge pace) aspects of maximal performance may also be important. These variables are in turn affected by physical factors such as increased fat mass and reduced cardiovascular function. These physical changes are ultimately the result of behavioural changes such as excessive energy intake relative to expenditure, reduced energy expenditure, and reduced vigorous physical activity. These behaviours, in turn, are driven to some extent by large social changes, such as a changing family profile, advancing technology and a shift towards suburbanisation.

It is not obvious however, why aerobic performances have declined and anaerobic performances have remained relatively stable. The secular differences may be due to the differential effects of fat mass and fat-free mass on aerobic and anaerobic performances. Advances in the rate of maturation (and therefore differences in the age-related changes in performance) may also influence the secular differences. It is also possible that skill contributes more to anaerobic performance in children and adolescents, and without evidence of secular changes in motor skills, anaerobic performances could be less susceptible to secular change.

ORAL AND POSTER PRESENTATIONS

RELATIONSHIP BETWEEN CARDIOVASCULAR PARAMETERS AND ACE GENE: PILOT STUDY

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Cardiovascular homeostasis is closely related with renin-angiotensin-aldosterone system where angiotensin-converting enzyme (ACE) plays a key role. Our previous longitudinal investigation revealed slight changes in functional state of the wall of elastic arteries during ages from 7 to 16 years. Aim. The aim of our pilot study was to assess the relationship between cardiovascular parameters during growth and development from 10 to 16 years and ACE gene polymorphism at the age of 35–36. Methods. Study included 8 persons from longitudinal research of cardiovascular parameters. During 10 year period of observation systolic (SBP) and diastolic (DBP) blood pressures were measured and polysphygmogramms from a. carotis, a. radialis, a. femoralis, and a. tibialis were recorded. ECG and tetrapolar impedance cardiography was used for evaluation of cardiac function. At the age of 35–36 ACE gene polymorphism by polymerase chain reaction and cholesterol and triglycerides were determined. The study protocol was approved by the Latvian Medical Ethics Committee and written informed consent was obtained. Results. Due to insertion-deletion (I/D) polymorphism we revealed 4 persons representing homozygote for allele DD (group 1) and 4 persons heterozygote (group 2). Group 1 showed statistically higher values of carotid – femoral pulse wave velocity (PWVcf) at the age 10, higher SBP and mean blood pressure of the ages 10, 11, and 12, higher mean SBP and PWVcf during 7 years of observation than group 2. Correlation showed close relationship between DBP at the age of 10 and level of low density cholesterol ($r = 0.96$; $p < 0.05$). Conclusions. These data reveal that ACE genotype might influence properties of arterial wall and dynamics of arterial pressure.

TRACKING OF PHYSICAL ACTIVITY IN CHILDREN, ADOLESCENTS AND YOUNG ADULTS FROM THE AUTONOMOUS REGION OF MADEIRA – PORTUGAL

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Aim. Physical activity is important for good health in children and adults, therefore, it is essential to promote and maintain active lifestyles as earlier as possible. However, most longitudinal studies indicate a decline of physical activity levels. The purpose of this study was to determine the magnitude of tracking in physical activity. **Methods.** The sample includes 481 participants (247 boys and 234 girls) in the 'Madeira Growth Study', a longitudinal study with five cohorts (8, 10, 12, 14 and 16 years). Each cohort was measure annually, during three consecutive years, and remeasure five years later. Physical activity was assessed by Baecke Questionnaire, which estimates three indexes: leisure time index, sport participation index and work index. This study only used the leisure time index and sport participation index. The tracking was analyze in each cohort, through the autocorrelations (Pearson). **Results.** The results show for an eight year interval, in sport participation index, that tracking was between -0,039 and 0,282 (male) to -0,039 and 0,282 (female) in the first cohort; between -0,009 and 0,328 (male) to 0,063 and 0,422 (female) in the second cohort; between 0,035 and 0,429 (male) to 0,107 and 0,384 (female) in the third cohort; between 0,160 and 0,440 (male) to 0,036 and 0,301 (female) in the fourth cohort; between 0,246 and 0,530 (male) to -0,052 and 0,652 (female) in the fifth cohort. In leisure time index, tracking was between -0,038 and 0,312 (male) to -0,150 and 0,471 (female) in the first cohort; between -0,029 and 0,159 (male) to 0,028 and 0,359 (female) in the second cohort; between -0,114 and 0,308 (male) to 0,120 and 0,544 (female) in the

third cohort; between 0,218 and 0,279 (male) to -0,063 and 0,385 (female) in the fourth cohort; between -0,115 and 0,592 (male) to 0,223 and 0,527 (female) in the fifth cohort. Conclusions. The highest values for autocorrelations were found in sport participation. In general, the autocorrelations for tracking were low to moderate, in both genders. Data suggests that physical activity doesn't have a stable behaviour, in children, adolescents and young adults from the Autonomous Region of Madeira – Portugal. Further contributes about tracking can be made in future research.

PHYSICAL FITNESS IN RELATION TO TRANSPORT TO SCHOOL IN ADOLESCENTS. THE DANISH YOUTH AND SPORTS STUDY

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Background. Physical activity is important for a range of health outcomes at all ages. In many Western countries there are concerns about declining levels of physical activity in school-aged children. Active transport is one way to increase physical activity of everyday living in children, but few studies have evaluated the potential benefits of active transport in school-aged children and adolescents. In the European Youth Heart study we found increased levels in aerobic fitness among cyclists, the aim of the present study was to analyze if other types of fitness measures differed among cyclists and non-cyclists. Methods. Participants were a representative Danish sample of 550 boys and 710 girls, 15–19 years of age. Physical fitness was assessed through a number of field tests. Tests included a maximal cycle test, dynamic and static strength in different muscle groups, muscle endurance, flexibility and agility. Transport to school was reported as mode of transport and distance traveled. Results. Almost two-thirds of the population cycled to school. Cyclists had higher aerobic fitness than walkers and passive travelers (4.6–5.9%). Isometric muscle endurance was also higher in cyclists (10–16%), dynamic muscle endurance in the abdominal muscles was 10% higher, and flexibility was 6% higher in cyclists compared to passive

travelers. However, no other fitness measures differed between those who did and did not cycle to school. There was no difference between traveling modes in leisure time sports participation. Conclusion. Fitness was higher in cyclists compared to walkers and passive travelers, specifically in the types of fitness that one might expect to be affected by cycling. Commuter cycling may be a way to improve health in adolescents.

PHYSICAL ACTIVITY AND CLUSTERED CARDIOVASCULAR RISK IN CHILDREN: A CROSS SECTIONAL STUDY (THE EUROPEAN YOUTH HEART STUDY)

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Background: Atherosclerosis develops from early childhood; physical activity could positively affect this process. This study's aim was to assess the associations of objectively measured physical activity with clustering of cardiovascular disease risk factors in children and derive guidelines on the basis of this analysis. Methods: We did a cross-sectional study of 1732 randomly selected 9-year-old and 15-year-old school children from Denmark, Estonia, and Portugal. Risk factors included in the composite risk factor score (mean of Z scores) were systolic blood pressure, triglyceride, total cholesterol/HDL ratio, insulin resistance, sum of four skinfolds, and aerobic fitness. Individuals with a risk score above 1 SD of the composite variable were defined as being at risk. Physical activity was assessed by accelerometry. Results: Odds ratios for having clustered risk for ascending quintiles of physical activity (counts per min; cpm) were 3.29 (95% CI 1.96–5.52), 3.13 (1.87–5.25), 2.51 (1.47–4.26), and 2.03 (1.18–3.50), respectively, compared with the most active quintile. The first to the third quintile of physical activity had a raised risk in all analyses. The mean time spent above 2000 cpm in the fourth quintile was 116 min per day in 9-year-old and 88 min per day in 15-year-old

children. Conclusions: Physical activity levels should be higher than the current international guidelines of at least 1 h per day of physical activity of at least moderate intensity to prevent clustering of cardiovascular disease risk factors.

MUSCLE PHOSPHOCREATINE KINETICS DURING MODERATE INTENSITY EXERCISE IN CHILDREN AND ADULTS

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Aim: This study examined the muscle phosphocreatine (PCr) kinetic response in children and adults at onset and offset of moderate intensity exercise. **Methods:** Eighteen 9–10 year old children (8 boys, 10 girls) and 16 adults (8 men, 8 women) completed repeat quadriceps constant-work exercise transitions (2 min rest, 6 min exercise, 6 min rest) corresponding to 80% of the inorganic phosphate (Pi)/PCr intracellular threshold. The changes in quadriceps PCr, Pi and intracellular pH dynamics were determined every 6 s using ³¹P-magnetic resonance spectroscopy (Philips 1.5T). The PCr kinetic parameters were estimated using a single-exponential model with no delay term. **Results:** No significant ($P > 0.05$) age or sex related differences were found in the PCr kinetic time constants at the onset (boys, 21 ± 4 s; girls, 24 ± 5 s; men, 26 ± 9 s; women, 24 ± 7 s) or offset (boys, 26 ± 5 s; girls 29 ± 7 s; men 23 ± 9 s; women 29 ± 7 s) of exercise. The 95% confidence intervals were approximately ± 6 s for all PCr time constants. **Conclusion:** The similar PCr kinetics may reflect a comparable capacity for oxidative phosphorylation in child and adult muscle.

THE CORRELATION BETWEEN PHYSICAL SELF-EDUCATION AND MENTAL HEALTH OF SCHOOLCHILDREN AGED FROM 14 TO 16

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The objective of the present study was to establish the correlation between physical self-education and mental health of schoolchildren aged from 14 to 16. The problem question being addressed in the study is the following: are there any differences in the level of mental health of schoolchildren who regularly practice physical self-education and schoolchildren who do not practice physical self-education. The following indicators of mental health were evaluated: psychological stability, perception of stress level, stress resistance. By using the principle of random selection, the sample was constructed out of 284 schoolchildren (190 boys and 94 girls) aged from 14 to 16 attending secondary school of the Kaunas County. The hypotheses of mathematical statistics were tested by the test. It was proved that mental health indicators of schoolchildren do not depend on their gender. The level of psychological stability of schoolchildren was average, perception of stress was adequately. The performed research helped to determine that physical activity has positive influence on mental health. Schoolchildren who regularly practice physical self-education are able to react on stressful situations adequately and overcome stress more easily.

DOES THE POSITIVE EFFECT OF PHYSICAL ACTIVITY DURING CHILDHOOD AND ADOLESCENCE ON BONE MASS ACCRUAL PERSIST INTO EARLY ADULT LIFE?

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We previously showed, in this cohort of children, that maturational and size adjusted total body and femoral neck bone mineral content (BMC) were greater in active boys and girls compared to their inactive peers, one year after the attainment of peak BMC velocity. AIM: The purpose of this study was to identify the influence of childhood physical activity on adult BMC. METHODS: Data were analyzed from 82 females and 65 males, aged 8 to 15 years at study entry, who were annually assessed from 1991 to 1997 and 2002 to 2006. Subjects were from the University of Saskatchewan's Pediatric Bone Mineral Accrual Study (PBMAS). Physical activity and anthropometry were measured every 6 months during childhood and annually in adulthood. Dual-energy X-ray absorptiometry scans of the total body (TB), lumbar spine (LS), total hip (TH) and femoral neck (FN) (Hologic 2000, array mode) were collected annually. Ages at peak height velocity (PHV) and peak BMC velocity were identified using data collected over the growing years. A mean age- and gender-specific standardized physical activity (Z) score was calculated for each subject based on multiple yearly activity assessments. The childhood activity scores were used to identify active (top quartile), average (middle two quartiles), or inactive (bottom quartile) groups. Adult BMC values were averaged over a maximum of four years. Adjusted adult BMC values were compared between childhood activity groups (ANCOVA). RESULTS: At follow-up, the average age from PHV was 10.6 ± 3.4 years in females and 10.0 ± 2.2 years in males. Comparisons between adult BMC values (adjusted for age from PHV, adult height and weight, and adult physical activity) found significant gender and physical activity main effects for total body, total femoral hip, and femoral neck BMC ($p < 0.05$). Lumbar spine BMC also showed a significant sex effect ($p < 0.05$) however, there was no effect of childhood physical activity at this site ($p > 0.05$). No significant

interactions were found between sex and physical activity at any of the four sites ($p>0.05$). **CONCLUSIONS:** We previously showed that during childhood and adolescence the growing skeleton responded to increased everyday physical activity by increasing bone mineral accrual. The present analysis suggests these observed changes persist into early adult life.

COMPARISON OF ENERGY EXPENDITURE RECORDED WITH SENSEWEAR™ PRO2 ARMBAND AND INDIRECT CALORIMETRY DURING TREADMILL WALKING AND RUNNING IN ADOLESCENTS WITH AND WITHOUT ASTHMA

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Physical activity assessment should be valid and accurate, socially acceptable, should not burden the participants with cumbersome equipment and should only minimally influence the person's normal physical activity pattern. A new instrument to measure physical activity objectively (SenseWear™ Pro2 Armband, BodyMedia Inc., Pittsburgh, PA, USA (Armband)) is currently available but not yet satisfactory validated. Aim: The aim of the present study was to examine the validity and reliability of the Armband during treadmill walking and running in adolescents with and without asthma. Methods: 88 adolescents (13–14yrs) with asthma (male/female: 63/25) and 87 without (male/female: 45/42), where recruited from the birth cohort "Environment and Childhood Asthma". Energy expenditure was recorded with Armband and indirect calorimetry according to the manufacturers, during walking and running on a treadmill. The speed of the treadmill started at 5 km; h-1 and an inclination of 5.3%, and

both were increased systematically during the test. Energy expenditure was computed at 1-minute intervals and expressed as kcal per minute. The data from the Armband was downloaded and analysed with software developed by the manufacturer (Innerview Professional Research Software Version 5.1). Results: We found no indications of any differences between gender for total energy expenditure. Consequently, we present analyses for pooled data only. The Armband significantly underestimated the total energy expenditure ($p < 0.0001$). The underestimation of energy expenditure increased by 3% for each unit of oxygen consumption when increasing intensity ($p < 0.004$). The intra class correlation coefficient was 0.88 ($p < 0.0001$) and limit of agreement (mean differences \pm 1.96 SD of the differences) was -6.0 ± 25.8 kcal respectively. Conclusion: Armband provided a valid and reliable estimate of energy expenditure during treadmill walking and running compared with indirect calorimetry in adolescents with and without asthma. However, Armband systematically underestimated the energy expenditure by increasing work load and did not detect the change in intensity that occurred with an increase in incline.

VALIDATION OF THE BEUNEN-MALINA METHOD FOR THE PREDICTION OF ADULT HEIGHT

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The assessment of biological maturation is of major relevance in paediatric exercise science and its applications. In the past non-invasive techniques have been proposed but few have been cross-validated. It is the purpose of this presentation to validate the Beunen-Malina method to predict adult stature. Longitudinal data from the Madeira Growth Study were collected from 5 cohorts covering the age range between 8 and 18 years, and re-measured after 8 years. Four age

groups were considered: 13, 14, 15, and 16 years. As in the original Beunen-Malina method, chronological age, height, sitting height, subscapular and triceps skinfold were used as predictors of adult height. Correlations between measured adult height and predicted adult height varied between $r=0.66$ and $r=0.83$. Average measurement errors ranged from -1.0 cm to 2.5 cm, and the residual standard deviation (measurement error) varied between 3.5 and 5.0 cm. This validation study provides evidence that the Beunen-Malina method has reasonable validity for the prediction of adult height in different populations, and can be used to derive percentage of adult height as a non-invasive method to assess biological maturation

ESTIMATION OF MAXIMAL OXYGEN UPTAKE FROM MAXIMAL POWER OUTPUT DURING BICYCLING AMONG 9–10 YEAR OLD CHILDREN IN LHASA, TIBET

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A study to compare maximal power output among 812 Tibetan and Han children aged 9–10 years old was carried out in 2005 in Lhasa. However, it is necessary to validate the bicycle procedure to develop an appropriate equation for estimating among these subjects. Aim: Therefore, the aim of present study is to evaluate a maximal watt cycle ergometer test against direct measured in 9–10 year old Tibetan /Chinese children in Lhasa, 3,700 m above sea level. Methods: The

present study was carried out in 46 children (20 boys and 26 girls) aged 9–10 years in one school in Lhasa city. Was measured directly (MetaMax II, CORTEX Biophysik MetaMax ® II portable CPX system, Germany) and predicted from maximal power output (W_{max}) in a progressive maximal watt cycle ergometer test. Standard multiple regressions were used to explain the variance of and to calculate a prediction model for from W_{max} . A probability value of less than 0.05 was considered as statistically significant. Results: The relationship between maximal oxygen uptake and W_{max} was: $(l \cdot \text{min}^{-1}) = 0.62 + (0.0097 \cdot W_{max}) - (0.083 \cdot \text{sex})$. A correlation coefficient of $r=0.83$ was found between W_{max} and maximal oxygen uptake. The prediction model included W_{max} and sex and they explained 74% and 5% of the variability in, respectively. Conclusions: The maximal oxygen uptake could be predicted from maximal power output in a progressive cycle ergometer test in 9 to 10 year old Tibetan /Chinese children. However, the beta value for W_{max} was different from the beta found in validation studies at sea level.

RER VARIABILITY ANALYSIS BY SAMPLE ENTROPY: A PRELIMINARY COMPARISON OF OBESE AND LEAN CHILDREN

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Aim: Obesity in children and adults is said to exhibit metabolic inflexibility (MI) – suppressed change in substrate utilization with changing metabolic state. We hypothesize that MI in obese children would decrease the inherent variability of their breath by breath RER data as demonstrated by a lower Sample Entropy (SampEn) score. **Methods:** RER data was collected using a Cosmed analyzer on 13 overweight (BMI > 85%) children (4 F, 9 M: age = 11.5 ± 1.7 years) and 9 lean children (6 F, 3 M: age = 12.3 ± 2.2 years). All subjects underwent two submaximal exercise stages on a cycle ergometer (3 mins. unloaded and 5 mins. at 50 W, both at a cadence of 50 rpm).

Breath by breath time series were analyzed for variability using SampEn method for the combined 8 min. interval and the single 5 min. 50 W interval. Results: The average RER for overweight subjects ($BMI = 26.9 \pm 6.5$) was significantly lower for both the combined and 50W pedaling intervals (unpaired, two tailed t-test, p value = 0.002). RER variability during 5 min. 50W pedaling showed a trend toward lower SampEn for overweight children (1.49 ± 0.29 vs. 1.72 ± 0.36 , unpaired, single tailed t-test, p value = 0.06). Conclusion: Longer RER time series collection and greater sample size are needed to see if RER SampEn reflects MI and could serve as a marker for it.

PATTERNS OF PHYSICAL ACTIVITY IN 3–5 YEARS OLD

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Introduction. Compared to prepubescents, the physical activity (PA) patterns of 3 to 5 yr-old-children have been sparsely investigated. Using accelerometry, with a high frequency sampling method, Baquet et al.1 has generated valid data commensurate with children natural physical activity behavior of high intensity and short duration. To the best of knowledge, no study has reported the PA levels with a consistent interval related to their physical activity at that age. Using accelerometry, the aim of this study was, therefore, to determine the habitual physical activity patterns of preschool children using with a sampling interval related to children bouts of activity. Methods. Ninety-nine children (48 boys et 51 girls), aged 3 to 5, were involved in this study. Age, height and body mass were 4.5 ± 0.7 yrs, 1.07 ± 0.06 m, and 17.8 ± 6.6 kg, respectively. Children's habitual physical activity was recorded during a 7-day period, with an uniaxial accelerometer (Computer Science Applications Inc (CSA), model GT1M, Fort Walton Beach, FL). The epoch duration was set to 5s

between 7 am and 9 pm. The times spent below and above different PA thresholds, corresponding from sedentary (<1.5 METs) to very high intensity (>9METs), were calculated². The latter were analyzed through different duration bouts (5, 10, 15, 20, 25, 30, 60, 120, 180, 300 and 600s) to determine physical activity patterns. Results. For boys and girls, the daily PA time spent at different intensity levels is displayed on table 1. Based on a 5-s epoch, children were sedentary for 82.5% of their time and spent 9.1% of their time in light physical activity (LPA), 4.7% in moderate to vigorous physical activity (MVPA), 1.9% in vigorous physical activity (VPA) and 1.8% in very high physical activity (VHPA) per day. Girls were more sedentary than boys (+2.5%, $p < 0.05$), while the latter spent more time in LPA (+12.3%, $p < 0.05$) and MPA (+18.4%, $p < 0.05$). No sex-related difference was found for time spent in VPA and in VHPA. A mean PA bout duration of 12.9 ± 2.2 s was found, with a significant gender difference (13.7 ± 2.4 s for the boys vs 12.2 ± 1.8 s for the girls, $p < 0.001$). The mean duration of PA bouts was 14.1 ± 2.4 s for LPA, 9.8 ± 0.9 s for MVPA, 7.2 ± 0.6 s for VPA and 6.6 ± 0.8 s for VHPA. A significant gender difference was found for LPA and MVPA ($p < 0.05$). For the whole population, 81% of MVPA bouts, 88% of VPA bouts and 96% of VHPA bouts lasted less than 10s. VPA and VHPA bouts represented $45.6 \pm 17.4\%$ of the daily amount of PA, while time spent in VPA and VHPA represented 3.7% of PA time. For intensity from MVPA to VHPA, there is a decrease of the number of physical activity bouts with respect to their duration. Boys showed significant higher bouts of 10 and 15s in VHPA than girls. Discussion/ Conclusion. Boys were significantly more active than the girls and spent a longer time in high and very high intensity activities than girls. Our results are comparable to those reported in the literature^{3,4}. Using a 5-s epoch, VPA and VHPA are captured and not diluted in MVPA or LPA, as the majority of bouts lasted between 5 and 10s, and children's PA patterns were therefore thoroughly assessed. Girls had not the same PA patterns than boys. Sex-related differences were found in the duration of MPA to VHPA bouts. Boys sustained a significantly higher number of bouts in MVPA (from 5 to 60s durations), in VPA (from 5 to 30s durations) and VHPA (from 10 to 15s durations). 81% of the boys reached the Healthy People 2010, Objective 22.65, while only 65% of the girls did, suggesting that at this early age, there is a need to improve physical activity,

Table 1. Physical activity time spent at different intensities and number of bouts of physical activity following intensity for school days and free days. Number of bouts (n)5s

	<1.5 METS	?1.5 METS	?3 METS	?6 METS	?9 METS
Boys	684±35	155±35??	77±9???	34±19	16±11
Girls	701±26??	138±26	65±15	28±16	14±9
	205±51??	338±66	256±61?	177±102	117±9710s
	100±23?	146±28	93±23?	47±28?	20±13?15s
	65±14?	71±15?	38±12???	15±10 ?	4±3?20s
	46±9	40±10??	19±7???	6±4??	0.4±0.530s
	26±5	15±5??	6±3???	1.1±1.0???	0.2±0.360s
	85±15	32±12??	10±5???	1.2±1.1	0.2±0.4?:

notably for the girls. Time spent at different intensities (min) significantly different between boys and girls at $p < 0.05$, ?? at $p < 0.01$, ??? at $p < 0.001$. References. 1Baquet G, Stratton G, Van Praagh E and Berthoin S. Improving physical activity assessment in prepubertal children with high-frequency accelerometry monitoring. *Prev. Med.* 44: 143–147, 2007.2Pate RP, Pfeiffer KA, Trost SG, Ziegler P and Dowda M. Physical activity among children attending school. *Pediatrics* 114: 1258–1263, 2004.3Reilly JJ, Jackson DM, Montgomery C, Kelly LA, Slater C, Grant S and Paton JY. Total energy expenditure and physical activity in young Scottish children: mixed longitudinal study. *Lancet* 2004, 363(17):211–212.4 Montgomery C, Reilly JJ, Jackson DM, Kelly LA, Slater C, Paton JY and Grant S. Relation between physical activity and energy expenditure in a representative sample of young children. *Am. J. Clin. Nutr.* 2004, 80(3):591–596.5 Pate R, Freedson P, Sallis J, Taylor W, Sirard J, Trost S and Dowda M. Compliance with physical activity guidelines: prevalence in a population of children and youth. *Ann. Epidemiol.* 2002, 12:303–308.

**THE PREVALENCE OF OVERWEIGHT,
OBESITY AND UNDERWEIGHT AND CHANGES
IN GRIP STRENGTH, STANDING BROAD JUMP
AND 20M MULTI-STAGE SHUTTLE RUNS
PERFORMANCE IN 9–10 YEAR OLD LIVERPOOL
SCHOOLCHILDREN: 1998–2006**

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The aim of this cross sectional 8-year study was to examine the prevalence of overweight, obesity and underweight and changes in the performance in 3 EUROFIT tests known to be affected by body mass in 9–10 year old Liverpool schoolchildren over time. Data were generated by the Liverpool SportsLinx field based motor fitness testing sessions. Body mass and stature data were used to calculate body mass index (BMI). Quartile thresholds for BMI were calculated and grip strength (GS), standing broad jump (SBJ) and 20m-multi stage shuttle runs (20m-MST) data were grouped by BMI quartile. Data were available on 26785 participants (n = 13640 boys, and 13145 girls) over the 8-year period. Year on year increases in overweight and obesity were apparent. Increases in the prevalence of overweight and obesity show signs of a plateau over the three most recent study years in boys and girls. Underweight fluctuated over the study period, showing no clear association with obesity or overweight prevalence. All three EUROFIT tests showed declines in performance over the 8-year period regardless of BMI quartile, in boys and girls, suggesting that declines may not be solely attributed to changes in BMI. Whilst much research is continuing to focus on physical activity and behaviour change, this study demonstrates that fitness is also a whole population issue and should not be overlooked in current health related research in children.

CHARACTERISTICS OF OBJECTIVELY MEASURED PHYSICAL ACTIVITY IN CHILDREN AGED 4 TO 6

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Aim: To establish an objective measure of physical activity in children aged 4 to 6 and relate such physical activity to age, sex, month of the year and body mass index (BMI). **Methods:** We studied 256 children (130 girls and 126 boys) aged 4 to 6 years attending the Copenhagen Prospective Study on Asthma in Childhood (COPSAC), a cohort of children born to mothers with asthma. The children were examined at ½-year visits at the clinical research unit from birth. An accelerometer (Actical®, MiniMitter®) was placed on the ankle to be worn for 28 days. A mini-mum of 7 days and minimum 20 hours per day were accepted in the analysis. **Results:** The overall mean level of physical activity for all children was 492 activity counts per minute; 528 for boys and 456 for girls. The accelerometer was worn for an overall mean of 26 days. Age was found not to be significantly connected with physical activity ($p = 0.58$). Boys had a significantly higher level of physical activity than girls ($p < 0.0001$). Month of the year was significantly associated with physical activity in a quadratic relationship; highest during summer and lowest during winter ($p < 0.0001$). BMI and physical activity was found not to be associated ($p = 0.87$). **Conclusions:** Physical activity was significantly associated with gender and season, but independent of BMI and age in children aged 4 to 6.

COMPARISON OF TRAINING LOADS BETWEEN TWO PARTICIPATION LEVELS, APPARATUS AND TRAINING PHASES OF FEMALE GYMNASTS

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Aim. The primary aim was to determine the effects of participation level (international and national levels), apparatus (beam and floor) and training phase (pre-competition and competition) on estimates of training load among female artistic gymnasts aged 7 to 13 years. **Methods.** Twenty-five gymnasts from an international ($n = 12$; 9.25 years [± 1.86]) and national ($n = 13$; 9.77 years [± 1.24]) levels program were assessed during two training sessions in both pre-competition and competition phases of training on the balance beam and floor apparatus. Video analysis was used to determine the frequency of observed gymnastic-specific movements including estimates of, ankle and wrist impacts, landings, balance-related skills, and rotations. Additional movement analysis for vertical accelerations and total steps was provided by an accelerometer placed on the gymnasts' iliac crest (GT1M, Actigraph LLC, model 5032, Fort Walton Beach, Florida). To further estimate training load, 16 gymnasts performed additional skills, common to both groups, on a portable force platform (Quattro Jump 9290AD, Kistler Instruments Corp., Amherst, NY). Statistical analysis consisted of two-sample t-tests for differences between participation level, apparatus, training phase and baseline descriptive data. The effects of participation level, apparatus and phase on gymnastics movements were then explored using correlation, three-way ANOVA, and linear regression. **Results.** Linear regression analyses were conducted following significant correlation coefficient effects. Explained variance was weak to moderate ranging from 34% to 51%. Therefore, other factors in addition to participation level, apparatus and training phase must have influenced the dependent variables. The extent to which participation level, apparatus and phase explained variance in movement was skill-specific. Three-way interactions were observed for ankle impacts ($F[1,180] = 18.925$, $p < 0.0001$) and landings ($F[1,173] = 4.831$, $p = 0.006$). Two-way interactions were strongest for group by phase interactions as

significance was achieved for all dependent variables with the exception of accelerations. Group was the strongest main effect variable as it was statistically different for all dependent variables. No significant differences in peak ground reaction forces (PGRF) were observed between ankle and wrist impacts of international and national gymnasts for any of the selected skills on the force platform. However, the floor apparatus routinely exposed gymnasts to greater forces relative to bodyweight than the beam. Similarly, the lower extremity was exposed to greater PGRF than the upper extremity, across both apparatus. Conclusions. This study has shown that differences exist in estimates of training load in regard to participation group, apparatus and periodised phase of training. International gymnasts were exposed to a higher frequency of impacts than national gymnasts across both apparatus throughout the periodised program. This effect is even more pronounced with the heightened hours of training each week associated with the higher skilled group. Coaches must be aware that frequent incidences as well as magnitudes of impacts lead to a greater need for injury prevention measures. The high mechanical loading of the lower body regions must be closely monitored to ensure the longevity of athletes and minimize the risk of chronic injuries. In the present study, the international level gymnasts followed a more refined periodised training program. Markers of a quality periodised program, such as greater variation in training load (intensity and volume) between phases, maximize the opportunity for peak performance during competition and concurrently minimize the potential for overtraining or under recovery.

CAN A 12-WEEK, 'WHOLE SCHOOL' INTERVENTION INCREASE PRIMARY SCHOOL CHILDREN'S PHYSICAL ACTIVITY?

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Aim: The purpose of this study was to determine whether a 12 week multi component whole school, physical activity intervention could increase primary school children's moderate-to-vigorous physical activity (MVPA). **Methods:** All children attending a school in the northwest of England were subject to the intervention components, which included a period of health related physical education, playground equipment and training intervention, pedometer use and policy change. Each component was introduced periodically over 12 weeks. Twenty children (aged 7–11 years) wore accelerometers for 5 consecutive weekdays during baseline in September 2006 and at follow up in January 2007 to monitor their MVPA. In addition, process evaluation was conducted through child focus groups and teacher interviews. **Results:** Due to the small sample size, boys' and girls' data were analyzed together. During the follow-up measurement period, children accumulated 8.16 minutes more MVPA during the school day (9am-3:30pm) than at baseline. The mean (SD) MVPA at baseline and follow-up was 26.46 (10.51) and 34.62 (11.48) minutes respectively. With the minimal clinical effect calculated as 2.67 minutes, the increase in MVPA was almost certainly beneficial ($Q = 99.2\%$). Interview and focus group data support this finding as both children and teachers thought that the intervention was successful in increasing children's physical activity. The teacher also commented that the intervention was 'sustainable' and could 'feasibly be used in other schools'. **Conclusion:** The school is an important environment for the promotion of healthful physical activity in children. A 'whole school' approach may be an effective way of increasing children's physical activity during the school day. While these findings hold promise, further study is needed to determine the sustainability and feasibility of this approach on a larger scale.

MOTOR PROFICIENCY, AGING AND PARTICIPATION IN PHYSICAL ACTIVITIES: IS THERE AN ACTIVITY-DEFICIT OVER TIME?

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Aim: It was been noted that children with poor motor proficiency (MP) have lower levels of physical activity than others (1,2). It is not clear, however, when this activity deficit emerges or whether it continues to widen throughout childhood. **Methods:** We measured physical activity (PA) and motor proficiency (MP) in a large (n=1382) sample of children ages 10 to 11, and conducted follow-up assessments of PA at half-yearly intervals for 2 years. We used the Bruininks-Oseretsky Test of Motor Proficiency (short form) to assess MP and the Participation Questionnaire (4) to measure participation in a range of organized and free-time activities. We used mixed effects modeling to examine the effect of MP on change over time in PA. **Results:** PQ and MP were significantly correlated cross-sectionally ($r=0.12$, $p<0.001$), indicating that a difference in PA exists by approximately age 10. PA declined over time at all levels of MP; a time by MP interaction in the mixed-effects model was not significant ($B=0.003$, $df=1333$, $p=0.28$), indicating that these trajectories are parallel rather than diverging. This was true of organized and free-time PA, as well as the aggregate measure. **Conclusions:** Our results are consistent with previous work indicating that differences in PA emerge early in life. Although PA declines similarly across the MP gradient, children with poor motor skills had a lower level of PA at the study baseline and thus are at increased risk of negative effects related to hypo-activity. Interventions in early childhood may be needed to prevent the development of sedentary habits. (1) Bouffard, M., Watkinson, E. J., Thompson, L. P., Causgrove Dunn, J. L., & Romanow, S. K. E. (1996). A test of the activity deficit hypothesis with children with movement difficulties. *Adapted Physical Activity Quarterly*, 13, 61–73. (2) Wall, A. E. (2004). The developmental skill-learning gap hypothesis: Implications

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MATURITY-ASSOCIATED VARIATION IN BODY SIZE, FUNCTIONAL CAPACITIES AND SPORT-SPECIFIC SKILL TESTS OF MALE BASKETBALL PLAYERS 14–15 YEARS

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Objectives: To estimate the contributions of body size and pubertal status to variation in the functional capacities and sport-specific skills of basketball players. **Methods:** The sample included 59 players 14.0 to 15.9 years from the midlands of Portugal. Height and weight were measured and stage of pubic hair (PH) development was assessed at clinical examination. Six tests of functional capacity were administered: squat jump and counter-movement jump, 60-second sit-ups, 2-kg ball throw, hand grip strength, 20-meter multistage shuttle run. Four tests of skills were administered: shooting, passing, dribbling and defensive movements. After testing the effect of sexual maturity on body size and motor variables, multiple linear regression procedures were used to estimate the contribution of age, stage of sexual maturity, height and weight to the six indicators of functional capacity and to the four basketball-specific skills. **Results:** Age, height, weight, maturity and the weight x height interaction term explained 18% to 33% of the variance in five of the six tests of functional capacity. Age was a significant predictor for four items while maturity was a significant predictor for one; height was not a predictor for any. Weight and the

weight x height interaction term were predictors in four and three tests. Body size accounted for 40% and 39% of the variance, respectively, in the two time-based skills. Height and the weight x height interaction accounted for only 10% of the variance in passing, while there were no predictors of shooting. Conclusions: Functional capacities and specific skills appear to be independent of pubertal status, specially after controlling for body size. In addition, age, height, weight and the weight x height interaction term were significant predictors, suggesting that an optimal combination of height and weight is important in adolescent basketball players.

COMPARATIVE ANALYSIS OF ABILITY TO CLIMB A POLE IN MIDDLE SCHOOLS IN NOTHERN ITALY

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Aim. Life styles of boys and girl in the ages 11 to 13 are radically changed from 30 years to today. Many of them don't move themselves and spend many periods of their leisure time in static games (playstation, gameboy, computer etc). The purpose of this study is to show that in this ipo-chinetic situation capacities of condition and motor global coordination decrease causing a functional impoverishments. Specifically this study show how, among 30 years to today, ability to climb to a pole is sensitively reduced both in boys and in girls from 11 to 13 years old. **Methods.** The study has been conducted in North of Italy with many groups of 10–13 years old students (Total 498, 249 males and 249 females) compared with 30 years ago situation (Total 1078, 538 males and 540 females). The data about tests of climb have been collected through the scolastic system after a climb test submitted to boys and girl from 11 to 13 years old in the middle schools. Climb test has been proposed in the cities and gyms (the same of 30 years ago) in this way: every student, in front of the pole, was asked departing from earth and trying to overcome the medium pole height (2 mt.) with both feet. The test has been considered valid when: • such goal was honored in way not dependent from the technique of execution of the climb • student, overcome once the medium pole

height with both feet, was able of returning to earth with a good motor control letting himself/herself go down slowly. Results. After 30 years meaningful differences are noticed in the weight, in the height and in the BMI. BMI data has been compared with the NCHS Growth Charts and we noticed that today occurs conditions of overweight in 42% of the 11 year-old, 38% of the 12 year-old and 32% of the 13 year-old boys and girl. For what it concerns to the ability of climb to the pole we notice, after 30 years, a loss of ability in every band of considered age. In some schools it was not possible to reach a taller number of students because the climb equipments were unusable and dangerous. Tab.2 point out the increase of the percentage of failure in the test of climb and the statistic indexes of correlation among the six groups of students. Conclusions. The reduction of leisure time due to the study, the increase of static games, the lack of motor activities in natural environment and the lack of realization of the scholastic programs with many exercises to the great physical education equipments for climbing, they are the causes that, to our opinion, have conducted to a reduction of the ability of climb. In order to find a possible solutions to these problems it is possible purpose: •to increase physical activity inside the scholastic system (more than the actual two hours of physical education for week!); •to invite teachers in their didactic plannings to purpose more exercises about learning of the climb as ability, gesture and action useful in all life span; •to ask to the scholastic directors to improve the purchase of gymnastic equipments and to guarantee an ordinary maintenance to the equipments devoted to the climb and learning and control of the traslocazionis against gravity .

SEXUAL DEVELOPMENT DISORDERS IN SCHOOL-AGE BOYS – THE STUDY OF RIGA STRADIŅŠ UNIVERSITY IN THE PERIOD OF 2005–2007

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Changes in social and economical factors call for the necessity to follow up the changes of the human body forms and functions, as well as to test, whether the boys in Riga city are seen to have changes in the physical development in this century, since in the last ten years the physical and puberty parameters of boys in Latvia have not been defined. Therefore, in 2005 the Institute of Anatomy and Anthropology started a study on “Evaluation of Riga school-age boys physical development in the turn of the century”. Anthropometrical measurements were carried out in Riga schools of 550 boys at the age from 7 to 18 years. In parallel to the anthropometrical measurements, the assessment of sex signs was done. One of the sex sign is the development of testes, therefore their thickness of saggital size was measured. During the study it was stated that the testes growth is gradual, reaching the maximum at puberty, at the age of 13–14 years. Several pathologies were identified during measurements. The most common of them: cryptorchidism (absence of both testes in the scrotum), which makes 6,54% of the total number of measured boys. Most commonly bilateral cryptorchidism was seen – 19 cases or 52,78%, 12 cases – left side cryptorchidism or 33,33%, 5 cases – left side cryptorchidism or 13,89%. Other pathologies, such as pseudocryptorchidism (unilateral or bilateral) or cystic changes in testicular tissues were seen. The measurements are still going on.

ANALYSIS OF BODY COMPOSITION IN PRESCHOOL CHILDREN FROM POZNAN, POLAND

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The aim: The aim of this study was to assess the body composition in preschool children from Poznan, Poland. Methods: The studied population included 214 children aged 4,7 to 6,7 years attending preschools in Poznan, Poland. Body height and weight were measured and body mass index (BMI) was calculated. To assess weight, height and BMI, percentile growth charts for Poznan children were used. The cut-off values for body height and weight were below the 3rd percentile and above the 97th percentile. Body composition was determined using bioelectrical impedance analyzer. The measurements included: fat free mass (FFM), fat mass (FM), muscle mass (MM), total body water (TBW), extracellular water (ECW) and body cell mass (BCM) expressed in absolute terms in kg and as percentages of body weight (%FFM, %FM, %MM, %TBW, %ECW, %BCM), and also intracellular water expressed as percentage of body weight (%ICW). The population was analyzed either according to the variable age-gender or gender alone. Correlation coefficients between BMI and body composition indices were calculated. The statistical analysis was carried out by means of the SPSS 12.0 PL for Windows computer programme. Results: Gender had statistically significant impact on percentages of children in different categories of %FM. More boys than girls (20.7% vs 14.3%) had 20% or less %FM and more girls than boys (85.7% vs 79.3%) had >20.0%FM. There were no gender differences in BMI. Only 4.1% of girls and 5.2% of boys was overweight and 3.4% of boys was obese. The variable age-gender had statistically significant impact on children's height, weight, FFM, FM, MM, TBW, ECW, %ECW and %ICW. The boys in all age groups were taller and heavier than girls. FFM, FM, MM and TBW were higher in boys in all age groups. BMI was highly significantly correlated with FFM, %FFM, FM, %FM, MM and %MM in both girls and boys. Conclusions: Although the percentage of children with overweight or obesity was low, a substantial percentage of preschoolers had high %FM. Detailed assessment of body composition should be the part of population studies in Poland. Standard

reference values or charts for assessing body composition in preschool children should be worked out.

SHORT-DURATION PATTERNING OF PHYSICAL ACTIVITY AND BIOMECHANICAL WALKING EFFICIENCY IN LEAN AND OVERWEIGHT CHILDREN

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Aim. Walking is an essential daily practice. It has been shown to account for differences in fat-mass gain in adults (Levine et al. 2005) and constitutes 80% of children's daily physical activity (Bailey et al. 1995). The primary purpose of this study was to examine the relationship between physical activity and walking economy during free- and paced on-ground walking in lean and overweight children. We hypothesized that (i) there would be a positive linear relationship between physical activity and biomechanical walking economy and (ii) there would be a negative, linear relationship between body fatness and walking economy. **Methods.** Thirty-four children with a mean age of 11.3 ± 1.1 who were able to walk independently and without documented disease participated. Eight were over the 90th percentile for BMI. Following anthropometric and body composition assessment, participants completed three trials at a self-selected and 4 km/hr walking velocity. Gait variables were collected using a 6-camera Vicon system and a Kistler force plate. Short-duration physical activity was assessed from 1s triaxial accelerometry data. Specific activity pattern characteristics were derived using cluster recognition algorithms (Velhuis & Johnson, 1986). Walking economy was derived from the biomechanical efficiency quotient (BEQ) algorithm (Kerri-gan et al. 1995). Linear regression was used to assess the relationship between BEQ, physical activity and body composition. **Results.** Negative associations were found between BEQ at 4km/hr walking speed and the total number of daily activity clusters ($r = -0.44$,

$p < 0.05$); as well as with the total time spent being physical activity ($r = -0.39$, $p < 0.05$). Positive associations were found between the rest interval between bouts of activity ($r = 0.38$, $p < 0.05$). BEQ at 4 km/hr showed a notable negative relationship with physical activity level, even after a partial correlation controlled for fatness ($r = -0.31$, $p < 0.05$). Conclusion. This study suggests that biomechanical walking efficiency has a moderate relationship with characteristics of physical activity in able-bodied children and is influenced by fatness. References. Bailey R et al. (1995). *Medicine and Science in Sports and Exercise*, 27, 1033–1041. Kerrigan et al. (1995). *American Journal of Physical Medicine and Rehabilitation*. 74(1): 3–8, 1995 Levine J et al. (2005). *Science*, 28, 584–586. Velduis JD and Johnson ML. (1986). *American Journal of Physiology*, 250:e486–493.

PERCEIVED AND MEASURED FATIGUE OF LUMBAR MUSCLES IN COMPETITIVE, MASTER, AND FIN SWIMMERS

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Increase of training loads in young athletes performing aquatic sports is related with increased injury rate. The lumbar muscles and shoulder joint are the principal localization of injuries. Each aquatic sport, differently stress the spine. Objective of the study is to investigate the influence of the aquatic sports practice on measured (surface EMG median frequency decay per minute) and perceived fatigue of lumbar muscles (Borg CR-10 Scale of Perceived Excerption). The experimental design was to test three groups of swimmers were compared with t-tests for paired samples. The tests were performed on the side of an indoor pool. The groups were composed as following: 1) competitive swimmers ($n = 31$) 2) master swimmers ($n = 15$) and 3) fin swimmers ($n = 18$). Main outcome measure were median frequency decay of the surface EMG and Borg CR-10 ratings during a modified Biering-Sorensen test. Results: Female master swimmers showed less EMG (objective) fatigue of lumbar muscles than female competitive swimmers ($t = 4.6$, $p = 0.010$). Female fin swimmers show less EMG

(objective) fatigue than female competitive swimmers ($t = 2.9$, $p = 0.027$). No statistical significant difference was found in EMG between female master and female fin swimmers. Perceived fatigue was less pronounced in male fin swimmers than in male master swimmers ($t = 2.6$ $p = 0.048$). Male competitive swimmers didn't show any significant difference from master and fin swimmers. Consent from the subjects was obtained after the explanation of the aims, procedure and modalities of the test. Conclusions: In general, older swimmers experienced less fatigue of the lumbar muscles. Specific adaptations induced by the sport causes a better tolerance to lumbar muscles fatigue in fin swimmers.

CORRELATES OF MOTOR TALENT IN A SAMPLE OF 12-YEAR-OLD PORTUGUESE SOCCER PLAYERS

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Youth Soccer players classified as possessing high and low levels of sport ability tend to differ in body size (Malina *et al.*, 2000). Classifications of players as talented are based upon coach evaluation comprising a substantial degree of subjectivity. Taking into account the complexity in quantifying skills in sports, the present study converted soccer specific tests to a composite score used to classify 12-year-old players into tertiles and then evaluated contribution of age, sexual maturity, somatic maturation given by % of estimated mature stature, body size, adiposity, strength, anaerobic performance and endurance on skill levels.

The sample consisted of 54 male players (12.0–13.0 years). Height, weight and four skinfolds were measured and stage of pubic hair assessed. Predicted mature stature was determined (Khamis & Roche, 1994, 1995). Tests of functional capacities included the 10×5-meter agility, vertical jump (squat and counter-movement protocols), 7×34-meter sprint (Bangsbo, 1994), YO-YO intermittent endurance run (Bangsbo, 1994). Tests of soccer-related manipulative skills were ball control with the body, dribbling speed, shooting

accuracy and passing accuracy (Coelho e Silva *et al.*, 2004). Number of sessions and minutes of practice in training and games were collected during the previous season. After comparing players placed above the 3rd tertile and below the 1st tertile of the composite variable [sum of Z-scores for each skill test], discriminant function analysis was performed to predict group membership. Multiple linear regression was used to estimate the contribution of sexual maturity, % of mature stature, height, weight and height x weight interaction and functional capacities to variation in skills.

Players who attained better scores in skills also obtained better performances in the 10x5-meter shuttle-run test, anaerobic performance, endurance, practiced more minutes, played more games and minutes and were injured more times. No significant differences were found in body size, lower limb power strength. Although in the margin of significance [$p=0.11$, $n=36$], a combination of 14 variables correctly predicted 83% of the players [$rc=0.73$, Wilks' Lambda=0.470, Chi-square₍₁₄₎=20.365]. Agility, 7 sprints, number of games, endurance and playing time presented correlations over 0.40 with the linear function. Approximately 21% to 65% of the variance in soccer skills was accounted for by age, maturity, body size and functional capacities: a) *Ball control*, 25%: sexual maturity, percentage of mature stature, 10x5-meter agility; b) *Slalom M-test*, 67%: age, 10x5-meter agility, anaerobic output; c) *Passing*, 29%: percentage of mature stature, anaerobic output; d) *Shooting accuracy*, 26%: weight and anaerobic output.

In summary, within 12-year-old pubertal soccer players, motor expertise seems to be a combination of age, maturity and anaerobic fitness. In addition, skill level is related to playing time and minutes of practice. Strength and body size failed to predict a substantial portion of variance in soccer skills emphasizing the potential influence of other variables such as coordination and perceptual skills.

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EPIDEMIOLOGY OF THE PHYSICAL ACTIVITY OF SECONDARY SCHOOL STUDENTS IN MADRID

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Our aim [1] was to know the relationship between physical activity level (PAL) and some demographic, sociologic and anthropometric factors in adolescent (13–17 years). A random sample of 266 boys and 288 girls from 35 educative centres from 16 of the 21 districts of Madrid completed anonymous forms and were measured with anthropometric techniques. Results show that 13.2% of the boys and 36.4% of the girls were inactive or sedentary. The socioeconomic level [SEL] significantly determined the PAL of the girls. The girls had a tobacco consumption [TC] significantly higher than the boys. A significant inverse relationship between TC and PAL was found for boys. Abusive alcohol consumption [AC] was significantly higher in girls than in boys. Nevertheless, for both girls and boys, no relation existed between AC and PAL. Worrying values of screen consumption [SC] –TV, PC and videogames– for the boys was found. A significant relationship between adiposity and PAL in the girls was observed [2]. We concluded that girls and subjects from low SEL should receive high-priority attention regarding health-related habits. SC is a relevant variable due to the current proliferation of multimedia entertainment means. In order to increase the PAL, activities for adolescents and young people in public sport facilities, should be promoted, mainly during weekend-nights. References: 1- Cordente C, 2006. Doctoral dissertation.

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CHARACTERISTICS OF BODILY ADAPTATION IN YOUNG FEMALE SWIMMERS

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Purpose: to determine characteristics and a correlation of physical development, physical fitness, and definite features of functional capacity exhibited by young girls trained in swimming regularly. We studied eighteen 13–18-year-old best Lithuanian swimmers. The first group included eight 13–15-year-old members of the national juniors' team. The second group consisted of ten 16–18-year-old members of the national youth team. The study showed that the girls of the second group, compared to the ones of the first group, were only 4.14 cm higher on average and 9.73 kg heavier ($p < 0.001$). Leading hand force between the groups differed by 5.77 kg ($p < 0.05$). Muscular mass mean exhibited by the second group was significantly higher, the difference between the groups being 3.56 kg ($p < 0.001$). Single muscular contraction power (SMCP), anaerobic glycolytic special power (AGSP) absolute indices differed greatly between the groups ($p < 0.005$). Analysis of anaerobic alactic muscular power (AAMP) data gave a similar picture. The difference between the psychomotor reaction time (PRT) index means was not reliable. However the difference between movement frequency per 10 s means (6.99 movements) reflecting the liability of the central nervous system was statistically reliable ($p < 0.05$). Muscular mass is related to hand force, SMCP, AAMP, and to AGSP absolute indices. However, it is not reliably related to the relative indices of 1 kg body mass power. A reliable relation was found between the absolute and the relative indices of different work duration. Means of functional capacity of the circulatory system indices differed insignificantly.

AGE AND SEX DIFFERENCES IN ISOKINETIC KNEE MUSCLE ENDURANCE BETWEEN YOUNG CHILDREN AND ADULTS

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It has been suggested that females fatigue less than males and that children recover faster than adults from repeated bouts of high intensity exercise (Hicks et al.). However, no studies appear to have examined the age and sex associated differences of repeated isokinetic knee extension and flexion in young children and adults. 51 participants consisting of 30 young children (16 boys and 14 girls) aged 12.2 ± 0.3 y and 21 adults (9 males and 12 females) aged 29.7 ± 5.6 y agreed to participate in the study. Isokinetic concentric peak knee extension (PET) and flexion (PFT) torque were measured using a calibrated Biodex System 3. Participants performed 4 concentric extension/flexion cycles with maximum effort, a 1min rest was given and then 50 continuous concentric cycles were performed. Range of motion was 90° and testing occurred at $1.56 \text{ rad}\cdot\text{s}^{-1}$ for all trials. Participants were encouraged to give a maximal effort for each action by using both visual feedback and strong verbal encouragement. Isokinetic PET and PFT were gravity corrected and windowed to only include constant velocity periods. Extensors and flexors total work for the complete 50 repetitions was recorded. Average peak torque and average work for the first and last 3 repetitions were calculated with the percentage difference between these values expressed to represent percentage decline in torque and work. Age and sex associated differences were examined using a 2 (sex) \times 2 (group) ANOVA. Variables examined were total work, percentage decline in PET, PFT, and percentage decline in work for extensors (WkET) and flexors (WkFL). Differences in PET and PFT from the maximal trial and the endurance trial were examined by sex and group using a paired sample t-test.

	Boys	Girls	Men	Women
Total WkET(J)	2682 ± 496\$	2673 ± 490	6622 ± 842	4377 ± 600
Total WkFL (J)	1413 ± 290\$	1316 ± 292	3444 ± 605	2223 ± 542
Total WkET (J/kg-1)	67 ± 11*	60 ± 11	82 ± 8	71 ± 10
Total WkFL (J/kg-1)	37 ± 8*	31 ± 6	43 ± 8	39 ± 12%
Fatigue PET	39 ± 12*	42 ± 11	60 ± 9	59 ± 9%
Fatigue PFT	51 ± 11*	49 ± 6	67 ± 7	62 ± 10%
Fatigue WkET	42 ± 12*	44 ± 12	62 ± 9	60 ± 9%
Fatigue WkFL	61 ± 10*	58 ± 8	72 ± 8	66 ± 8

* Significant main effect for age ($P < 0.05$)\$

* Significant interaction effect ($P < 0.05$).

There were no significant differences between groups in the peak torque generated during the pre-trial and endurance task suggesting participants gave a maximal effort at the start of the endurance task. There was a significant interaction effect in the total work done for both extensors and flexors with adult males producing the greatest amount of work. However, when total work was divided by body mass there were no significant interaction effects and only main effects for group. Adults seem to be able to produce more work even when body size is controlled for and this may be a function of muscle size. The percentage decline for PET and PFT and WkET and WkFL demonstrated only significant main effects for group. The greater % fatigue in adults may be attributed to a function of initial torque magnitude and is in agreement with others (Pincivero et al., 2001). We found no significant sex effect except for total work done, although this became non-significant when body size was controlled for. These data suggest that the ability to sustain repeated bouts of muscular exercise is similar in 12-year-old boys and girls and adult males and females. This study concludes that females do not resist fatigue from repeated isokinetic muscle actions to a greater extent than males and that the greater fatigue in adults compared to children is probably a product of greater initial torque production. REFERENCES. Hicks et al. (2001). *Excerc Sports Sci Rev* 29: 109–112 Pincivero et al. (2001). *Med Sci Sport & Exerc* 33: 334–338

THE INFLUENCE OF PEERS AND PARENTS IN THE PHYSICAL ACTIVITY OF THE ADOLESCENTS OF MADRID

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OBJECTIVES: To know the influence of the surroundings (peers and parents) on the level of physical activity (LPA) of adolescents (mean= 15 ± 0.3 years old) in Madrid. **METHODS:** A sample of 554 subjects (288 girls and 266 boys) was selected randomly in 35 educational centers of Madrid. The subjects were measured and surveyed anonymously, after written consent of the parents. **RESULTS:** The survey showed that usually both parents have similar attitude towards physical activity. With regard to the boys, their LPA was significantly influenced ($p=0.034$) only by the LPA of the father. None of the other possible influences on the LPA were significant for the boys. Regarding the girls their LPA was significantly influenced by more factors. Specifically it was found that for the girls the order of importance was the LPA of the father ($p=0.003$), the mother ($p=0.007$) and their friends ($p=0.022$). **CONCLUSIONS:** The physical activity of the girls was easier to influence than that of the boys. The family plays a fundamental role in the LPA and, probably, in the other aspects of risk [2]. The parents, deliberately or not, have the most influence in the life of their children. The influence of other social contexts (mass media, peers, school...) are filtered by the family, who can amplify or diminish their effects and influences, be these negative or positive. We conclude that the promotion of the physical activity in parents is fundamental if we want their children to be active.

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JUMP POWER CHANGES IN GIRLS AND BOYS DURING GROWTH AND DEVELOPMENT

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Aim: Muscle performance during growth has been studied using different testing procedures. In the lab, various cycle ergometer tests have been used to measure leg short-term power output. However, most of the studies included a small sample and have been traditionally limited to young males. In large-scale population surveys, because of its practicability, jumping field tests have been more often used than lab measurements of jump power output. Vertical jump (VJ) height by means of a single maximal jump has been widely interpreted to indicate maximal (“explosive”) muscular power. The purpose of this cross-sectional study was to investigate age- and sex-differences in muscle capabilities during growth in a large population. **Methods:** Seven hundred and ninety children and adolescents aged 9–19 years (383 girls and 407 boys) volunteered for this study. After a squat jump was performed, a squat jump index (SJI) was calculated as follows: $SJI (N \cdot m) = \text{body weight} \times \text{jumping height}$. Lean leg volume (LLV) was determined by anthropometry. **Results:** Anthropometric characteristics and jumping performance were comparable until mid-adolescence, from then on significant sex-differences were observed. An allometric regression analysis indicated that LLV explained the major part (around 76% in girls and 88% in boys) of the variance of jumping performance. The data of dimensional analysis indicate that squat jump height should theoretically be independent of body dimensions. Therefore, the squat jump index (jump height \times body weight) should be proportional to LLV. However, in males, but not in females, the LLV exponent was higher than expected. **Conclusion:** In males, although during the growth period muscle performance is strongly related to anthropometric characteristics, other undetermined factors, such as fiber type variability, neuromuscular factors and improved motor coordination, must be considered. The results of the present study agree with previous studies on short-term muscle power measured in the laboratory. The squat jump index can be used in large-scale developmental prospective studies on short-term muscle performance.

THE EVALUATION OF PHYSICAL EDUCATION TEACHERS OPINIONS FOR NEW PHYSICAL EDUCATION AND HEALTH CURRICULUM IN NORTH CYPRUS

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General education system in North Cyprus related to the contemporary education systems in Europe, search for transformation in every area of education-instruction process. The aim of this study to describe and identify the opinions of physical education teachers in North Cyprus for the new physical education and health curriculum and to evaluate the application of new program in schools. The sample of this study which represent the population of physical education and sports teachers in North Cyprus are 21 female and 32 male ages between 22–50 years old. Five scale likert questionnaire with 36 questions and SPSS 12.0 statistical packet program were used in this study. Frequency (f) and percentage (%) analysis were used for the opinions about the new physical education and health lessons and evaluation of the utilization level of the new physical education and health program. According to the results of this study, physical education teachers were mostly agree with the suitability of general aims of this program (%73.6), increasing socialization between students (%78.8), participation of students to new program (%78.8), increasing the creativity of students (%88.5). Physical education teachers mostly wanted to identify the separation of coaches and teachers duties in schools (%94.3) finally they had an opinion that physical education technologies are insufficient in North Cyprus elementary schools (%71.2). Key words: School sports, Physical Education, Curriculum, North Cyprus

HOURLY-BY-HOURLY WEEKDAY PHYSICAL ACTIVITY PATTERNS OF LIVERPOOL BOYS AND GIRLS

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Aim. The study aimed to establish during which times of the day Liverpool children were most and least active. Boys' and girls' physical activity levels were also compared. **Methods.** Fifty-eight school-children (31 boys, age = 8.6 y, BMI = 19.5 kg·m⁻²; 27 girls, age = 8.4 y, BMI = 19.6 kg·m⁻²) wore ActiGraph accelerometers during waking hours for four consecutive weekdays and data were recorded and stored every 5 s. On the fifth day data were downloaded and analyzed on an hour-by-hour basis using established cut-points to represent the number of minutes spent in moderate-to-vigorous physical activity (MVPA). Repeated measures and one-way ANCOVAs determined hourly and sex differences in MVPA, respectively. **Results.** Over the whole day boys spent 11 more minutes in MVPA than girls (76.4 ± 19.7 min vs. 65.4 ± 17.6 min, $p = .027$, ES = .75). There was a main effect for hours ($p = .001$) with children recording most activity between 12–1pm (9.3 ± 4.5 min), 3–4pm (8.5 ± 3.7 min), and 8–9am (7.1 ± 4.4 min). The smallest amounts of MVPA were recorded before 8am and during the late evening (8–10pm). Sex differences in MVPA occurred between 10–11am (boys = 6.0 ± 3.0 min; girls = 4.3 ± 2.4 min, $p = .024$, ES = .61), and 12–1pm (boys = 10.6 ± 4.9 min; girls = 7.8 ± 3.4 min, $p = .015$, ES = .65). **Conclusions.** Most MVPA was accrued during lunch-break, and immediately before and after school. These data support the notion that children can accumulate meaningful amounts of MVPA during unstructured physical activity contexts such as playtime and active commuting. During free play periods boys may have been more active than girls because of the types of play activities that the respective sexes typically engaged in. While the school environment has great potential for physical activity promotion, interventions should recognize the often diverse nature of boys' and girls' activity behaviours.

RELATIONSHIP BETWEEN CLASSIFICATION LABELS OF OVERWEIGHT OR OBESITY AND MOTOR PERFORMANCE IN BOYS AGED 11–13.

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Background: Childhood overweight and obesity are critical biological states. The growing child may get accustomed to a hypoactive lifestyle, that would then generally associated with poorer motor performance. The usage of this labels, however, is not uniform. Zsidegh et al. (2006) found significant differences in the prevalence of overweight and obesity by using the percent fat (Lohman 1992) and the BMI (Cole et al. 2000) categories for the classification of 9–10-year-old boys. **Aim:** The purpose of the study was to compare the motor performance scores in Cypriot, Hungarian and Malaysian boys grouped by the cut-off values of BMI and fat percentage. **Methods:** Overweight (G1, G3) and obese (G2, G4) 10–13-year-old volunteer boys (N=1195) were investigated between 2003 and 2005. Height, body mass and 5 skinfold thicknesses were measured. Grouping bases were: calendar age, cut-off percent body fat according to Lohman (G1, G2) and cut-off values of BMI according to Cole (G3, G4). Physical performance was estimated by the scores in 30 m dash, 1200 m run and standing long jump. Differences in prevalence were compared by Chi-squares, mean group differences were analysed by t-tests for independent samples ($p < 5\%$). **Results:** There were no significant differences in the prevalence of overweight boys. Significantly lower fat content, body mass, BMI and better motor performances were found in G1, compared to G3 of the same age. Significantly greater body mass and BMI were typical in the G4 groups of all ages, while motor performance was very low and homogeneous independent of classification. **Conclusion.** The two classifications did not result in differences of motor performance in the obese children. The two approaches showed significant differences both in the anthropometric and motor characteristics in the overweight boys. The classification by fat percentage seems to be more sensitive for kinanthropometric studies.

YOUTHS AND THE ALCOHOL (PILOT STUDY)

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In the modern societies the number of the substance abusers are increasing. The relative incidence of alcohol addiction is fairly high and one of the main current problems of the Hungarian population. Besides, more youngsters consume alcoholic drinks in early ages. In this present pilot study we tried to get information about „drinking habits” of secondary vocational and industrial school youths by questionnaire. The aim was to get data about: – How frequently youth consume alcoholic drinks, – At which age they had the first „alcohol” experience, – If there is any connection between the school type and alcohol consume, – If family „alcoholic anamnesis” has any risk on youngsters’ habits, – To learn the reasons why youngsters consume alcohol, at all. In the questionnaire we had groups of questions about family and school background, about the expectations/demands toward the youngsters, and their opinion about alcohol and the (related) aggressivity. Subjects were altogether 107 suburban pupils (79 boys and 28 girls) from different school types, aged between 14 to 18 years. Of the 107 subjects 72% lived in whole family the others in one parent or broken family. Among juveniles 63% of them drank alcoholic drinks between 10 and 14 yrs for the first time and only 6% had no „alcoholic experience”, at all. Unfortunately, more than 10% of the youths were not particular about the types of the alcohol – they drank whatever they got. Those who happened to be drunken ever, had the „event” at the age of 14–15yrs. Industrial school youths used to drink more beer, secondary vocational/technical school juveniles drank more spirits. 3% of the subjects were „daily drinkers”. The motivation of drinking was primarily the company and „just for fun”, but 15% of the youngsters drank for stress relieving because of family or school problems. Telling by the pupils, parents knew nothing about their drinking, mostly they were prohibited to drink alcohol, at all. Of the respondents 7% drank until getting drunk. In almost one-third of the juveniles’ families alcohol addiction problems were existing, mostly because of the fathers or grandparents. The most important task/ mission of the society to inform the younger generations about the actual and long-term risks of the alcohol consumption on the human organism.

EFFECTS OF A 3-MONTH EXERCISE INTERVENTION ON AMBULATORY BLOOD PRESSURE AND CARDIOVASCULAR DISEASE RISK FACTORS IN PRE-PUBERTAL OBESE CHILDREN

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Aims: There is an urgent need for action to strengthen treatment in obese children to pre-empt the spread of the cardiovascular diseases and diabetes. The aim of this project was to investigate the effects of a 3-month exercise training program on ambulatory blood pressure and cardiovascular disease risk factors in pre-pubertal obese children. **Methods:** This was a randomized controlled trial including 41 pre-pubertal obese children, aged 6 to 11 years, randomly distributed in 2 groups: 1) exercise and 2) non-exercise. The intervention consisted of moderate exercise training (ball games, swimming, walking), three times per week (180 min/week) during 12 weeks. Heart rate was maintained at 55–65% of maximal cardiorespiratory capacity ($\dot{V}O_{2peak}$) using a Polar monitor. There was no dietary intervention. **Measures included:** systolic (SBP) and diastolic (DBP) ambulatory blood pressure during 24 hours (ABPM, Dyasis Integra); body fatness by DXA; $\dot{V}O_{2peak}$ by treadmill test; 7-day physical activity (PA) count by accelerometer (MTI Actigraph); fasting blood lipids (triglycerides, total-, HDL- and LDL-cholesterol), glucose, insulin and CRP levels. **Results:** At baseline, physical characteristics and blood pressure were similar among groups and 47% of obese children had systolic hypertension by ABPM. The prevalence of the metabolic syndrome was 45%. After 3 months of training (table 1), 24-hour SBP ($p < 0.0001$), and DBP ($p = 0.007$), percentage of total fat ($p < 0.0001$) and abdominal fat ($p = 0.019$) decreased, while $\dot{V}O_{2peak}$ increased ($p = 0.006$) in the intervention group, compared to the control group. Blood markers did not change significantly. **Conclusions:** Hypertension and the metabolic

syndrome appear before puberty in a high proportion of obese children. Moderate exercise training during 3-month results in significantly improved ambulatory blood pressure, as well as body fatness and cardiorespiratory fitness. Obese children should be encouraged to participate in moderate physical activities to reduce body fatness and prevent premature cardiovascular complications. Funded by the Swiss National Science Foundation and the Research and Development Fund of the University Hospitals of Geneva

Table 1. Physical Characteristics and Ambulatory Blood Pressure Monitoring Variables

	Intervention Group		Control Group	
	Baseline	3 months	Baseline	3 months
Number (F/M)	22 (13/9)	22 (13/9)	19 (11/8)	19 (11/8)
Age (years)	9.1 ± 1.5	9.4 ± 1.5	8.8 ± 1.5	9.1 ± 1.5
Height (cm)	140.4 ± 7.9	142.0 ± 8.1	135.3 ± 10.4	137.2 ± 10.3
Weight (kg)	50.6 ± 11.8	51.6 ± 12.2	47.1 ± 14.8	49.0 ± 15.6
BMI(kg•cm ⁻²)	25.4 ± 4.6	25.3 ± 4.4	25.1 ± 4.9	25.5 ± 5.2
Body fat (%)	42.6 ± 6.9	41.0 ± 7.0**	42.4 ± 7.1	43.4 ± 7.5
Abdominal fat (%)	50.4 ± 8.1	49.1 ± 7.9*	49.1 ± 7.9	50.3 ± 8.1
VO ₂ peak (ml•kg ⁻¹ •min ⁻¹)	34.4 ± 5.0	36.3 ± 5.4**	36.9 ± 7.1	34.4 ± 6.37 -day
PA (cpm)	306.8 ± 34.2	300.2 ± 83.2	329.4 ± 79.1	272.2±40.2* 24h
SBP (mmHg)	127.6 ± 13.3	120.0 ± 11.5**	121.9 ± 15.8	128.8±18.124h
DBP (mmHg)	73.5 ± 6.9	70.6 ± 5.4*	73.8 ± 8.6	73.5 ± 9.0

ENDOTHELIAL AND SMOOTH MUSCLE DYSFUNCTIONS APPEAR BEFORE PUBERTY IN OBESE CHILDREN AND ARE ASSOCIATED WITH ELEVATED AMBULATORY BLOOD PRESSURE

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Aims: Childhood obesity lays the foundation of cardiovascular diseases (CVD) and impairment of arterial function has been observed in obese adolescents. The aim of this study was to determine whether brachial endothelial (flow-mediated dilation, FMD) and smooth muscle dysfunctions (nitroglycerin-mediated dilation, NTGMD), and remodelling of the common carotid artery (CCA) develop before puberty in obese children. **Methods:** Arterial intima-media thickness, FMD and NTGMD were measured by high resolution ultrasound in 48 obese and 23 lean pre-pubertal children (8.8+/-1.5 years old). We assessed central pulse pressure, incremental elastic modulus (Einc), casual and ambulatory systolic (SBP) and diastolic blood pressure (DBP); body fatness by DXA and VO₂peak by a treadmill test. **Results:** Obese children had significantly lower FMD (4.5+/-4.0 vs. 8.3+/-1.7%) and NTGMD (19.0 +/- 9.0 vs. 25.8 +/- 6.1%), VO₂peak (35.9 +/- 6.6 vs 44.2 +/- 7.8 ml/kg/min), and increased Einc (13.9 +/- 5.2 vs. 10.4 +/- 5.2 mmHg.102), ambulatory SBP (121.3 +/- 12.6 vs. 106.6 +/- 7.1, mmHg) and DBP (69.1 +/- 5.7 vs. 63.7 +/- 4.5 mmHg) than lean subjects, whereas IMT was not significantly augmented. Ambulatory systolic hypertension was present in 47% of obese subjects. Flow-mediated dilation, NTGMD, and Einc were correlated with body fatness, BMI, BP and VO₂peak. **Conclusion:** Impaired endothelial and smooth muscle functions and altered arterial wall materials develop before puberty in obese children, however remodelling of the CCA is not yet present. Arterial dysfunction may be considered as the first marker of atherosclerosis and it is associated with elevated blood pressure. ABPM is a useful tool to detect early hypertension in obese children.

IS PHYSICAL ACTIVITY LEVEL REDUCED IN CHILDREN WITH CHRONIC DISEASES?

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Aims: Physical activity may be reduced in children with chronic diseases due to overprotection, social exclusion, low physical fitness, ignorance or pain. The aim of this study was to compare the physical activity level of children with type 1 diabetes (DM1), obesity, or juvenile idiopathic arthritis (JIA) with that of healthy children. **Methods:** This was a cross-sectional study including 30 children with DM1 (DIAB, 10.5 \pm 2.3 yr), 32 obese children (OB, 9.5 \pm 1.1 yr), 26 children with juvenile idiopathic arthritis (JIA, 10 \pm 2.5 yr) and 122 healthy controls (CON, 9.9 \pm 2.8 yr). We measured the physical activity count and time spent in light and moderate to vigorous activities using an accelerometer (MTI Actigraph 7064) worn at the waist during 7 days (24 hours /day), and the past 12-month leisure-time physical activity using the Modifiable physical activity questionnaire for Adolescents. **Results:** Groups were matched for age, height and gender. Obese children had higher body weight (52.6 \pm 14.0 kg) and body mass index (25.2 \pm 5.4 kg; m⁻²) compared to other groups. Physical activity count was decreased in DIAB (303.9 \pm 104.2, $p=0.011$), OB (308.2 \pm 53.5, $p=0.016$) and JIA children (316.4 \pm 82.2, $p=0.048$) compared to CON (361.3 \pm 125.2). There were no significant differences among the three groups with chronic diseases. The time spent in moderate to vigorous activities was significantly decreased in DIAB and OB, compared to CON. Past 12-month physical activity was significantly reduced in OB (0.6 \pm 1.1, h./week) compared to DIAB (4.0 \pm 4.1), JIA (4.3 \pm 3.2) and CON groups (4.2 \pm 4.6). **Conclusions:** Children with DM1, obesity and JIA have low physical activity level compared to healthy children. Leisure-time physical activity is particularly reduced in obese children. Children with chronic disease should be encouraged to participate in adapted sports programs.

PHYSICAL SELF-PERCEPTIONS IN NON-OVERWEIGHT AND OVERWEIGHT BOYS AND GIRLS

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Aim: Previous research with children and adolescents has found that physical self-perceptions are related to physical activity. Overweight and obese children participate in less physical activity than normal-weight children. This study examined whether differences in physical self-perceptions might be a contributing factor. **Methods:** 231 children (Age mean 9.5, $s = 0.5$) were recruited from 11 local primary schools. Physical self-perceptions were assessed using the Children and Youth Physical Self-Perception Profile (CY-PSPP). Children were measured for body mass and stature to calculate body mass index (BMI) (body mass/stature²). Participants were then classified as non-overweight or overweight/obese according to UK referenced cut-off points. The final sample therefore included 97 boys (52 non-overweight, 45 overweight) and 134 girls (83 non-overweight, 51 overweight). Independent sample t-tests were used to assess differences between groups on all CY-PSPP scales, with separate analyses for boys and girls to allow for gender differences in physical self-perceptions. **Results:** Overweight boys had significantly lower perceptions of sports competence [$P < 0.05$]; physical condition [$P < 0.01$]; and body attractiveness [$P < 0.01$], than their non-overweight counterparts, and scored significantly lower on the total physical self-perception score [$P < 0.05$]. However, no significant differences were found for perceptions of physical strength, physical self-worth, and self-esteem. For girls, no significant differences were found on any of the CY-PSPP scales, or on the sum of scale score. **Conclusions:** These findings indicate that low physical self-perceptions might be an important factor in childhood obesity in boys, though other issues may contribute to difficulties in maintaining a healthy weight status in girls. Future researchers may wish to evaluate the accuracy of these self-perceptions. Physical activity interventions seeking to combat obesity

should include opportunities to develop fundamental movement skills and physical fitness to improve perceptions of competence.

EFFECT OF TRAINING INTENSITY ON HEART RATE VARIABILITY IN PREPUBESCENT CHILDREN

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The purpose of this study was to compare the effect of submaximal continuous or maximal and supramaximal intermittent exercise training on children's Heart Rate Variability (HRV). Fifty six children (Age: 9.6 ± 1.2 years) were divided into a submaximal (SUB, $n = 18$), a maximal and supramaximal (SUP, $n = 22$) and a control group (CON, $n = 16$). At baseline and after a 7-week training period, HRV parameters and maximal aerobic velocity (MAV) were assessed. Training consisted of three 30-min submaximal running sessions at velocities ranging from 80 up to 85% of MAV for SUB and by short maximal and supramaximal running sessions at velocities ranging from 100 up to 190% of MAV for SUP. HRV was computed in time and frequency domains. Training resulted in a significant increase in MAV in SUB and SUP only (10.8 ± 1.1 to 11.8 ± 1.1 km .h-1 and 11.3 ± 0.7 to 12.1 ± 0.7 km .h-1 respectively; $p < 0.05$) without any significant change in HRV parameters for the three groups. Whatever exercise modality, 7 weeks of training allow to improve aerobic fitness without positive effect on the heart rate autonomic regulation in children.

TRENDS OF CARDIOVASCULAR RISK FACTORS CLUSTERING OVER TIME. A STUDY IN TWO COHORTS OF PORTUGUESE ADOLESCENTS

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This study analyses trends in CVD risk factors and aerobic performance. Two cross sectional studies were performed in the area of Porto including 138 (58 boys and 80 girls) 1998 and 110 (58 boys and 80 girls) in 2003 adolescents aged 14–15 years-old from Porto, Portugal. Frequencies of total cholesterol, BMI and VO₂max tend to increase in the second cohort for both genders. Cardiorespiratory fitness (CRF) showed statistically significant ($p < 0.05$) differences between the two cohorts for boys and girls, increasing significantly the number of adolescents at risk. Risk factors tend to cluster in a higher percentage of adolescents, either in boys (10.3% vs. 11.6%) or girls (11.2% vs. 13.8%). Levels of CRF decreased significantly in both genders from the first to the second cohort. This cross-sectional study revealed a marked low CRF level over time in both boys and girls.

BONE MINERAL DENSITY, ANTHROPOMETRY AND BODY COMPOSITION IN 13–15-YEAR OLD PHYSICALLY ACTIVE GIRLS

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The aim of this study was to investigate the relationships between bone mineral density (BMD), anthropometry and body composition in physically active pubertal girls. In total, 131 13–15-year-old girls were studied (13.6±1.1 yrs, 165.7±7.3 cm, 54.2±8.6 kg, BMI 20.3±0.8 kg/m²). The studied girls exercised 3–6 times per week and parti-

icipated in different sport events (sprinting, sport games, gymnastics, etc.). Body composition and BMD at lumbar spine and femoral neck were measured by DXA. Body height ($r = 0.58$ and $r = 0.51$) and body mass ($r = 0.62$ and $r = 0.60$) were the main predictors of BMD at lumbar spine and femoral neck. BMI did not correlate significantly with measured BMD values. LBM highly influenced BMD at lumbar spine ($r = 0.61$) and femoral neck ($r = 0.63$). Body fat% influenced significantly but moderately BMD at lumbar spine ($r = 0.28$) and femoral neck ($r = 0.22$). Stepwise multiple regression analysis indicated that body height and body mass together were the main predictors of BMD at lumbar spine (44.3%; $R^2 \times 100$). It was concluded that anthropometrical parameters highly influenced measured BMD values in physically active pubertal girls.

MOTOR COMPETENCE AND AEROBIC FITNESS IN SPANISH SECONDARY SCHOOLCHILDREN

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Introduction. Ample evidence exists to support the benefits of habitual physical activity level for long-term health and well-being in children. Childhood activity levels may have an important role in determining habitual physical activity during adulthood. Children with poor coordination are more sedentary and it is reasonable to hypothesize that they will have lower cardiorespiratory fitness (CRF) than their peers. This study explored the relationship between motor competence and aerobic fitness in a sample of 12–14 year old Spanish children. **Methods.** Motor competence was measured using the Body Coordination Test for Children (BCTC) [1], and aerobic capacity was assessed using the multistage Léger 20m shuttle run test [2], in a sample of 221 children from two secondary schools (M=123; F=98). All measurements were carried out in the school gymnasium. **Results.** Children were divided into three groups by level of motor competence using standard BCTC cutoffs: children without motor coordination problems, (BCTC >16th percentile M=92 and F=35); borderline children, (BCTC <P16th and >P3th, M=19 and F=32); and clumsy

children with probable Developmental Coordination Disorder (pDCD) (BCTC <3rd percentile M=12 and F=31). The results of a two-way ANOVA (motor competence X gender on peak VO₂) showed significant differences in CRF between the three groups of motor competence, with children of both genders with poor motor skills demonstrating lower CRF ($p=.001$). Boy's CRF was significantly higher than girl's ($p=.001$). There was a significant interaction evident between gender and motor competence category ($p=.029$), suggesting that the CRF of boys with pDCD is more strongly affected by poor motor competence than that of girls with pDCD. These results are consistent with North American data that suggest clumsy children might be at risk for low aerobic fitness. Further research is needed understand the causal factors behind these findings. References. [1] Kiphard, B.J. & Schilling, F. (1974). Körperkoordinations Test für Kinder. Beltz Test GmbH, Weinheim. [2] Leger, L.A.; Mercier, D.; Gadoury, C.; & Lambert, J. (1988). The multistage 20 metre shuttle run test for aerobic fitness. *Journal of Sport Sciences*, 6, 93–101.

MULTIDIMENSIONAL ANALYSIS OF DROP OUT IN YOUTH BASKETBALL: 2-YEAR FOLLOW-UP AMONG PORTUGUESE INITIATES

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Dropout is a major concern in youth sports. Classical studies (Gould et al., 1982; Ewing & Seefeldt, 1995) adopted empirical inventories of reasons to explain dropout. Previous studies also estimated an incidence ranging from 17% to 39% among youth Portuguese male basketball players. The understanding of a complex behaviour such as discontinuing from sport, claims for a biocultural approach and a follow-up design. The purpose of this study is to describe the variables that can predict dropout during the transition from Initiates (12–13 years) to Juveniles (14–15 years) among Portuguese Basketball Players. The sample consisted of 84 male basketball players with a chronological age of 13.0 ± 0.6 years, measured in 2003. Somatic characteristics included body weight, stature, and sum of skinfolds. Functional capacities were assessed through the counter movement

vertical jump, squat jump, 60-second sit-ups, hand grip strength, 2 kg-ball throw, and 20-meter shuttle run. Four basketball specific skills were also considered, according to Kirkendall *et al.* (1987). Stage of pubic hair was assessed at clinical examination. In addition, athletes fulfilled the *Portuguese version of Task and Ego in Sport Questionnaire – TEOSQp* (Fonseca, 1999). After comparing players who continued sport participation for at least two seasons (2004 and 2005) and those who dropped out, discriminant function analysis was used to predict group membership.

Players who continued their sport careers were heavier ($p \leq 0.05$), fatter ($p \leq 0.05$), attained poorer performances in the counter movement jump ($p \leq 0.05$) and reached better scores in all manipulative skills [shooting, $p \leq 0.01$; passing, $p \leq 0.01$; dribbling, $p \leq 0.05$]. Based on shooting, lower limb power strength, sit-ups and body mass, it was possible to accurately predict 73% of subjects according to their sport status [$r = 0.50$, Wilks' $\lambda = 0.753$, $\chi^2(4) = 22.094$, $p \leq 0.01$]. In summary, sport dropout seems to be reasonably predicted by a small set of variables, including body size given by weight, strength and skill level. These findings contrast with sport selection that seems to be explained by body size given by stature (Coelho e Silva, 2002). It is also of interest to note that achievement goal orientations failed to explain sport continuity, claiming for new multidimensional approaches. References. Coelho e Silva MJ (2002). Seleção desportiva: análise prospectiva e retrospectiva. [Sport selection: prospective and retrospective analysis]. In F Tavares, MA Janeira, A Graça, D Pinto, E Brandão (editores). *Tendências actuais da investigação em basquetebol*. Faculdade de Ciências do Desporto e Educação Física – Universidade do Porto. 60–74. Ewing ME, Seefeldt V (1995). Patterns of participation and attrition in American agency-sponsored youth programs. In Fl Smoll, RE Smith (editors). *Children and youth in sport – a biopsychosocial perspective*. Dubuque, Iowa. Brown & Benchmark, pp: 31–46. Fonseca, A. (1999). Atribuições em contexto de actividade física ou desportiva – perspectivas, relações e implicações. [Atributions in physical activity or sport context: perspectives, relations, and implications]. PhD dissertation. University of Porto. Gould D, Feltz D, Weiss M (1981). Reasons for attrition in competitive youth swimming. *Journal of Sport Behavior*. Vol. 5 (3): 155–165. Kirkendall DR, Gruber JJ, Johnson RE (1987). *Measurement and Evaluation for Physical Educators*. Human Kinetics. Champaign, Illinois.

PECULIARITIES OF PRESYNAPTIC INHIBITION OF IA GROUP AFFERENT FIBERS IN PERSONS OF DIFFERENT AGES

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The goal of the research was to study age-specific peculiarities of the afferent Ia provision of human skeletal muscles (using the example of *m. rectus femoris* and *m. soleus*). 50 males of different ages (9–12 year-old boys, 14–15 and 17–18 year-old teenagers, and 22–27 year-old men) were examined. The following methods were used to evaluate various afferent inputs in the process of ontogenesis: the assessment of the presynaptic inhibition (PI) of heteronymous Ia afferent fibers of *m. soleus* going from *m. rectus femoris* to the *m. soleus* – motoneurons (Hultborn et al, 1987) and recording of the *m. soleus* Ia afferent fiber PI under homonymous vibration stimulation of *t. calcaneus* (Anissimova et al, 1987). The research results have shown that, at different age development stages, the maximum intensity of PI of the Ia afferent fibers is observed when different intervals between the conditioning and testing stimuli are used. In the group of 9–12 year-old boys, the PI is most intense when the –5.1ms delay between the stimuli is used under heteronymous conditioning stimulation. In other age groups, the PI is most intense when the –5.9ms interval between the heteronymous conditioning stimulus of *n. femoralis* and the testing stimulus of *n. tibialis* is used. Under homonymous vibration stimulation of *t. calcaneus* in 9–12 and 14–15 year-old boys, the most intense PI of the Ia afferent fibers of *m. soleus* was observed at the 30th second of the vibration stimulation. This is probably associated with the morphological age-specific characteristics of the persons under test. Different human ontogenesis periods are described with different intensities of the PI of *m. rectus femoris* Ia afferent fibers. Under heteronymous conditioning stimulation of *n. femoralis*, in the relative muscular rest condition, the PI of *m. rectus femoris* Ia afferent fibers is more intense in 14–15 year-old boys as compared to other age groups. This can probably be explained by the fact that the afferent link development is still being finished during this ontogenesis period, which is interrelated with the stabilization of many basic motion parameters and movement qualities during

adolescence. Under heteronymous conditioning stimulation of n. femoralis in 17–18 year-old teenagers, the PI of the m. rectus femoris Ia afferent fibers is less intense than in the other groups under study, which was expressed in higher m. soleus H-reflex reinforcement in these persons under test. These changes may be caused by heterochronous development of supraspinal structures in the human central nervous system. Under homonymous vibration stimulation of t. calcaneus, the PI of m. soleus afferent fibers is considerably higher in 9–12 year-old boys than in 14–15 year-old teenagers. In the after-vibration period, the PI of the spinal α-motoneurons of m. soleus reaches the initial level faster in 14–15 year-old teenagers than in 9–12 year-old boys. It is likely that the limitation of the afferent pulse flow to nerve centers under homonymous vibration stimulation of t. calcaneus in 9–12 year-old boys is determined by the PI mechanism, which is associated with the course of neuromuscular apparatus development in this age. In our opinion, the change of intensity of the PI of the m. rectus femoris Ia afferent fibers and m. soleus primary afferent fibers, both under heteronymous conditioning electric stimulation and homonymous vibration stimulation, is caused by the development of reflectory functions of the neuromotor apparatus, which is associated with the level of the morphofunctional maturation of its links and their anatomic changes in the process of the human age-related development.

RELIABILITY OF PHYSICAL ACTIVITY AND HEART RATE MEASURES IN CHILDREN DURING STEADY RATE AND INTERMITTENT TREADMILL EXERCISE – THE A-CLASS PROJECT

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AIM: The validity of a physical activity (PA) monitor is frequently investigated via comparison to an external criterion measure. The essential pre-requisite of test-retest reliability assessment is however often neglected. Such repeatability has seldom been examined with children during steady rate and intermittent exercise. The aim of this study was to assess the test-retest reliability of the Actiheart combined movement and heart rate (HR) sensor, and the GT1M Actigraph accelerometer in children during steady rate and intermittent exercise. **METHODS:** Three boys and 7 girls (10.8 ± 0.4 years) completed repeated, progressively intense steady rate (3.2km.h⁻¹, 3.2km.h⁻¹+incline, 5.6km.h⁻¹, 8km.h⁻¹) and intermittent (4km.h⁻¹, 4km.h⁻¹+incline, 7km.h⁻¹, 10km.h⁻¹) protocols on a motorised treadmill in controlled laboratory conditions. Intermittent work to rest ratio was 30s:15s. Over 15-second epochs Actiheart measured HR and movement, and a hip-mounted GT1M Actigraph measured movement. Test-retest measurement error was assessed through paired t-tests, coefficient of variation (CV) and 95% limits of agreement (LOA) with Bland-Altman plots. **RESULTS:** CVs for the intermittent protocol at 4km.h⁻¹, 4km.h⁻¹+incline, 7km.h⁻¹ and 10km.h⁻¹ were 13.0%, 11.1%, 7.3% and 4.6% for Actiheart PAHR, 19.2%, 19.0%, 6.1% and 8.0% for Actiheart movement, and 20.4%, 20.4%, 14.7% and 10.1% for Actigraph movement respectively. Test-retest 95% LOA were greatest at 7km.h⁻¹ for Actigraph movement (-75.9 ± 498.8 CPE) and Actiheart PAHR (0.5 ± 17.8 bpm), and at 10km.h⁻¹ for Actiheart movement (-10.1 ± 101.7 CPE). CVs for the steady rate protocol at

3.2km.h⁻¹, 3.2km.h⁻¹+incline, 5.6km.h⁻¹ and 8km.h⁻¹ were 9.0%, 11.3%, 9.9% and 14.5% for Actiheart PAHR, 12.0%, 9.9%, 11.4% and 7.8% for Actiheart movement, and 18.9%, 16.4%, 10.6% and 8.8% for Actigraph movement, respectively. Test-retest 95% LOA were greatest for Actigraph movement (-56.3 ± 418.9 CPE), Actiheart PAHR (9.4 ± 39.8 bpm) and movement (-2.8 ± 140.3 CPE) at 8km.h⁻¹. **CONCLUSIONS:** Test-retest measurement repeatability errors of this magnitude suggest a large sample is required to minimize the impact of such error on the use of these measurement tools for future research purposes.

ADOLESCENT ENERGY EXPENDITURE WHILST PLAYING NEW GENERATION AND TRADITIONAL COMPUTER GAMES

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AIM: The aim of the study was to compare the energy expenditure of adolescents whilst playing traditional (X-BOX 360) and new generation (Nintendo Wii) computer games. **METHODS:** Six boys and 5 girls (14.6 ± 0.5 years) from one school had their energy expenditure predicted (EEpred) using the Intelligent Device for Energy Expenditure and Activity (IDEEA) whilst playing 1 traditional (car racing) and 3 new generation (bowling, tennis, boxing) computer games. The participants visited the laboratory on two occasions. The first visit involved a familiarisation session with the two consoles and an assessment of resting energy expenditure (REE). The second visit involved 15 minutes of gaming per game. Each game was followed by a 5-minute recovery period. Repeated measures ANOVA's were used to compare differences in boys and girls' EEpred across games. **RESULTS:** No significant differences were found between boys and

girls' EEpred for the four computer games. All computer games increased EEpred above REE. Traditional X-BOX 360 game play increased EEpred by 44.2 ± 22.9 J·kg⁻¹·min⁻¹ ($P = 0.001$), whilst the Nintendo Wii sports of bowling, tennis and boxing increased EEpred by 109.3 ± 20.4 , 121.2 ± 27.8 , and 116.8 ± 32.0 J·kg⁻¹·min⁻¹ above REE, respectively ($P < 0.01$). The interactive bowling, tennis and boxing games significantly increased EEpred compared to the seated computer game ($P < 0.001$). **CONCLUSIONS:** The new generation interactive computer games stimulated significantly higher energy expenditure in adolescent boys and girls compared to traditional seated computer games. Interactive computer games have the potential for encouraging adolescents to be active while permitting highly valued screen-based activities.

DEMOGRAPHIC FACTORS ASSOCIATED WITH OBJECTIVELY MEASURED PHYSICAL ACTIVITY IN CHILDREN ATTENDING PRESCHOOL

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Aim. The purpose of this study was to identify demographic factors contributing to the variation in the level of physical activity in children attending preschool. **Methods.** Sixteen preschools had given their consent to participate in a larger study including two types of preschools; eight traditional preschools, and eight preschools with a policy intended to promote physical activity and play from three different areas (urban, suburban and a district with a high level of ethnic, religious and cultural diversity) of the Municipality of Odense in Denmark. For this minor study we randomly selected one traditional preschool and one preschool with a policy intended to promote physical activity and play from each area. A total of 167 children from six preschools participated in the study. Habitual physical activity was assessed objectively using the MTI accelerometer (model 7164). The activity monitors were only worn by the children in the time spent in

preschool. Height and weight were assessed by standard anthropometric procedures. Socio-demographic factors were obtained through a parental questionnaire. Results. A significant difference in physical activity levels was observed between boys and girls, independent of age, socioeconomic position, individual- and type of preschool ($p < 0.001$). Age of preschools children was positively associated with physical activity level independent of gender, socioeconomic position and individual- and type of preschool the children attended ($p < 0.01$). No significant difference in children's levels of activity was found between preschools with a policy designed to promote physical activity and play and traditional preschools with no policy in regard hereto. The individual preschool was the strongest predictor of physical activity level accounting for nine percent of the variation. Conclusion. This study demonstrated that, the individual preschool was the strongest predictor of physical activity level in preschool children. A preschool policy intended to promote physical activity and play was surprisingly not associated with a higher level of physical activity. Further research should be carried out in order to locate the factors determining physical activity behaviour in children attending preschool.

UNDERSTANDING PARTICIPATION IN ADOLESCENT RUGBY UNION USING MOTION ANALYSES AND TRAINING DIARIES

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Investigating the structure and loads of adolescent rugby training and games may assist in understanding optimum training prescription and physiological adaptations. Geostational Positioning Satellite tracking devices and training diaries were used to (1) quantify weekly sport and physical activity demands placed on adolescent rugby union players and (2) profile typical rugby training sessions. Seventy-five males aged 14 to 18 years were recruited from three levels of rugby; school-

boy, national representative, and a selective talent squad. Data were collected for 12 weeks of a school-boy season, for six weeks of a representative season, and for 10 weeks of a selective talent squad season. School-boy players covered a distance of (mean \pm SD) 3511 \pm 836 m, representative squad players 3576 \pm 956 m, and talent squad players 2208 \pm 637 m per rugby training session. The representative squad recorded the highest weekly duration of sport and physical activity (515 \pm 222 min/week) followed by the talent squad (421 \pm 211 min/week) and school-boy group (370 \pm 135 min/week). Profiles of individual players identified as group outliers for high training and game volumes showed participation in up to three games and up to eleven training sessions per week with twice the weekly load of the team averages. In addition, results of motion analyses (tracking game video footage using Trak Performance analysis software) on 12 players' competitive games found notable differences between the structure of training and games. Exercise load was considerably less ($p < 0.05$) for training compared with games in terms of average distance covered (4.4 km, 5.8 km), average speed (3.3 km/h, 4.3 km/h), and time spent sprinting (33 s, 108 s). Discrepancies between training and games could reflect additional coaching and organisational demands during training, or sub-optimal time use. Results of game and training comparisons provide a premise to redesign training sessions to be more reflective of game demands potentially improving performance while decreasing strain placed on adolescent players through extraneous training hours that are not game specific. Measures of adolescent training and game loads provided useful participation profiles, but most significantly identified individual outliers with higher than average weekly loads. Optimum participation may be compromised through many high-load, high-impact training sessions and games in addition to commitment to other sports and physical activities. Serial monitoring of player loads and a greater understanding of game and training demands may aid in systematic training prescription including time-efficient, game-specific training sessions to maximise performance and minimise adverse outcomes such as injury, fatigue and overtraining among adolescent rugby union players.

TRACKING WAIST GIRTH AND BMI IN CHILDREN: THE CONTRIBUTION OF MOTOR PROFICIENCY TO OVERWEIGHT AND OBESITY

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Aim. As the prevalence of obesity during childhood continues to rise, our need to understand the factors underlying this pandemic becomes increasingly urgent. A decrease in children's physical activity levels is commonly identified as a potential causal factor and programs designed to increase activity are heavily promoted as a needed response. Until recently, motor proficiency has been neglected when barriers to activity have been considered in the design of activity programs. In this investigation we determined the motor competence of a large cohort of school-children and tracked their height, weight, and waist girth over a 24 month period. We analyzed results after dividing the group into deciles by performance on the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP). **METHODS.** We measured motor proficiency (MP), body mass index (BMI), and waist girth in a large (n=1282) sample of children aged 10 and 11 and collected follow-up measures of BMI and waist girth every six months for 24 months. The sample was drawn from 50 schools in the Niagara region of Ontario, Canada. We assessed MP using the short form of the BOTMP. To test for differences over time in BMI, we constructed a mixed-effects model, including time, gender, baseline age, and MP as fixed effects and school as a random effect. **RESULTS.** MP and BMI and MP and waist girth were significantly correlated cross-sectionally ($r=-0.3$ and $r=-0.33$, respectively, both $p<0.001$), and an analysis by MP deciles revealed a strong linear gradient in both baseline measures. Changes over time in BMI and waist girth showed greater increases among children with poorer MP. The mixed effects model confirmed that BMI and waist girth increased more rapidly in children with poorer MP ($p<0.01$). Means of BMI for the lowest MP decile (BOTMP percentile <6) were 20.7 at baseline, rising to 22.1 at

study end; corresponding BMI values for students in the highest MP decile (BOTMP percentile > 95) were 17.6 and 18.5. CONCLUSIONS: As proposed BMI cut-points for overweight in this age range are between 20.2 and 21.2 for both genders, it is clear that children with low MP are at serious and increasing risk of obesity. Children with poor motor proficiency are at significantly greater risk of developing obesity than their more able peers and should be considered a sub-group in need of targeted intervention.

**THE EFFECT OF STRUCTURED EXERCISE
CLASSES AND A LIFESTYLE INTERVENTION
ON CARDIOVASCULAR RISK FACTORS
IN PRIMARY SCHOOL CHILDREN
(THE A-CLASS PROJECT)**

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Aims: Many preventable chronic diseases are becoming increasingly prevalent due to increasing obesity and a reduction in physical activity levels. The purpose of this exploratory trial was to evaluate the effect of a structured exercise (STEX) programme and a lifestyle intervention (PASS) programme upon pre-clinical cardiovascular (CV) disease risk factors in children. **Methods:** Sixty-one 10–11 year old Liverpool primary school children volunteered and were randomly assigned by school to a STEX programme (2 x 60 min sessions per week at a heart rate of ~145 beats.min⁻¹), a PASS programme (weekly physical activity tasks and pedometer challenges) and a control (CON; no intervention). Carotid intima media thickness (cIMT; the primary outcome variable), left ventricular (LV) mass, LV diastolic function, and body composition were measured before and after a 9-week intervention. Delta (Δ) scores were analysed by ANCOVA, with baseline scores as the covariate. For cIMT the probability that the population

effect of the intervention is at least as great as the pre-specified Minimum Clinically Importance Difference (MCID) was estimated, to evaluate clinical relevance. Results: All participants met 75% compliance criteria for STEEX and PASS. The effect of the STEEX intervention (compared with CON) was a mean benefit of -0.018 mm for average maximum cIMT (90% CI, -0.039 to 0.002 mm), and -0.016 mm for average mean cIMT (90% CI, -0.040 to 0.008 mm). The probability (% chance) that the true population effect of the STEEX intervention would be clinically beneficial was 79% for average maximum and 71% for average mean cIMT. The PASS intervention did not result in clinically important effects, and no other substantial changes were observed for the secondary outcome variables. Conclusions: The relatively high probability of clinically beneficial effects of the STEEX intervention suggests that a larger, definitive randomized trial with longer follow-up is warranted to define the effectiveness of the intervention more precisely.

A PROCESS EVALUATION OF A LIFESTYLE INTERVENTION FOR 8–10 YEAR OLD CHILDREN: THE A-CLASS PROJECT

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At least 50% of children are not achieving activity levels which would benefit their health (Biddle et al. 2004). Therefore there is a need to develop sustainable lifestyle interventions to increase children's physical activity levels. There is limited evidence for such interventions. AIM: The aim of this study was to measure the effectiveness a lifestyle intervention on children's physical activity. METHOD: Forty-five children from two primary schools in Liverpool took part in the study. The program was delivered to a group of children at school in 2, 6 weekly blocks (1 hour per week) with a 6 week break between each block. Each weekly session consisted of a discussion of the previous week's task followed the delivery of the following weeks physical activity task. These tasks encouraged the children to be active in their home and local environment. An action-research approach and

process evaluation were used to measure programme effectiveness. After all the tasks in the block were completed focus groups with the children were undertaken along with interviews with teachers and parents. RESULTS: Sixty-nine percent of children completed all the missions, all children returned at least one mission. Qualitative data collected after the first block of missions suggests that all the children thoroughly enjoyed the tasks and that physical activity had increased. The children feel that they are more active 'We got to do more activity than we used to do and it helped us instead of being lazy we got to be active' in addition they have greater self-esteem 'before I thought I was fat now I don't cos I'm more active.' Some evidence also suggested that parents and teachers were also influenced by the mission style behaviour change approach. CONCLUSION: The lifestyle intervention appears to be having a positive influence on the children's activity behaviours.

DIFFERENCES IN LUNG FUNCTIONS AND PHYSICAL PERFORMANCE IN CHILDREN WITH CYSTIC FIBROSIS: THE EFFECT OF ACE POLYMORPHISMS

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Aim: To investigate the association of ACE I/D polymorphism on lung function and physical performance in children with CF. **Methods:** All children with CF who are treated in the CF Center Utrecht undergo routine multidisciplinary examination regardless of their health status. This examination includes lung function and symptom limited exercise testing. The ACE I/D polymorphism was determined in ~90% of our paediatric CF population. Patients with a mild or unknown CFTR genotype were excluded from this study. **Results:** 172 patients were included in the study. Lung function was significantly higher in patients with the ACE II genotype compared with the ID and DD genotype (83% vs 76% of predicted, $p=0.03$). Furthermore,

patients with the II genotype tended to have a higher VO₂, VO₂/kg and load at ventilatory anaerobic threshold (calculated as percentage of predicted maximum) than the ID and DD genotype. Finally, our data indicated higher muscle force of the leg extensors in patients with the II genotype. These data are in accordance with previously performed studies in healthy individuals. Conclusion: The ACE I/D polymorphism is associated with lung function and physical performance in children with CF. These differences may have implications for physical training strategies.

OVERWEIGHT AND OBESITY OF 4–7 YEARS OF AGE IN BELARUS

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Research purpose: to determine the overweight and obesity morbidity at 4–7 years of age children in various Belarus regions who were examined in the first half of the 2000s. To reach the result, a qualified anthropometrics specialist examined 1011 boys and 1009 girls and took their body length and mass measurements, the body mass index (BMI) has been calculated, its average value was determined for every age, gender and territory group, as well as the percentage rate for the united group. Cut off points for BMI for overweight and obesity were calculated in accordance with the international standards (Cole et al, 2000). Body mass excess was more often noted in girls. So, among all of the examined children, 9,1% of boys and 12,9% of girls had overweight and obesity, accordingly, in 1,5% and 2,2% of them. Children from less urbanized settlements were characterized as having the least body mass excess prevalence (5,1–6,7% in boys and 7,4–9,6% in girls), there were no cases of obesity fixed at all. The maximum quota of body mass excess children was noted in Krichev, a small industrial town (30 thousand inhabitants) situated in the eastern part of Belarus (16,6% in boys and 20,8% in girls). The results obtained are close to the average values of overweight and obesity prevalence among children in a number of European countries.

RELATIONSHIPS BETWEEN LEG BONE MINERAL DENSITY AND JUMPING HEIGHT IN PREPUBERTAL CHILDREN

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The aim of this study was to determine the relationships between leg bone mineral density (BMD) and vertical jumping height in prepubertal children. In total, 64 8–11 year old schoolchildren (27 boys and 37 girls) were studied. All children were at Tanner stage 1. Height and body mass were measured and BMI calculated. Total body and leg fat mass and fat %, lean mass (LBM) and leg BMD were measured by DXA. Maximal jumping height was measured on the contact mat. Stepwise multiple regression analysis indicated that body height in boys (54.6%, $R^2 \times 100$) and body mass in girls (57.3%) were the most important basic anthropometric parameters that influenced leg BMD. From the body composition parameters, most important was leg LBM (48.9–59.5%). Jumping height did not influence measured BMD in any studied groups. In summary, the present study demonstrated that measured LBM were the main predictor of BMD in prepubertal children.

HOW MUCH SKILFUL AND LESS-SKILFUL CHILDREN PRACTICED FUNDAMENTAL MOTOR SKILLS DURING A PRESCHOOL PE PROGRAM?

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Children need skill specific practice to acquire mature fundamental motor skills (FMS) before entering school. This study examined children's motor developmental status and time spent practicing FMS during 8-month preschool Physical Education Program (PEC), which

aimed at to help children understand the importance of a healthy lifestyle and to foster of social skills through the acquisition of FMS. The four children (5.2 ± 0.4 years) were identified by APM-Inventory (Numminen 1995) as two skilful and two less skilful participants. Systematic video-observation based on actual continuous duration coding was used to analyse seven PEC-lessons out of total of 48. The computer software summarized percent (%) of total time (s) during which the categories of FMS was observed. To produce reliable observation category (8) scores, was 83–90% interobserver agreement of two trained observers demonstrated. Results show the children engaged of total time in: walking and running (21–25%); crawling, creeping, crab walking and bear walking (2–7%); leaping, jumping, hopping, skipping, sliding and galloping (3–8%); body rolling (1–2%); upper body manipulative movements (1–9%); lower body manipulative movements (1%); apparatus gymnastics (9–18%), and sedentary behavior (43–56% of total time). The only systematic difference between children was that one of the less skilful children received the highest scores of sitting and standing still and the lowest scores in most of the movement activities. The preschool PE programs must be carefully planned and implemented by PE specialist to cause the expected changes in children's FMS.

SOMATOTYPE OF WEIGHTLIFTING ATHLETES INFANT-JUVENILES IN GUATEMALA

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To success in Weightlifting is necessarily specific physic quality, for this reason we studied by first time weightlifting athletes in the XXIX Juveniles sports games in Guatemala City, Dec. 2006, 28 (100%) infant-juveniles, 13 (46%) females, 15 (54%) males, age between 13.67 to 16.68 and 12.48 to 17.77 years respectably. The anthropometrics data was like used for analysis of somatotype described with the method of Heath-Carter using the technique like Anthropometry

Illustrated for WD Roos, RV Carr and JEL Carter (Turnpike Electronic Publication Inc. 1999). Tested % of fat by Bioimpedance (BI), sexual maturity by pubic hair (PH), and nutritional analysis by NCHS (CDC Growth charts). The results in females mean age 15.14 (\pm SD 1.49), weight 52.1 (\pm SD 14.4), height 150.4 cms (\pm SD 6.4), % fat BI 26.9 (\pm SD 9.1), Somatotype Endomesomorphic I = 5.8 (\pm SD 1.8), II = 4.9 (\pm SD 1.2), III = 1.4 (\pm SD 0.9), nutritional state by weight/height one with >95 pc, the others normal limits, by pubic hair (PH) 2 grade V, four grade IV, and others \square grade III. The results in males, mean age 15.0 years (\pm SD 0.8), weight 53.0 Kgs., (\pm SD 10.2), height 158.8 cms (\pm SD 8.2), % of fat BI 15.5 (\pm SD 4.5), Somatotype Mesomorphic-Endomorphic I = 2.8 (\pm SD 1.1), II = 5.1 (\pm SD 0.9), III = 2.6 (\pm SD 0.8), the nutritional state by weight/height all normal, by height/age 4 <5 pc, the others normal, sexual maturity by Pubic hair (PH) 2 grade V, 5 grade IV, others \square grade III and two grade I. In conclusion the somatotype analysis in juveniles weightlifting females are Endomesomorphic and the sexual maturity most \pm de III PH; the males athletes are Mesomorphic-Endomorphic, five athletes with sexual maturity \square grade III PH and two grade I

PHYSICAL FITNESS OF CHILDREN BETWEEN THE AGES OF 7 AND 15 YEARS FROM A RURAL BACKGROUND, IN VIEW OF RESEARCH FROM THE YEARS 1986, 1996 AND 2006

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BACKGROUND: In 1986, 1996 and 2006 population research was conducted into rural environment of Poland's Wielkopolska region. The main aim of this study was to ascertain the physical fitness of children in the 7–15 age range, in view of the dynamic social and economic transformation at the turn of the XX and XXI century in Poland. It was most important to determine the size and direction of motor and somatic changes of youth from a rural background as a basis to work out the new physical education programmes, at an adequate level of physical fitness. **METHOD:** To research basic motor ability the following methods were used: velocity –5 m run, with a

0.5 m run up, and time of straight response; strength – hand dynamometer and vertical jump; endurance – step-test by Montoye; agility – run in a figure of “8”; and flexibility via the – sit and reach test. To estimate somatic development height and body mass were used to measure BMI. SETTING: the study was conducted at the Department of Theory of Sport at the University School of Physical Education in Poznań, Poland. PARTICIPANTS: Children who were randomly chosen from ten primary schools in the Wielkopolska region in Poland. RESULTS: The analysis of the accumulated data of somatic measurements seem to confirm a tendency to increased height and body mass in consecutive terms of research during the 20 years of observation. On the other hand, the measurement of motor performance had irregular trends, some of them go up and others decrease during two decades. CONCLUSIONS: The study showed that growth of somatic and motor parameters changed similarly but not in every case. This could be as a result of many different developmental factors and susceptibility to their influence on the observed individuals. The effect of the research could provide an important basis on which to prepare new physical education programmes. The new programme should show increased physical activity among youth and lead to a more healthy generation, able to develop pro-health habits for better adult and later life.

THE CORRESPONDENCE BETWEEN PHYSICAL ACTIVITY OF ESTONIAN YOUTH AND HEALTH-RELATED RECOMMENDATIONS

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The main propose of this study was to evaluate physical activity of Estonian youth and how it correspond to the science-based physical activity recommendations. In addition, the second aim of this study was to compare physical activity (PA) in children and adolescents (considering age and sex). For this, children and adolescents were divided into three groups: children (age of 4–10 years), adolescents in the early pubertal period (age of 11–13 years) and adolescents in the

late pubertal period (age of 14–17 years). Study was built up by comparing several researches that are made in Estonia in last 10–13 years. In those researches physical activity has been assessed in children and adolescents by questionnaires. Widely accepted recommendations for PA are: 1. Children should accumulate at least 30 to 60 minutes of moderate physical activity on all or most days of week (USDHHS – U.S). Department of Health and Human Services; Centres for Disease Control and Prevention, National Centre for Chronic Disease Prevention and Health Promotion, The President's Council on Physical Fitness and Sports. 1996).2. Adolescents should engage in three or more sessions per week of moderate to vigorous activity each lasting 20 minutes or more (Sallis, Patrick 1994). Results showed that Estonian children's physical activity correspondence to recommendations is rather low. Only children's (age of 4–10 years) were mostly able to follow both recommendations. Adolescents in early pubertal period showed lower activity and adolescents in late pubertal period showed the lowest physical activity. The most problematic situation seems to appear with girls over age of 15 years. Study also conformed two trends in Estonian youth: 1. Adolescents girls (especially girls in late pubertal period) are less physically active than adolescent boys.2. There is a continuous decrease with children's age in physical activity. Conclusion: much more health-related promoting programmes are needed for youth.

ACUTE EXERCISE AND MICROVASCULAR FUNCTION IN 9–10 YEAR OLD CHILDREN

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Aim. Regular exercise has been shown to restore macrovascular function in obese children however the effect of exercise on microvascular function is currently unknown. The aim of this study was to determine the effect of a single bout of maximal exercise on microvascular function in 9–10 year old children. **Methods.** 21 boys (age 10.0 ± 0.5 y) were recruited. Microvascular function was measured at rest and 30-minutes after a continuous, incremental exercise test to

exhaustion on a cycle ergometer by the skin blood flow response to the iontophoretic application of the endothelium dependent and independent vasodilators, acetylcholine (ACh) and sodium nitroprusside (SNP). Results There was no significant difference in the peak ACh (pre: 1.71 ± 0.57 v post: 1.86 ± 0.57 V, $p=0.239$) or SNP (pre: 1.21 ± 0.52 v post: 1.38 ± 0.53 V, $p=0.152$) response pre and 30-minutes post-exercise. There was also no significant difference in the percentage change from baseline perfusion in the ACh (pre: 376 ± 90 v post: $364 \pm 103\%$, $p=0.628$) or SNP (pre: 165 ± 83 v post: $216 \pm 96\%$, $p=0.083$) response or area under the ACh (pre: 562 ± 241 v post: 594 ± 191 V.time, $p=0.470$) or SNP (pre: 233 ± 161 v post: 286 ± 154 V.time, $p=0.181$) response curves over the two test occasions. Conclusions. These data suggest that a single bout of maximal exercise does not improve microvascular function in 9–10 year old children.

IMPLEMENTATION OF AN EXERCISE PROGRAM IN FAMILIES WITH OBESE CHILDREN

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OBJECTIVE: Implementation of an intervention program within families with obese children. **MATERIAL AND METHODS:** Prospective interventional study. Thirty two overweight and obese children, aged 6 to 12 years, assisting the Endocrinology Department from the Hospitales Civiles de Guadalajara, voluntary accepted an invitation to participate in a special program that included 6 steps: 1) Physical activity and nutritional evaluation; 2) Medical, cardiological and orthopaedic evaluation; 3) Body composition by anthropometry and DXA; 3) Evaluation of their physical fitness; 4) Qualitative evaluation of beliefs about health, nutrition and exercise; 5) Application of a health, educational and physical activity program for six months, and 6) Report of an everyday summer activity. **RESULTS:** Only 9 (28%) children completed the program, The associated metabolic pathologies where: 20% metabolic syndrome, 20% diabetes

mellitus type II, 10% with hypothyroidism and 50% with exogenous obesity. 100% of the obese children presented muscle-esqueletic alterations such as genu valgus, inversion of ankles and lumbar hyper lordosis. 50% showed muscular hypertrophy in extremities. The DXA study showed high abdominal adiposity, 50% referred pain on knees and lumbar back. The improvements on adiposity and weight were not significant but all the children improved their physical fitness components which influenced the self steam and the well being perception of the family. **CONCLUSIONS.** In this study we found that adherence to exercise in obese children is related with a) the orthopaedic muscle-esqueletic limitations, b) the children self-steam and body image, and c) the time the parents devote to the program. In future studies we should promote more the involment of the parents to do more physical activity and we suggest to evaluate the impact of physical activity program in a tridimensional way: How they feel, How they look and How they are.

TEST BATTERY FOR TESTING PHYSICAL FITNESS OF OVERWEIGHT CHILDREN

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INTRODUCTION. Many physical fitness tests are difficult to perform properly by obese children. Therefore, the prediction outcome might not be reliable. The aim of the present study was to develop a reliable, feasible, and motivating physical fitness test battery for obese children. **METHODS.** Two groups, ten obese and ten normal weight children, were tested. The test battery consisted from anthropometric measurements (height, weight, BMI and bioimpedance), balance, motoric (plate tapping), sit and reach, vertical jump, standing long jump, hand grip, stand-ups, push-ups, sit-ups, 10-m walk, sub maximal cycle ergometer and lung function tests. Repeatability was evaluated by test – re-test comparison and test comparison between groups was analyzed. Feasibility and acceptance was evaluated by observation and questioner. **RESULTS.** The mean (+SD) age, height, weight and BMI for obese group was 12.4 years (+2.41), 158.6cm

(+7.41), 86.7kg (+23.02) and 33.9 (+4.99) and for control group 12.8 years (+1.75), 158.3cm (+4.92), 50.5kg (+7.27) and 20.1 (+2.5), respectively. Best repeatability by correlation and t-test in obese group was found in anthropometric measurements, sub maximal cycle ergometer ($r=0.95$, t-test $p=0.812$), lung function ($r=0.90$, $p=0.491$), sit and reach ($r=0.93$, $p=0.251$), standing long jump ($r=0.97$, $p=0.135$), 10-m walk ($r=0.86$, $p=0.105$) and balance ($r=0.68$, $p=0.098$) tests, respectively. **DISCUSSION.** The test battery for obese children could include anthropometric measurements, sub maximal cycle ergometer test, lung function test, 10-m walk test and standing long jump. This test battery indicates reliably the physical fitness of obese children and is pleasant to perform.

PLASMA VISFATIN CONCENTRATIONS ARE RELATED TO METABOLIC PARAMETERS IN PHYSICALLY ACTIVE ADOLESCENT BOYS

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The purpose of the present study was to investigate the association of fasting plasma visfatin concentration with insulin resistance parameters according to sex in physically active adolescent children. Thirty four healthy children (17 boys and 17 girls) aged between 13 and 16 years participated in this study. All children were swimmers recruited from local training groups and trained for at least eight hours per week during at least last two years. The distribution of age and body mass index (BMI) was not different between boys and girls. Plasma visfatin concentrations were not different between sexes (boys: 1.3 ± 0.9 ng/ml; girls: 1.2 ± 1.0 ng/ml). No differences were also observed for insulin, glucose and fasting insulin resistance index (FIRI) values between studied groups, while girls presented significantly higher values for leptin compared to boys. Plasma visfatin concentrations were related to the markers of insulin sensitivity

(insulin, FIRI) and BMI only in boys, while no relationship between these parameters was observed in girls. In conclusion, the results of this study suggested that plasma visfatin concentrations are not different between regularly physically active boys and girls. In addition, our findings indicated that the associations of fasting plasma visfatin concentrations with metabolic and body composition parameters were sex-dependent in children.

RELATIONSHIPS BETWEEN GHRELIN, TESTOSTERONE AND FINGER-LENGTH RATIOS IN YOUNG BOYS

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The aim of this study was to investigate possible relationships between different finger-length ratios and different fasting hormone concentrations, which possibly influence the growth of the length of fingers in a sample of young swimmers. Twenty-six boys, aged 10 to 17 years participated in this study. Body height and body mass were measured and BMI calculated. The original method of Visnapuu and Jürimäe (2007) was used for the measurement of length parameters of the hand. The following finger-length ratios were calculated: 1:2, 1:3, 1:4, 1:5, 2:3, 2:4, 2:5, 3:4, 3:5, and 4:5. Ghrelin and testosterone were analyzed on venous blood. The relationships between finger-length ratios and basic anthropometric parameters were not significant. Testosterone concentration correlated with the 2:3 ($r = -0.38$) and 2:4 ($r = -0.37$) finger ratios. These relationships were not significant after controlling for age and Tanner stage. Ghrelin concentration correlated with most of the finger-length ratios. Regression analysis indicated that ghrelin and testosterone together influenced the 2:4 ratio by 20.3%. In conclusion, ghrelin is another biochemical parameter to the sex steroids which influence the different digit-length ratios.

THE EFFECT OF CENTRAL AND PERIPHERAL FACTORS IN ADULTS AND CHILDREN FATIGABILITY

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Aim: The effect of central and peripheral mechanisms on children fatigability has not been well studied. The purpose of this study was to examine to what extent central and peripheral mechanisms explain the fatigue differences between adults and prepubertal boys during maximal sustained fatigue test **Methods:** Seven boys (age: $10,9 \pm 0,8$ yrs, body mass: $43,1 \pm 10,9$ kg, height: $150,1 \pm 7,7$ cm, means \pm SD) and seven men (age: $25,4 \pm 1,9$ yrs, body mass: $74,9 \pm 7,8$ kg, height: $180,4 \pm 6,3$ cm, means \pm SD) volunteered to participate in this study, with informed consent. Maturation was determined in the boys as suggested by Tanner (1962). The maximal voluntary contraction (MVC), the voluntary activation and the peak twitch torque were evaluated prior and at the end of a maximal sustained plantar flexion fatigue test. The fatigue procedure was terminated when the torque output decreased to 50% of the MVC. A supramaximal electrical stimulus was given at rest and during MVC for the voluntary activation and the peak twitch torque estimation. The level of voluntary activation was calculated as $[(\text{initial torque} - \text{final torque}) / \text{initial torque}] \times 100$. The results were analyzed with a two factor ANOVA. The level of significance was set at $p < 0,05$. **Results:** The results showed that there was a higher fatigue in adults regarding prepubertal boys. There was also a main effect of fatigue ($F_{1,12} = 144,4$, $p < 0,001$) on level of activation. Furthermore, there was a main effect of age ($F_{1,12} = 45,1$, $p < 0,001$), fatigue ($F_{1,12} = 62,5$, $p < 0,001$) and interaction ($F_{1,12} = 25,6$, $p < 0,001$) on peak twitch torque at rest. More specific after fatigue both men and boys showed a significant decline in level of activation (men = 8,6%, boys 7,1%, $p < 0,05$). The Scheffe post hoc test showed that the measures of peak twitch torque declined more in men (22%) than boys (10,7%) ($p < 0,001$). **Conclusions:** The current findings suggest that the fatigue differences between adults and children during a maximal sustained contraction could possibly be attributed in peripheral factors and not in central ones.

PHYSICAL ACTIVITY LEVELS OF CHILDREN DURING SCHOOLCAMPS PLAYTIME

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Physical activity at school is an important determinant of children exercise behaviour, and it gives protection from many of different problems. Today schoolchildren are tomorrow middle aged local populations. The aim of the present research was to examine determinants of physical activity levels among 60 schoolchildren from 7 to 13 years old with normal or low socio-economic status in two summer schoolcamps during 2004–2005 in small rural district Tirza of Gulbene region of Latvia. Methods: Children activity levels were measured during first and last days in the schoolcamps after providing game equipment or using special tests. Results: In the schoolcamps during the first day children physical activity was lesser and needed to better characterize the range of activity that was associated with health. There were significant variations in levels of participation in sport and physical activity between different schoolchildren groups. Schoolchildren with low socio-economic status were also less physically active. During camps periods (2–4 weeks) providing game equipment was effective in increasing children physical activity. Boys were more active than girls, and activity increased during camps periods. Conclusions: Providing game equipment during summer schoolcamps was found to be effective in increasing children physical activity levels. Different games can be low-cost methods of increasing children daily physical activity levels in the short term. This finding suggests that promoting physical activity through game equipment provision during camps periods can contribute to reach the daily activity levels recommended for good health.

HEALTH-RELATED QUALITY OF LIFE AND PHYSICAL ACTIVITY LEVEL ARE REDUCED IN PRE-PUBERTAL OBESE CHILDREN

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Aim: To measure health-related quality of life (HRQOL) and physical activity level in pre-pubertal obese children, and to determine their relationships **Methods:** It was a prospective cross-sectional study including 94 pre-pubertal children aged 6 to 11 years (mean 9 ± 1.5 y), divided in 2 groups: 47 obese and 47 lean subjects. The HRQOL was assessed by the Swiss French version of the Child Health Questionnaire (PF50), 7-day physical activity count by Actigraph accelerometer, past 12-month physical activity by questionnaire, and anthropometrics. **Results:** Obese children have significantly lower total HRQOL (76 ± 15 vs $85 \pm 6\%$, $p < .001$) as well as physical and mental health, social, family activities and cohesion subscales, except emotional behaviour and bodily pain, compared to non-obese children. Obese children had lower 7-day physical activity count (324.9 ± 67.7 vs 378.6 ± 111.5 , $p = 0.02$) and past 12-month physical activity (0.8 ± 1.3 vs 3.9 ± 3.8 , $p < .001$) than lean controls. Univariate regression analysis showed that HRQOL sub-scales were inversely associated with BMI and positively related to 7-day physical activity count and past 12-month physical activity. Physical activity variables were inversely associated with BMI ($r = -0.35$, $p = 0.002$). Multivariate regression analysis including BMI, gender, age and physical activity showed that BMI was the only significant predictor of HRQOL ($r = 0.24$, $p < .001$). **Conclusions:** We demonstrate that HRQOL as well as physical activity level are reduced in pre-pubertal obese children, compared to lean subjects, and that BMI but not physical activity is an independent predictor of HRQOL. We conclude that the impact of obesity on the child's physical and mental health and functioning, as well as parent's emotions and time should not be underestimated, even in this very young population. It is urgent to identify effective intervention to increase both HRQOL and physical activity.

ISOMETRIC CONTRACTION DIFFERENCES IN 12–15 YEARS OLD BOYS AND GIRLS

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The aim of the research is to investigate the muscle tension age and gender differentiation during isometrical contractions of various muscle groups. Material and methods. 78 boys and girls aged 12–15 years were examined on the dynamometer REW 9000 made by company Technogym, what allowed to investigate the movements of separate muscle groups – flexors and extensors – of the upperarm, forearm, trunk, thigh and calf in different conditions. Results and discussions. The repetition accuracy at the loads of 25%, 50% and 75% from the maximum shows a similar tendency in all age groups for the boys. The repetition accuracy of flexor muscle groups increases with the age and muscle tension is better regulated in forearm and calf flexors in both genders. Thus, having analyzed the accuracy results of the execution at the 28% load at different ages, we can conclude that some muscle group parameters (the forearm, the upperarm, the calf and trunk flexors) alongside with the age increase, but at the age of 13 these indices decrease in the boys. Conclusions. Having summed up the results at the loads of 25%, 50% and 75% from the maximal load, we have conclude that alongside the age the differentiation accuracy increases. Analysing the changes of summary parameters of the flexor muscle differentiation it should be noted that the highest load accuracy is observed at the age of 14 for the boys and at the age of 13 for the girls.

PERCEIVED TEACHING BEHAVIOURS AND MOTIVATION IN PHYSICAL EDUCATION: EFFECT OF AGE

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This study examined the effect of age (i.e. grade level) on perceived teaching behaviours, basic psychological needs for competence, autonomy, and relatedness, and motivation in physical education of Estonian students. Participants were 98 students assigned to groups on the basis of grade level (7th and 12th grade students). Questionnaires assessing perceived teaching behaviours with dimensions of democratic and autocratic behaviour, teaching and instruction, social support, situation consideration, positive general and informational feedback, and positive and negative nonverbal feedback were used. Students completed also questionnaires assessing their perceptions of competence, autonomy, and relatedness, as well as motivation in physical education. Results from the independent samples T-test indicated that 12th graders perceived significantly higher than 7th graders that their teacher is more instructive, socially supportive, situation considerate, and gives them informational feedback. Furthermore, 12th graders scored significantly higher on motivation in physical education. 7th graders, on the other hand, perceived significantly higher than 12th grades that the teacher behave as autocrat and respond to their poor performance using negative nonverbal gestures. Separate correlation analyses revealed that different dimensions of perceived teaching behaviours are related to 7th and 12th graders motivation in physical education. Results seem to suggest that age is an essential factor that may influence students' perceptions of their teacher's behaviour in physical education. Physical education teachers should take these differences into account while dealing with students with different age groups to ensure high motivation in lessons.

SECULAR TRENDS IN OBJECTIVELY MEASURED PHYSICAL ACTIVITY AMONG 15-YEAR OLDS IN OSLO: CHANGES FROM 2000–2006

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There is a common perception that the current generation of children and adolescents are less active than before. There is, however, little published data to support this view. **PURPOSE:** The purpose of this study was to assess secular trends in objectively measured physical activity among a representative sample of 15-year old adolescents in Oslo, Norway. **METHODS:** Data was registered in two cross-sectional studies; "The European Youth Heart Study" carried out in 2000 and "Physical Activity among Norwegian Children" carried out in 2006. Forty-two percent of the adolescents in 2000 and 58% of the adolescents in 2006 agreed to participate. Physical activity was assessed using the Actigraph accelerometer, model 7164. The accelerometer was attached on the subject's right hip using an elastic belt. The output was sampled every 60 s for four consecutive days, which included both weekend days. **RESULTS:** A total of 303 adolescents (210 and 93 in year 2000 and 2006, respectively) provided valid activity measurements that met all inclusion criteria. Boys were more active (counts 8729;min⁻¹) than girls in 2000 ($p < 0.001$). There was no difference in physical activity level between the sexes in 2006. No difference was detected in the adolescents physical activity level between 2000 and 2006, neither in boys nor girls. Fifty-three percent and 57% of the adolescents, in 2000 and 2006 respectively, met the recommendations of 60 min of physical activity of at least moderate intensity every day. This increase, however, was not significant. **CONCLUSIONS:** This study indicates that no secular trend has occurred in the physical activity level of 15-year-olds in Oslo between 2000 and 2006.

CHARACTERISTICS OF HEART RATE AND ENERGY EXPENDITURE DURING INDOOR HOCKEY MATCH

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Key words: indoor hockey, heart rate, energy expenditure, polar team system. **BACKGROUND:** The purpose of this study was to examine the heart rate value and energy expenditure of field hockey players during the indoor match. The semifinal match of Polish premier league between Military Sports Club Grunwald (Team 1 – T1) and Sports Club Poczta Poznań (Team 2 – T2) was observed. The final score of this match was 5:9 (2:3) for SC Poczta Poznań. **METHODS:** Experimental design to characterize the heart rate and energy expenditure of indoor team game competitors. **SETTING:** the study was conducted at the Department of Theory of Sport at the University School of PE in Poznań, Poland. **PARTICIPANTS:** eighteen male representing the field hockey Clubs (T1 – 9 and T2 – 9 person) (\pm SD; T1 – T2) 27.13 \pm ; 3.87 – 27.50 \pm ; 4.41 years; 174.75 \pm ; 6.36 – 1.78 \pm ; 5.5 m; 71.81 \pm ; 8.51 – 75.41 \pm ; 7.10 kg; VO₂max 54.79 \pm ; 3.58 – 51.49 \pm ; 3.36 ml•kg⁻¹•min⁻¹) were involved in the study. **MEASURES:** to record the heart rate during matches, Polar Team System™ by Polar Electro Oy was used. To study the results (heart rate and energy expenditure) Polar Precision Performance™ 4SW program was used. **RESULTS:** The energy expenditure was higher in the first than in the second observed team (T1=799.88 \pm 149.88 kcal – T2=789.75 kcal). In the heart rate value, the measured parameters proved to be lower in the case of the second team (Mean HR: T2 =133.25 \pm ; 8.99 beats/min) than in the first team (T1=138.00 \pm 12.64 beat/min). The maximal average (match) HR amounted to 189.13 \pm 9.60 (beats/min) (T1) and 192.25 \pm 6.41 (beats/min) (T2). The analysis of the accumulated data showed that in every observed parameter there were no significant differences ($p=0.05$) between the first and the second team in every observed parameters. Also, it was stated that sport fight and the score of a match had especial influence on the result of HR value and energy expenditure. **CONCLUSIONS:** The research showed that the second analyzed team reached better sport results at lower energy expenditure and HR value than first team.

WEIGHT BEARING BONES ARE MORE SENSITIVE TO PHYSICAL EXERCISE IN BOYS THAN IN GIRLS DURING PRE- AND EARLY PUBERTY

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Background: Physical activity (PA) positively influences bone mineral accretion. Little is known whether there are gender differences in sensitivity of bone to loading and to what extent objectively recorded spontaneous PA influences bone mass, independently of muscle mass and strength. We investigated gender differences in the association between measures of PA and bone mineral density (BMD) in pre- and early pubertal children of both genders. Methods: We measured bone mineral density/content (BMD/BMC) and fat-free mass in 374 6–13-year-old children from randomly selected schools at the hip, lumbar spine and total body, by dual-energy x-ray absorptiometry. Lower extremity strength was evaluated by a jump-and-reach test, and PA by accelerometers. Results: Boys had higher hip and total body BMD, higher fat-free mass, higher lower extremity muscle strength and were more physically active than girls at all ages. Total hip BMD was positively associated with time spent in total and vigorous PA in boys ($r=0.33$ and 0.27 , $p<0.01$), but not in girls ($r=0.02$ and 0.04 , $p=ns$), even after adjusting for fat-free mass and lower extremity strength. While boys and girls in the lowest tertile of vigorous PA (22 min per day) did not differ in hip BMD (0.668 vs 0.679 $g*cm^{-2}$), those boys in the highest tertile (72 min per day) had significantly higher values than the corresponding girls (0.730 vs 0.692 $g*cm^{-2}$, $p<0.05$). There was no influence of PA on lumbar spine BMD in either gender. In multiple logistic regression analyses, a low hip BMD in boys was best predicted by fat-free mass (OR 0.55 [95%CI 0.38, 0.78] per 1 kg) and total PA (OR 0.69 [95%CI 0.49, 0.98] per 106 counts), while in girls predictors included fat-free mass (OR 0.63 [95%CI 0.50, 0.79] per 1 kg) and jump-and-reach (OR 0.90 [95%CI 0.84, 0.98] per 1 cm).

Conclusions: Gender differences in bone mineral mass during pre- and early puberty may be related to a different sensitivity of bone to physical loading, irrespective of muscle mass.

INTERVERTEBRAL DISC HEIGHT, SPINAL CURVATURE AND LOW BACK PAIN IN YOUNG RHYTHMIC GYMNASTS

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This study investigated the function of thoracal and lumbar spine in young rhythmic gymnasts with and without idiopathic low back pain (LBP). Seven female rhythmic gymnasts with idiopathic LBP (with mean Oswestry index 19.8% and mean (\pm SD) age of 13.3 \pm 1.0 years) were compared with 5 asymptomatic gymnasts (with mean age of 13.7 \pm 0.6 years). All subjects underwent magnetic resonance imaging (MRI). Intervertebral disc morphology for segments from T7-T12 and L1-S1 was recorded. Disc height and T2-weighted signal intensity were used as indicators for disc degeneration. The measurements of the thoracal kyphosis (TK) and lumbar lordosis (LL) were made radiographically by Cobb. In gymnasts with LBP, disc height in thoracal and lumbar spine was significantly lower ($p < 0.01$) in comparison with asymptomatic girls. Oswestry index correlated significantly ($p < 0.05$) negatively with TK, LL and mean L1-S1 disc height ($r = -0.87, -0.86, -0.89$, respectively). It was concluded that young rhythmic gymnasts with LBP had the flattened spine with lowered disc height in thoracal and lumbar spine as compared with asymptomatic girls. Whereas serious abnormalities in rhythmic gymnasts with LBP were not found. There is evidence that flattened spine in young rhythmic gymnasts is associated with lowered intervertebral disc height.

DETERMINATION OF GROWTH AND SPORT TRAINING EFFECT ON YOUNG LATVIAN BASKETBALL PLAYERS PERFORMANCE

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An aim of our investigation is to determine endurance and power characteristics in young male basketball players and to compare them in the age groups: 15–17 years and 18–21 years. 34 Latvian elite male basketball players participated in the investigation. An oxygen uptake, heart rate, lactic acid level in the plasma during a treadmill test, and vertical jumps height (counter-movement and free) are measured. The height, weight and body mass index do not differ significantly between age groups. All parameters determined at the anaerobic threshold level exercises are none significantly better in the older group of athletes. The average relative oxygen uptake in the age group 15–17 years is $47,5 \pm 5,2$ ml/ kg·min., but in the age group 18–21 years $49,2 \pm 4,2$ ml/ kg·min. The running speed is $3,55 \pm 0,31$ m/s in the younger group and $3,80 \pm 0,37$ m/s in the older players. The average heart rate is 176 ± 5 beats per min. in the younger and 173 ± 7 beats per min. in the older athletes. The maximal height of the counter-movement and free jumps are none significantly higher in the older basketball players ($49,9 \pm 8,0$ cm and is $60,5 \pm 9,0$ cm) in comparison with the younger group ($44,9 \pm 6,8$ cm and $55,1 \pm 8,7$ cm). The performance improvement in the older group of athletes can be explained by the sport training effect. It is not related to the growth because the average height and weight are none significantly higher in the younger athletes.

THE EFFECTS OF PRE-EXERCISE CARBOHYDRATE SUPPLEMENTATION ON ANAEROBIC EXERCISE PERFORMANCE IN ADOLESCENT MALES

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Aims: This study examined the effects of pre-exercise carbohydrate (CHO) supplementation on anaerobic exercise performance in adolescent males. **Methods:** Eleven healthy males (15.0–0.9 yrs; pubertal stage – 3) completed an exercise protocol consisting of a Wingate anaerobic test (WAnT), ten by 10-second sprints, and a second WAnT. Peak power (PP), mean power (MP), and fatigue index (FI) were assessed during each WAnT. The testing protocol was performed on separate days, 30 minutes after consuming a CHO (1.5 g glucose/kg of 22.5% CHO) or placebo (PL) beverage provided in a balanced and double-blinded manner. Venous blood samples were obtained pre-beverage, pre-exercise, and post-exercise, and analyzed for glucose, lactate, and insulin. Analysis used a trial by time ANOVA ($P < 0.05$). **Results:** PP across the two WAnT in CHO was 457.1 – 145.5 W and 336.9 – 94.0 W; while MP was 341.4 – 126.9 W and 237.9 – 77.3 W. In the PL trial, PP was 398.1 – 116.5 W and 337.9 – 94.8 W and MP was 294.3 – 93.3 W and 237.6 – 67.5 W, respectively. There was a tendency for PP and MP to be higher ($P < 0.09$) in CHO versus PL; and also a tendency for MP to decline more in CHO ($P < 0.06$). FI for the two WAnT were similar ($P < 0.05$) between trials and ranged from 47.6 – 12.7% to 51.2 – 10.9%. In the CHO trial, glucose concentration significantly increased from pre-beverage (85.5 – 9.9 mg/dL) to pre-exercise (125.6 – 19.3 mg/dL) then returned to baseline post-exercise (91.9 – 14.3 mg/dL), whereas in PL glucose level remained unchanged over time. Insulin concentration tended to follow the same pattern as glucose. Blood lactate increased over time, but was similar post-exercise in the CHO (11.8 – 1.5 mmol/L) and PL (10.5 – 2.1 mmol/L) trials ($P > 0.05$). **Conclusion:** The tendency for PP and MP to be higher in CHO might suggest a potential ergogenic benefit of pre-exercise CHO although the change in MP over time in CHO and the similarity in FI might suggest otherwise. Supported with a grant from the Gatorade Sports Science Institute

HOW TO SELECT THE MOST TALENTED CHILDREN FOR SWIMMING SCHOOLS?

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The main goal of this study was to determine which anthropometric characteristics and which motor abilities were the best predictors for performance in 50 m front crawl swimming in pre-adolescent boys. For this purpose 37 male swimmers, aged 9–10 years, were tested. The swimmers have participated in the training process for 2–4 years. The second objective was to utilize the obtained findings in the construction of swimming tests that would be used for testing the primary-school children to be initially selected for swimming-school participation. Therefore, the study was aimed at identifying those anthropometric and motor tests that would help select potential future swimmers regardless of whether they were able or not to swim over a 25 m distance prior to the testing procedure. >From the whole set of anthropometric characteristics and motor abilities predictors, only five characteristics and abilities can be singled out as significant for predicting success in the 50 m front crawl event. Among the tests that had been singled out as predictive -sitting height, upper arm circumference, upper arm skinfold, hand diameter and vertical jump, the two: sitting height and upper arm skinfold were negatively correlated with the 50 m crawl performance. This actually means that the children whose scores in the five tests exceed the arithmetic mean should be regarded as apt or predisposed to swimming and they should be asked to participate in the second phase of swimming-selection skills testing over the 25m distance. The authors do not propose any general standards (model values) to be prescribed. Instead, in order to provide as wide a selection pool as possible, the values of the arithmetic means of the scores in individual tests should be determined for each generation separately on the basis of the sample measured. Upon data processing, those children who meet the listed criteria would be asked to participate in the further testing of their swimming skills.

LONGITUDINAL CHANGES IN BODY COORDINATION IN CHILDREN: A 4 YEARS STUDY IN AZORES ISLANDS

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Aim: The purpose of this study was: (1) to analyse longitudinally the changes in body coordination (BC) in children during 4 years (6 to 10 years old); and to analyse the stability of BC. **Methods:** Sample size comprises 142 girls (6.46 ± 0.31 and 9.37 ± 0.52 years old at the first and at fourth evaluation respectively), and 143 boys (6.44 ± 0.29 years old at the first evaluation and 9.35 ± 0.54 at the third). C was evaluated according to the body coordination test battery (Körperkoordinations Test für Kinder). The battery comprises four tests: backward balance (BB), jumping sideways (JS), hopping on one leg (HL), and shifting platforms (SP), from the 4 tests it is obtain a motor quotient (MQ), which permit the classification of children BC. A mixed ANOVA was used to analyze the changes along the 4 years and the differences between boys and girls. Intra-class correlation coefficient was used to analyze the stability in the all items test battery. **Results:** In both boys and girls and in all items of test battery there were significant linear increases during the 4 years. In MQ the results show a significant quadratic effect in girls, with an increase until the third evaluation and then a decrease. In boys the opposite occurred, the show a decrease until the third evaluation and then an increase. The BC level was higher in boys than in girls at all 4 evaluations, although in both boys and girls the level was low. It was found low (0.36) to moderate (0.66) stability in both boys and girls in battery test items, and a high stability in MQ (0.90 – 0.91). **Conclusions:** There was an increase in the results of all battery test items in both and girls, but boys had a better performance than girls. Both boys and girls had a low MQ. BC test items had a low-to-moderate stability, and MQ had high stability.

BIOMECHANICS AND BIOENERGETICS OF FRONT CRAWL SWIMMING IN YOUNG FEMALE SWIMMERS

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The purpose of this study was to examine the influence of energy cost of swimming, anthropometrical/body composition and technical parameters on swimming performance in young swimmers. Twenty six girls, 14 prepubertal (11.1 ± 0.7 yrs; Tanner stages 1–2) and 12 pubertal (14.7 ± 1.6 yrs; Tanner stages 3–4) girls participated in the study. Energy cost of swimming (Cs) and stroking parameters were assessed over maximal 400 metre front crawl swimming in a 25 metre swimming pool. The backward extrapolation technique was used to evaluate peak oxygen consumption (VO_{2peak}) in addition to assessed VO_{2peak} on a cycle ergometer. A stroke index (SI; $m \cdot s^{-1} \cdot cycles^{-1}$) was calculated by multiplying the swimming speed by the stroke length. Correlation analysis indicated that that SI ($r = -0.92$), VO_{2peak} ($r = -0.48$) and fat free mass ($r = -0.61$) were the best predictors ($p > 0.001$) of swimming performance in studied young swimmers. In addition, the backward extrapolation method could be used to assess VO_{2peak} in young swimmers in sport specific conditions. In conclusion, the SI, fat free mass and VO_{2peak} appear to be the major determinants of front crawl swimming performance in young female swimmers.

PRE-EXERCISE CARBOHYDRATE CONSUMPTION AND PERCEIVED EXERTION IN ADOLESCENT MALES PERFORMING HIGH-INTENSITY INTERMITTENT EXERCISE

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Aims: The effect of pre-exercise carbohydrate (CHO) consumption on ratings of perceived exertion (RPE) during an intermittent, anaerobic exercise protocol was examined in 10 healthy males (15.1 \pm 0.9 yrs; pubertal stage \pm 3. **Methods:** The exercise protocol consisted of a Wingate anaerobic test (WAnT), ten by 10-sec sprints, and a second WAnT with 30 sec rest intervals. Testing was performed on separate days, 30 minutes after consuming a CHO (1.5 g glucose/kg of 22.5% CHO) or placebo (PL) beverage provided in a balanced and double-blinded manner. Venous blood samples ($n = 7$) were obtained pre-beverage, pre-exercise, and post-exercise and analyzed for glucose and lactate. MP and associated OMNI RPE were determined from each WAnT and the 2nd, 4th, 6th, 8th, and 10th sprint. The data were analyzed using a trial by time ANOVA ($P < 0.05$). **Results:** MP was 341.4 – 126.9 W and 237.9 – 77.3 W in CHO and 294.3 – 93.3 W and 237.6 – 67.5 W during PL. During the sprints MP ranged from 279.4 – 101.2 W to 314.5 – 107.0 W in CHO and 281.1 – 94.7 W to 293.6 – 91.6 W in PL. There were no difference or interaction effects between trials, but a decline ($P < 0.05$) in MP over time occurred. Across the seven bouts of exercise RPE ranged from 4.2 – 1.8 to 8.9 – 0.9 in CHO and from 3.8 – 1.8 to 8.5 – 1.1 in PL and was similar between trials, but increased ($P < 0.05$) over time. In CHO, glucose increased from 85.9 – 10.7 mg/dL pre-beverage to 126.6 – 20.7 mg/dL pre-exercise and declined to 96.4 – 6.7 mg/dL post-exercise ($P < 0.05$) whereas blood glucose remained unchanged in PL. Before exercise lactate concentrations were < 1.7 mmol/L in both trials and, although significantly increased to 11.8 – 1.6 mmol/L and 10.7 – 2.2 mmol/L in CHO and PL, respectively, there was no trial difference. **Conclusion:** Consumption of CHO prior to intermittent, anaerobic exercise does not appear to affect performance or perception of effort. Supported with a grant from the Gatorade Sports Science Institute.

PHYSICAL ACTIVITY IN PORTUGUESE TWINS. A PILOT STUDY

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Aims: The purposes of this paper are twofold: (1) to inform, in very general terms, about a research project with twins being conducted in Portugal; (2) to present pilot data about physical activity patterns (PAP) in twins that were monitored for 5 days. **Methods:** The main aims of the project are as follows: (1) estimate genetic and environmental factors in physical activity levels, health-related physical fitness, overweight and obesity; (2) to explore possible correlations among mtDNA (particularly its haplotypes) polymorphisms and physical activity, and health-related physical fitness; (3) to cross-validate an indirect method of zygosity determination against DNA information; (4) describe the possible influences of low levels of physical activity in obesity and their genetic influences; (5) determine the genetic effects of variable patterns of physical activity. To assess PAP, we followed 31 twin pairs (18 MZ, and 13 DZ diagnosed with DNA markers), aged 6 to 12 years of age, during 5 days (3 week-days and a week-end) with a tri-axial accelerometer (TRITRAC R3D). Count data was read in specialized software (GEM-WIZARD), and was transformed in energy expenditure according to manufacturer indications, so that 4 phenotypes were available: till 3 Mets, from 3–6 Mets, from 6–9 Mets, and above 9 Mets. SPSS 15 and SYSTAT 10 softwares were used in data analysis. **Results:** The highest frequency of energy expenditure was noted in low level activities (<3Mets), and very low frequency of high intensity (>9 Mets) activities. DZ twins showed greater inter-individual differences at all intensity activities, suggesting the presence of genetic factors (Pearson correlations were always higher for MZ than DZ twins). **Conclusions:** In children, physical activity seems to be mainly random. The highest frequency is for low activities, interspersed with a low frequency of moderate to vigorous activities. Intra-pair differences being higher in DZ as compared to MZ twins suggest that genetic factors may play an important role. Portuguese Foundation for Science and Technology (POCI/DES/62499/2004) supported this study

HEALTH-RELATED PHYSICAL FITNESS OF PORTUGUESE SIBLINGS. A QUANTITATIVE GENETIC STUDY

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Aim: Health-related physical fitness presents an evident inter-individual variation at the population level. Biological and environmental correlates are significant correlates, although they explain less than 50% of the total variation. Therefore, the purpose of this study is to address if criterium-related physical fitness is govern by genetic factors. **Methods:** Two hundred and sixty two siblings pairs (75 female pairs, 59 male pairs, and 128 opposite sex pairs) aged 10 to 18 years were sampled from Bragança county, a northeast region of Portugal. Physical fitness was evaluate with the Prudential Fitness-garm test battery, health-related, and criterium designed, in which subjects are classified as fit (value of 1) or non-fit (value of 0) according to age and sex specific cut-off intervals of performance for trunk-lift, push-ups, curl-ups, 1-mile run, and body mass index. Data analysis includes basic statistics, reliability estimates by intraclass correlation coefficient (R), as well as a maximum likelihood approach to quantitative genetic analysis with binary traits, controlling for sex, age, sex*age, age², and physical activity levels. SPSS 15 and SOLAR 4 softwares were use. **Results:** Reliability estimates for all fitness tests were high (0.84–8804; R–8804; 0.99) confirming the quality of the data. Since in the trunk-lift all subjects were classify as fit, there was no variation and covariation available and no genetic analysis was done. The genetic effects for the other fitness tests were as follows: push-ups, $h^2=0.46\pm 0.22$, $p=0.02$; curl-ups, $h^2=0.37\pm 0.16$, $p=0.03$; 1-mile run, $h^2=0.50\pm 0.18$, $p<0.01$; BMI, $h^2=0.74\pm 0.20$, $p<0.01$. **Conclusions:** we have shown that health-related physical fitness classification is dependent upon genetic factors; moreover, it is also important to pinpoint that a similar part of the variation is associated with environmental effects. This suggests, at least, two things: (1) health-related physical fitness classification is dependent upon the genotype of each individual; (2) that levels and changes in physical fitness are prone to be influence by environmental factors if stimuli are sufficient to match individual genotypes. Portuguese Foundation for Science and Technology (POCI/DES/62499/2004) supported this study

COMPARISON OF PEAK OXYGEN UPTAKE IN BOYS EXERCISING ON TREADMILL AND CYCLE ERGOMETERS

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In children as well as for adults, risk factors for cardiovascular health includes physical fitness. Peak oxygen uptake (VO_{2peak}) is a commonly used method of assessing aerobic fitness. Higher VO_{2peak} values (5–10%) have been found on treadmill for adults, in a number of studies. Scarce evidence exists for children, and we investigated how the test modus influenced the VO_{2peak} results in boys. Twenty boys aged 9.1 ± 0.3 yr (mean \pm SD) were tested on the treadmill and on a cycle ergometer. Mean VO_{2peak} was 1.71 ± 0.21 vs. 1.63 ± 0.17 L min^{-1} for running and cycling, a difference of 4.7% in the favour of running ($p < 0.01$). Maximal heart rate was 3.9% higher for the treadmill test; 203 vs. 195 beats min^{-1} ($p < 0.01$). Breathing frequency was 66.7 vs. 61.2 breath min^{-1} respectively, a difference of 9.1% ($p < 0.01$). Pulmonary ventilation was 2.2 L min^{-1} higher in the running test (61.2 ± 7.6 vs. 59.0 ± 6.7) but this difference was not statistical significant. Neither was there a significant difference in Oxygen pulse, 8.5 ± 1.1 ml $beat^{-1}$ vs. 8.4 ± 0.9 ml $beat^{-1}$ or in Respiratory Exchange Ratio, (1.06 ± 0.03 for both modes). Tidal volume was 4.6% higher when cycling. Both test forms achieved the same degree of criteria fulfilment for a maximal test. Children can use both test forms, but results will be better on the treadmill. This must be taken into account when comparing different studies of children that have used running or cycling as work form.

DIFFERENCES IN VOLUNTARY ACTIVATION BETWEEN ADULT AND PREPUBERTAL MALES

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Aim: The effect of central and peripheral mechanisms on children fatigability has not been well studied. The purpose of this study was to examine to what extent central and peripheral mechanisms explain the fatigue differences between adults and prepubertal boys during maximal sustained fatigue test. **Methods:** Seven boys (age: $10,9 \pm 0,8$ yrs, body mass: $43,1 \pm 10,9$ kg, height: $150,1 \pm 7,7$ cm, means \pm SD) and seven men (age: $25,4 \pm 1,9$ yrs, body mass: $74,9 \pm 7,8$ kg, height: $180,4 \pm 6,3$ cm, means \pm SD) volunteered to participate in this study, with informed consent. Maturation was determined in the boys as suggested by Tanner (1962). The maximal voluntary contraction (MVC), the voluntary activation and the peak twitch torque were evaluated prior and at the end of a maximal sustained plantar flexion fatigue test. The fatigue procedure was terminated when the torque output decreased to 50% of the MVC. A supramaximal electrical stimulus was given at rest and during MVC for the voluntary activation and the peak twitch torque estimation. The level of voluntary activation was calculated as $[(\text{initial torque} - \text{final torque}) / \text{initial torque}] \times 100$. The results were analyzed with a two factor ANOVA. The level of significance was set at $p < 0,05$. **Results:** The results showed that there was a higher fatigue in adults regarding prepubertal boys. There was also a main effect of fatigue ($F_{1,12} = 144,4$, $p < 0,001$) on level of activation. Furthermore, there was a main effect of age ($F_{1,12} = 45,1$, $p < 0,001$), fatigue ($F_{1,12} = 62,5$, $p < 0,001$) and interaction ($F_{1,12} = 25,6$, $p < 0,001$) on peak twitch torque at rest. More specific after fatigue both men and boys showed a significant decline in level of activation (men=8,6%, boys 7,1%, $p < 0,05$). The Scheffe post hoc test showed that the measures of peak twitch torque declined more in men (22%) than boys (10,7%) ($p < 0,001$). **Conclusions:** The current findings suggest that the fatigue differences between adults and children during a maximal sustained contraction could possibly be attributed in peripheral factors and not in central ones.

SEASONAL VARIATION IN OBJECTIVELY ASSESSED PHYSICAL ACTIVITY IN THREE AND FOUR YEAR OLD CHILDREN

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Aim: The purpose of the current study was to investigate seasonal variation in the physical activity (PA) of three and four year old children during winter and spring. **Methods:** Mean daily activity was assessed using an electronic pedometer (Digiwalker™ DW-200, Yamax, Tokyo, Japan) in 85 (33 F) three- to four-year old children over a six day period (4 weekdays and 2 weekend days) in Winter (December or January) and Spring (April). Children were recruited from Nursery Schools in the greater Belfast area. Data included in the analysis had a minimum of 9.5 hours monitoring per day and included at least 3 week days and one weekend day. The effect of season and gender on PA were assessed via a between-within subjects ANOVA. Gender differences in PA in Winter and Spring were evaluated with t-tests. Institutional ethical approval and parental informed consent were obtained. **Results:** PA results are presented below (Mean (SD)):

Group	Mean Daily		Pedometer Counts	
	Winter	Spring	Winter	Spring
Male (N=52)	9780 (2979)	11417 (3374)		
Female (N=33)	8655 (2104)	11064 (2856)		
Total (N=85)	9349 (2717)	11280 (3170)		

ANOVA results showed a main effect for season ($p = 0.0001$) but this was not differentiated by gender. T-test results indicated that PA levels in males and females of this age are not significantly different. **Conclusions:** The results indicate that PA levels in young children are influenced by seasonal effects. Researchers in the field should take cognisance of this seasonal effect when assessing PA.

USING HEART RATE FEEDBACK TO ENHANCE PHYSICAL ACTIVITY IN CHILDREN

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AIM. Childhood obesity is arguably the most significant global public health threat, yet effective strategies to contain or prevent the disease are not available. This study was designed to evaluate whether self-referent, iterative feedback from a heart rate monitor was an effective way of increasing physical activity in the short- and long-term. **METHODS.** Intervention: Individualized, iterative heart rate feedback was given via the Polar E600 heart rate monitor (Polar Electro Oy, Finland), either in combination with a two-week educational program or in isolation (no educational program). The education program was intended to provide information about heart health and the use of heart rate feedback for gaining information on the attainment of the goal of adding more activity per day to reach the target of 60 minutes of moderate to vigorous intensity activity. Setting/participants: Schools were randomly assigned to either a control group; an educational program group, or a no-educational program group. Two hundred and ten children (105 boys and 105 girls) from three schools were recruited from primary grades 4 and 5 (mean age 10.44 years; SD = 0.85). Main outcome measures: The main outcome measures were physical activity responses (time above flex heart rate; percent time in low, moderate and vigorous physical activity) and changes in attraction to physical activity (CAPA). **RESULTS.** Repeated measures ANOVA indicated that in the short term, heart rate monitor feedback increased overall physical activity by an average of 70 min/day ($p < 0.001$). Percentage time spent in the vigorous heart rate zone increased by an average of 4 min/day ($p < 0.05$). These increases were apparent regardless of whether or not participants had received any educational program, and occurred in the absence of any change in attitudes towards physical activity. The 6-month follow-up showed that short-term feedback mediated changes in physical activity did not persist. **CONCLUSIONS.** The findings from the current study suggest that personalized feedback received from heart rate monitors is effective in increasing physical activity. We would like to acknowledge Polar Electro Oy, Finland and the HKU UDF fund for their support of this project.

THE RELATIONSHIP BETWEEN THE EXERCISE-INDUCED CHANGES IN STRESS HORMONES AND IMMUNE RESPONSES

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Aim: Research in adults has suggested that relationships exist between the exercise-induced inflammatory responses and the stress hormone responses (Gabriel, 1992; Kappell, 1991; Pedersen, 1997). Since these relationships have not been examined systematically in youth, the purpose of this study was to examine these relationships in youth. **Methods:** 38 youth (7 to 17 yr old; 19 of each sex) completed 10, 2-min bouts of high-intensity exercise (50% > anaerobic threshold), with 1 min rest between bouts. Pre and immediate-post exercise blood samples were analyzed for leukocytes and lymphocyte subsets, IL-1B, IL-6, TNF-a, and stress hormones. **Results:** Exercise significantly increased the catecholamines and growth hormone ($p=0.0001$), but not cortisol ($p>0.582$). Exercise increased IL-6 and all leukocyte subsets ($p<0.01$) except CD4 & CD8 cells. No significant correlations were found between the HGH or cortisol responses and any of the leukocyte subsets or cytokine responses ($p>0.31$). The catecholamines were associated with changes in monocytes ($r=0.33$; $p<0.05$) and the majority of lymphocyte subsets ($r = 0.32-0.41$; $p<0.05$). **Conclusion:** Although these results suggest that the immune responses of youth to high-intensity exercise may not be highly correlated to the stress hormone responses, the results do not eliminate the possibility that the elevated stress hormones may initiate the immune responses.

THE EFFECT OF A 9-WEEK HIGH-IMPACT EXERCISE PROGRAMME ON BONE AND BODY COMPOSITION OF CHILDREN AGED 10–11 YEARS. THE A-CLASS PROJECT

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Aims. Increasing the physical activity levels of children is a key objective in health strategies. Skeletal health and body composition are fundamentally important in childhood health and can be modified favourably through physical activity. This investigation implemented a high-impact exercise intervention alongside a lifestyle intervention and compared changes in body composition and bone mineral density over a 9-week period. **Methods.** Sixty-one children (girls n=36, boys n=25) aged 11.03±0.2 years from three randomly selected schools volunteered for the study. The three schools were randomly assigned to either a structured exercise (STEX) intervention (n=16 children), a lifestyle intervention (PASS) (n=15) or a control (CONT) (n=30). The STEX group attended sessions of high-impact vigorous activity (duration 1 hour) twice weekly for a 9-week period. Sessions included a combination of games and circuit activities with the target of maintaining an average heart rate of over 75% of their age predicted maximum heart rate (145 beats·min⁻¹) for the duration of the session. The PASS group received weekly mail to their home in the style of a “mission” suggesting a task as a prompt to participate in physical activity during the week. Dual-energy x-ray absorptiometry (DEXA) was used to measure fat mass, fat-free lean mass, and bone mineral content (BMC) and bone mineral density (BMD) of total body (TB), femoral neck (FN) and lumbar spine (LS) at baseline and post-intervention. ANCOVA, with baseline scores as the covariate, was used to evaluate the effect of the intervention. **Results.** Compared with changes observed in the control group, the STEX intervention resulted in an additional mean increase in stature-adjusted BMCTB of 38.59 g (95% CI for the difference between groups: 2.34 to 74.84, P=0.037)

and an additional increase of 0.008 g.cm⁻² (95% CI: 0.001 to 0.014) for BMDTB (P=0.017). These mean effects exceeded a pre-specified threshold for clinical importance. No significant changes were found in fat mass, lean mass or percent body fat measures. The PASS group observed no significant changes compared to the control group. Conclusion. A sixty-minute high-impact programme of structured high-impact exercise performed twice weekly stimulated a significant and clinically relevant increase in BMCTB and BMDTB, and produced a tendency towards favourable changes to body composition in 10–11 year old children.

THE DESIGN AND TESTING OF AN INNOVATIVE ACTIVITY CONTINGENT MULTI-MEDIA TOOL

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AIM. There is substantial evidence to suggest that the epidemic of obesity is the consequence of chronic reduction in total daily energy expenditure (TDEE), rather than excess energy intake. The excess energy which results in sustained weight gain has recently been estimated in children to be between 110 and 165 kcal/day (Wang et al., 2006). Screen time represents a substantial proportion of sedentary time. We designed and tested a gaming treadmill that enables all screen time to be conducted whilst ambulating slowly, with the aim of converting otherwise sedentary screen time into active screen time. The aim of this study was to (i) test habituation and gaming ability on the gaming station and (ii) address the hypothesis that ambulatory computer gaming results in a meaningful increase in energy expenditure above rest. **METHODS.** Thirty 7 to 12 year-olds were recruited to attend laboratory testing sessions. Resting energy expenditure was assessed following a 12-hour fast using indirect calorimetry. A 12-minute habituation protocol, as well as seated and ambulatory computer gaming were completed. Energy expenditure was then assessed during seated and ambulatory computer game playing. **RESULTS.** Steady gait walking at 1 km/hr was achieved by all the children in less than 1 minute. None had any difficulty walking

steadily at either 1.2 or 1.8 km/hr. All the children could let go of the handrails during the second 3 minute bout (1.2 km/hr), and only two had to re-adjust their balance during 9 minutes of walking. When game score was compared between seated and walking play modes, no significant difference was found. Walking at 1, 1.2 and 1.8 km/hr increased EE above rest by 70 kcal/hr, 84 kcal/hr and 103 kcal/hr, respectively. Seated computer play provided 18 kcal/hr of expended energy above rest, whilst computer play using the Walk-and-Game Station at 1 km/hr resulted in 72 kcal/hr, a 4.8 fold greater energy expenditure than in the seated mode. **CONCLUSIONS.** These data demonstrate the feasibility and ease of use of the gaming station by children. If regular gamers spent 50% of their gaming time per day on our activity contingent gaming station, sufficient energy would be expended to close the energy gap and prevent weight gain. **REFERENCES.** Wang, Y., Gortmaker, S., Sobol, A., & Kuntz, K. (2006). Estimating the energy gap among US children: a counterfactual approach. *Pediatrics*, 118, e1721–1733

ASSESSMENT OF PHYSICAL FITNESS AND ITS RELATION TO ANTHROPOMETRICAL INDICES IN PRESCHOOL CHILDREN FROM A MOUNTAINOUS REGION IN POLAND

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The aim: The aim of this study was to assess physical fitness and its relation to anthropometrical indices in preschool children from a mountainous region in Poland. Methods: The studied population included 121 children aged 6 years living in Nowy S'cz and the vicinity. Physical fitness was assessed using physical fitness test for preschool children worked out by Sekita, which comprises four exercises: 4 × 5 m shuttle run (to measure agility), standing broad jump (to measure power), medical ball throw for distance (to measure strength) and 20-metre run (to measure speed). Parents were asked about their opinion of their children's physical fitness. Body height

and weight were measured and body mass index (BMI) was calculated. To assess height, weight and BMI percentile growth charts for Cracow children were used. The cut-off values for body height and weight were below the 3rd percentile and above the 97th percentile. Statistical analysis was carried out by means of the SPSS 12.0 PL for Windows computer programme. To assess physical fitness, the studied population was divided according to gender. To assess relation between physical fitness and anthropometrical indices, the population was divided according to physical fitness indices, using TwoStep cluster analysis. Results: Gender had statistically significant impact on the level of agility. Higher percentage of boys than girls had good level of agility (26.3% vs. 4.7%) and higher percentage of girls than boys had unsatisfactory level of agility (64.1% vs. 45.6%). Satisfactory level of physical fitness was represented by 43.7% of girls and 40.4% of boys, and good level of physical fitness was represented by 25.0% of girls and 38.6% of boys. Boys scored more in agility, power and strength exercises and in the whole physical fitness test. Girls scored more only in speed exercise. The percentage of preschoolers' parents who were convinced of their children's good or very good physical fitness was high, 48.3% and 32.2%, respectively. TwoStep cluster analysis revealed three clusters of children. Preschoolers in cluster 1 had the lowest level of physical fitness, and preschoolers in cluster 3 the highest. This variable had statistically significant impact on children's weight, percentages of children in percentile categories for weight and percentages of children meeting the norm for weight. Children in cluster 1 had lower body weight than children in clusters 2 and 3. In cluster 3 the highest percentage of children with height, weight and BMI from the 25th to 75th percentile category was observed. Conclusions: Physical fitness in the studied population was lower compared to their peers from other regions of Poland, which shows the need to pay more attention to physical education in preschools. Neither the highest nor the lowest values of anthropometrical indices were connected with the highest level of physical fitness. It seems that there is an optimal range of these values that is related to high level of physical fitness in preschool children.

BODY FAT AND ENDURANCE OF PREPUBERTAL BOYS

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Sample differences in body dimensions, body composition and physical performance accurately characterise the changes in life standards and life-style. Such human biological differences are called secular growth trends. According to the results of successive, cross-sectional growth studies the consequences of the secular growth trend are still remarkable in Hungary during a longer observation period. The aim of the study was to analyse the 15-year differences between the results of two longitudinal studies. Two, six month frequency data collections (1987–1991 and 2002–2006) (n=108 and 115) were carried out in non-athletic boys aged between 6.51 and 10.50 years. Height, body mass, BMI, percent fat (Parizkova 1961) and running performance in Cooper-test means were compared by repeated factorial ANOVA. Changes with age were tested by linear regression analysis. Boys of the second investigation were significantly taller and not proportionally heavier. The mean nutritional status indicators and also the cardio-respiratory performance were consistently less favourable at the beginning of the new millennium. The age related speed of increase in height and running performance did not change but the increase of body mass, BMI and fat content was faster in the sample of 2002. Height and in part the body mass differences can be attributed to the existing secular growth changes, but behind the greater BMI, percent fat means and the significantly weaker running performance the consequences of markedly changed lifestyle (definite hypoactivity) can be estimated.

PRIMARY SCHOOL CHILD DEVELOPMENT – ISSUES OF SOCIO-ECONOMIC DIFFERENCES IN GIRLS

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Environmental conditions including socio-economic status, nutrition, habitual physical activity can influence the progress of somatic growth, biological maturation and also of physical performance. Approximately 25–30% of the Hungarian primary schoolchildren are estimated to have some kind of governmental or municipal social support. The aim of the study was to follow up and compare the somatic and motor development of primary schoolgirls supported because of low socio-economic status. Eight data collections each were carried out in three geo-economic regions of Hungary between 2002 and 2006. The study group (low SES) contained 143 girls and the control one consisted of 330 ones of the same calendar age (7–11 yrs) and school grade. Low SES category was determined according to the five supportable categories determined by the government. Group differences in mean stature, body mass, body fat content, 30m dash, standing broad jump and 400m run scores were analysed by t-tests for independent samples at the 5% level of random error. Height and the body mass means were consistently and significantly greater in the control group, but the body fat content means relative to weight were statistically the same. The low SES children performed poorer in the three observed motor tests. The observed differences could be attributed to poverty that was likely to have existed already before and during the observation period. Nevertheless, it was not the absolute but the long-lasting relative malnutrition (the inappropriate essential amino acid, vitamin, etc. intake) that we have to consider in the low SES children

EXERCISE BLOOD PRESSURE AND VASCULAR FUNCTION IN 9–10 YEAR OLD CHILDREN

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Aim. An exaggerated blood pressure response to exercise predicts future cardiovascular disease and has been shown to reflect impaired vascular function in adults. The aim of this study was to determine the relationship between the blood pressure response to exercise and vascular function in 9–10 year old children. **Methods.** 96 children (51 boys) (age 9.9 ± 0.4 y) were recruited. Systolic (SBP) and diastolic blood pressure (DBP) were measured at rest (restBP), pre-exercise (preBP) and immediately after (exBP) a continuous incremental exercise test to exhaustion on a cycle ergometer. Delta blood pressure (~ 8710 ; BP) was calculated as post-maximal minus pre-exercise blood pressure. Microvascular function was assessed by the skin blood flow response to the iontophoretic application of the endothelium dependent and independent vasodilators, acetylcholine (ACh) and sodium nitroprusside (SNP). **Results.** exSBP was significantly correlated with the peak ACh response ($r=0.21$, $p=0.038$) and the peak SNP response ($r=0.25$, $p=0.031$). 8710 ; SBP was significantly correlated with the peak SNP response ($r=0.24$, $p=0.042$). The peak SNP response was significantly greater in the highest versus the lowest quartile of exSBP response (highest quartile: 1.80 ± 0.58 v lowest quartile: 1.43 ± 0.44 V, $p=0.027$). **Conclusions.** In contrast to adult data, a higher systolic blood pressure response to exercise in 9–10 year old children reflects an enhanced endothelial and smooth muscle function.

ROWING ERGOMETER PERFORMANCE IN 12–13-YEAR-OLD ROWERS AS THE BASIS FOR TALENT IDENTIFICATION

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Performance-predictive parameters have been established for rowers representing different quality levels, sexes, weight categories and classifications, but none have been designed for very young rowers (age<14). The aim of this study was to predict 1000 m rowing ergometer performance based on 12 anthropometric and 6 physiological variables in 48 male rowers (age range 12.0–13.9; mean±SD 12.94±0.61) and to determine the key parameters that would perhaps provide a scientific basis for talent identification and the selection process in rowing. The subjects underwent anthropometric measurements after which they completed an incremental maximal treadmill test. Within three weeks they competed at the Zagreb Indoor Rowing Championship over a 1000 m ergometer distance. Subjects' body height ($r=0.79$), body mass ($r=0.60$), lean body mass ($r=0.82$), leg length ($r=0.72$), arm length ($r=0.71$), bicristal diameter ($r=0.63$), biacromial diameter ($r=0.73$), upper arm girth ($r=0.34$), forearm girth ($r=0.63$), thigh girth ($r=0.29$), calf girth ($r=0.54$), maximal oxygen uptake (in L/min, $r=0.89$; and in mL/kg/min, $r=0.36$), maximal ventilation ($r=0.77$), and oxygen uptake at ventilatory anaerobic threshold ($r=0.87$) correlated with 1000 m time ($p<0.05$), while percent body fat, percent of maximal oxygen uptake at ventilatory anaerobic threshold, and maximal lactate did not. Multiple regression procedures indicated that the model comprising anthropometric and physiological variables combined best predicts performance ($R^2=0.85$), followed by models that comprised physiological ($R^2=0.80$) and anthropometric ($R^2=0.76$) variables alone. In conclusion, in rowers aged 12–13 years a higher aerobic capacity (as measured by maximal oxygen uptake in L/min), and a larger body size are beneficial for performance over 1000 m rowing ergometer distance.

MUSCLE AND CARDIORESPIRATORY ENDURANCE OF GIRLS WITH TURNER'S SYNDROME

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Aim: To compare girls with Turner's syndrome with their healthy mates of short stature with respect to muscle and cardiorespiratory endurance. **Methods:** Girls with Turner's syndrome (TS; $n = 79$) and healthy ones below Percentile 25 for body height (REF; $n = 292$), aged 10–19 years, were subjected to two EUROFIT tests: bent-arm hang (BAH) and endurance shuttle run (ESR). The results were standardized against age functions of respective means and standard deviations for Polish population. The contributions of age, body height and body mass to the total variances of BAH and ESR were computed. **Results:** Turner girls attained significantly ($p < 0.001$) worse results in ESR compared with healthy girls but difference was not found in BAH. Multiple correlation with age, body height and mass was significant only for BAH in Turner girls ($R^2 = 0.185$) in whom the only significant, negative contribution was that of body mass (14%). **Conclusion:** No significant effect of age or somatic variables on muscle or cardiorespiratory endurance was detected in healthy girls and in those with Turner's syndrome only body mass negatively affected the muscle endurance. This may suggest that factors not directly involved in that kind of performance could play a role.

METABOLIC STABILITY DURING TREADMILL WALKING IN YOUTH WITH DIPLEGIC AND QUADRIPLEGIC CEREBRAL PALSY

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Prior to implementing treatments designed to improve locomotor economy (V_{O_2}) in children with cerebral palsy (CP), it is important to establish baseline measures of walking energy use. Hence, the purpose of this study was to quantify within- and between-day stability of treadmill walking V_{O_2} in children with diplegic ($n = 10$) and quadriplegic ($n = 3$) CP. Eleven boys and two girls (mean age = 12 ± 3 yrs; mean body mass = 44.1 ± 17.5 kg) participated in three treadmill walking sessions over a 2-week period. In Session 1, subjects received instruction on how to mount and walk on a treadmill, completed 5 min of treadmill walking at $0.67 \text{ m}\cdot\text{s}^{-1}$ (a speed that could be negotiated successfully by all children), and were familiarized with the use of a mouthpiece and noseclip. In Session 2 (S2), each child performed three 5-min walks (W1, W2, W3) at $0.67 \text{ m}\cdot\text{s}^{-1}$, while in Session 3 (S3), a single 5-min bout of walking (W4) was completed. In S2 and S3, V_{O_2} was determined from analysis of an expired gas sample collected during the last 2 min of each walk. Results indicated no significant difference ($p > .05$) in V_{O_2} across the four walking trials (W1 $V_{O_2} = 17.1 \pm 4.4 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$; W2 $V_{O_2} = 16.7 \pm 4.3 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$; W3 $V_{O_2} = 16.2 \pm 4.6 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$; W4 $V_{O_2} = 16.3 \pm 4.0 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$). Within-day coefficient of variation (CV) and intraclass correlation coefficient (ICC) values for V_{O_2} were $5.2\% \pm 3.5\%$ and 0.98, respectively. Analysis of between-day variability in V_{O_2} yielded a CV of $5.5\% \pm 4.8\%$ and an ICC of 0.96. Viewed collectively, these data confirm previous findings obtained in children with hemiplegic CP and suggest that among youth with diplegic and quadriplegic CP, stable within- and between-day values of locomotor economy measured at a comfortable walking speed can be obtained following 5 min of treadmill walking practice and a brief exposure to metabolic testing procedures.

LEISURE TIME STRUCTURE ACCORDING TO LEVEL OF PHYSICAL ACTIVITY IN ADOLESCENTS

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Aim: These study main goals were: (1) to examine the relationship between physical activity involvement and other leisure activities in a sample of Portuguese youth. (2) To analyse gender differences in physical activity and leisure-time activity structure. **Methods:** The sample comprised 1123 adolescents, which were classified according to physical activity levels into actives ($n=589$) and non-active ($n=534$). A questionnaire assessed Leisure-time activities was applied. **Results:** Girls were significantly more engaged in social leisure, dutiful and individual artistic activities during leisure-time, whereas boys were more involved in sports and computer and TV viewing activities. Significant associations between PA and social leisure was found in girls ($r= 0.18$; $p=0.000$) and boys ($r= 0.13$; $p=0.004$) after adjusted for age. The same was found between level of PA and sports engagement during leisure (girls: $r= 0.56$; $p=0.000$; boys: $r= 0.51$; $p=0.000$). In girls ($r= 0.10$; $p=0.02$) but not in boys, a statistically significant association was found between PA and individual artistic activities. **Conclusions:** This study has certain implications for health-related physical activity promotion efforts. Our data give additional reinforcement to the importance of organized and non-organized sports/physical activity during leisure-time for overall levels of PA in adolescents.

RELATIONSHIPS BETWEEN GHRELIN CONCENTRATION AND METABOLIC PARAMETERS IN BOYS

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The aim of the present study was to assess the influence of regular physical activity on ghrelin concentration and the interrelationships between ghrelin and metabolic and biochemical parameters in boys. In total, 56 healthy schoolboys aged between 10 and 16 years were divided into the swimming (n=28) and the control (n=28) groups. The subjects were matched by age and body mass index (BMI), generating 9 matches pairs in pubertal group I (Tanner stage 1), 11 pairs in group II (pubertal stages 2 and 3) and 8 pairs in group III (pubertal stages 4 and 5). Plasma ghrelin levels were significantly higher in the swimmers groups II and III than controls (group II: 1126.8±406.0 vs. 868.3±411.2 pg/ml; group III: 1105.5±337.5 vs 850.8±306.0 pg/ml). Ghrelin was significantly correlated with VO_{2peak} in control group ($r = -0.530$; $p < 0.05$), while not in the swimmers group. From biochemical parameters ghrelin was significantly related to testosterone ($r = -0.596$), IGF-1 ($r = -0.656$) and IGFBP-3 ($r = -0.494$). No relationships were observed in the swimmers group between ghrelin and biochemical parameters. In conclusion, ghrelin concentration decreased during puberty in physically inactive boys.

A PROFILE OF PAEDIATRIC SPORTS INJURIES AT THREE TYPES OF MEDICAL PRACTICE

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Despite immeasurable benefits, organized sport comes with injury risks. The Paediatric Sporting Injuries Study in Sydney, Australia was a prospective surveillance study involving 250 sporting injuries in young people (63% male) aged 5 to 16 years. The objective was to profile and compare injuries from patients seeking help for sports-related injuries at three types of medical practice; Sydney's largest paediatric emergency department (The Children's Hospital at Westmead) ($n = 1$ site and 103 patients), sports physician practices ($n = 5$ sites and 91 patients) and general practices with a paediatric focus ($n = 5$ sites and 56 patients). Patients or parents (where appropriate), volunteered to complete surveillance forms on presentation for medical assistance. Treating physicians also completed a surveillance form. Bivariate analyses were conducted to examine unadjusted relationships between injury data and different types of medical practices. Because variables were categorised, Chi-squared tests were applied to examine bivariate associations. Patients presenting to the hospital (82%) and general practitioners (84%) tended to be more involved in team sports than those who presented to sports physicians (63%) ($\chi^2 = 11.36$, $p = 0.003$). On the other hand, more hours of training were reported in patients presenting to general practitioners (28%) and sports physicians (42%) than patients seeking help at the emergency department (16%) ($\chi^2 = 18.05$, $p < 0.001$). A greater incidence of impact injuries was observed in patients at the emergency department (54%) compared with patients presenting to sports physicians (19%) and general practitioners (18%) ($\chi^2 = 26.97$, $p < 0.001$). Patients presenting to the hospital were also more likely to sustain new injuries (63%) ($\chi^2 = 18.89$, $p < 0.001$), and more likely to have some imaging procedures (92%) ($\chi^2 = 32.31$, $p < 0.001$). The findings advance the understanding of the spectrum of paediatric sports injuries in children in Australia and will contribute to the development of appropriate models for future injury prevention education.

OSTEOPENIA OF PREMATUREITY – THE ROLE OF EXERCISE IN PREVENTION AND TREATMENT

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Premature infants have an increased risk of osteopenia due to limited bone mass accretion in utero and a greater need for bone nutrients. Currently, the diagnosis of osteopenia is based on clinical and radiological signs and measurements of biochemical markers. Recent studies suggested that measurements of circulating bone turnover markers, and bone strength assessment using quantitative ultrasound measurements of bone speed of sound (SOS) may help in the evaluation of bone metabolism in preterm infants. So far, most of the preventive efforts of osteopenia of prematurity focused on nutritional changes. Recent studies from our laboratory and others indicate that passive range of motion exercise of the extremities result in a significant greater increase of body weight, increased bone mineralization, increased bone formation markers and leptin levels, and attenuation of the natural post-natal decline in bone SOS. These results suggest that exercise may play an important role in the prevention and treatment of osteopenia of prematurity.

SOMATIC AND MOTOR DEVELOPMENT OF OBESE BOYS

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By the results of the past two nation-wide representative anthropometric Hungarian studies the prevalence of obese children has almost doubled. Since the majority of the merely overweight pupils reach the critical body fat content or BMI cut-off values within 2–3 years childhood obesity can be qualified as a serious social health problem. The aim of the study was to compare the rate of somatic and motor

development of obese and non-obese boys. Somatic and motor developments were followed in a sample of 41 initially obese boys (aged between 6.51 and 7.50 years) for four years. The contrast group of normal development contained boys (n=188) that had not reached a BMI or fat percent indicating overweight during the observation period. Age related changes in height, weight, BMI, percent body fat, standing broad jump, 30m dash, and 400m run were analyzed by linear regression. In the obese boys all the compared anthropometric parameters were significantly and consistently greater while their mean physical performance grew remarkably weaker. The age related changes in the anthropometric variables were faster in the obese group, but were slower in the physical tests results. The line of development in the 400m run times failed to improve further after the fourth data collection when the average body fat content reached 33%. The greater height and its faster increase in the obese boys could be attributed in part to their accelerated biological maturation. Since height differences after puberty decrease and are not significant at young adulthood we have to stress the effects of sedentary lifestyle that may have other consequences than merely a change in the rate of performance development.

BREAKFAST CONSUMPTION AND DAILY PHYSICAL ACTIVITY IN PRIMARY SCHOOL CHILDREN. THE EUROPEAN YOUTH HEART STUDY

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Background: Cross-sectional studies suggest that frequency of breakfast consumption is inversely related to level of obesity in children. No studies have looked at pattern and volume of physical activity in relation to breakfast consumption and obesity. Aim: The aim of this study was to investigate physical activity volume and pattern of children who regularly eat breakfast compared to those who do not.

Methods: A cross sectional study where schools in Odense, Denmark were stratified according to school type, location and the socio-economic character of the catchments area. A proportional, two-stage cluster sample of children was selected from each stratum. Children wore an accelerometer recording minute-by-minute physical activity for a continuous period of at least four days. Total volume of physical activity and hourly physical activity patterns were estimated and groups of children compared according to frequency of breakfast consumption. **Setting:** Accelerometers were worn whilst participants carried out normal activities of everyday living. All other measurements were carried out on school premises. **Participants:** 413 nine-year old Danish children selected for participation in the European Youth Heart Study and who were requested to wear an accelerometer. **Results:** Three hundred and fifty-two children completed all measurements. Children who ate breakfast most days were significantly more physically active (accelerometer counts per minute) than those who ate breakfast only once or twice a week for both weekdays (598; 222 vs. 450; 204, $p=0.004$) and weekends (571–272 vs. 393; 184, $p=0.016$). Analysis by gender demonstrated that significant differences were seen for girls only. BMI was also significantly greater in girls who ate breakfast less frequently vs regular breakfast consumers, but not for boys. **Conclusions:** In primary school aged girls greater frequency of breakfast consumption was related to lower levels of BMI and higher levels of physical activity. This was not the case for boys.

AFFECTIVE RESPONSES OF SEDENTARY BOYS TO A MAXIMAL INCREMENTAL EXERCISE TEST: A TEST OF THE DUAL MODE MODEL

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Aim: Physical activity levels in children are worryingly low. Van Landuyt et al. (2000) suggest that affect may be the first link in the exercise to adherence chain and in his 'dual-mode model', Ekkekakis (2003) proposes that affective responses will be universally negative above the ventilatory threshold (VT). The purpose of this study was to

examine this proposal with sedentary boys. Methods: 10 sedentary adolescent boys ($12.5 \pm .5$ yrs), completed a graded exercise test (GXT) to volitional exhaustion. Affect (using the feeling scale), heart rate and perceived exertion were assessed at two minute intervals throughout the test. For analyses purposes exercise intensity was standardized relative to each boys' VT. The V-slope method was used to determine VT. Data points of the second minute (2 min), before VT (VT-2), the minute of VT (@VT), 2 min following VT (VT+2) and the last minute (end) were analyzed. Results: Time main effects were significant for each dependant variable ($P < 0.01$). Follow-up pairwise comparisons indicated that HR and perceived exertion increased significantly at each time point, while affect was stable up to @VT, but decreased significantly following VT. Conclusion: Results appear to support the proposals of the dual-mode model and would suggest that if adolescent boys exercise below or at their VT then their affective responses should remain positive. This has implications for physical activity interventions.

CHILDREN'S PSYCHOLOGICAL WELL-BEING, HABITUAL PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR

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Aims: Using pedometry, Parfitt and Eston (2005) reported that habitual physical activity in 9–10 year old children was positively associated with global self-esteem, and negatively associated with anxiety and depression. The present study extends Parfitt and Eston (2005) by expanding the self-esteem measure and using accelerometry to record the intensity of physical activity. **Method:** 57 children completed three psychological well-being inventories. Physical activity was assessed by triaxial accelerometry (RT3) for 7–14 days. **Results:** After accounting for body fat, very light activity had positive associations with anxiety and depression ($r > .282$, $P < 0.035$) and negative associations with aspects of physical self-esteem ($r > -.266$, $P < 0.048$). Vigorous activity had negative associations with anxiety ($r > -.283$,

$P = 0.035$) and positive associations with aspects of physical self-esteem ($r > .285$, $P < 0.033$). Conclusions: Results suggest that specific aspects of the physical-self are negatively associated with sedentary behaviour and positively associated with vigorous activity. Children who spent more time in vigorous activity or less time in sedentary behaviour had more positive psychological profiles. Consequently, increasing time in vigorous activities and reducing time in sedentary behaviour may improve psychological well-being for this age group.

FACTORS RELATED TO DAILY PHYSICAL ACTIVITY IN PRESCHOOL CHILDREN

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Aim: The purpose of this study was to determine predictors of daily physical activity (PA) in a diverse sample of preschool children. **Methods:** Children 2–5 years old ($n=331$) in 22 preschools were assessed. Height and weight were measured, and physical activity was assessed by accelerometry. Children wore the monitors all day for 8–10 days, including a weekend. For analyses, up to five weekdays and two weekend days were included. Parents reported their age group, education level, height, weight, race, vigorous PA, family support for PA, PA equipment in the home, distance to and usage of the nearest park, child's athletic coordination (AC), and child's birth weight via survey. Pearson correlations between PA variables and potential predictor variables were calculated. Significant variables ($p < 0.10$) were placed into linear regression analysis, which was used to determine predictors of moderate-to-vigorous PA (MVPA) and total physical activity (TPA) for the overall sample and separately by sex. **Results:** For MVPA, significant variables for the overall sample were sex, age, race, distance to the nearest park (inverse association), and AC. In sex-specific analyses for MVPA, age was a significant predictor for boys, while age, BMI, and AC were significant variables for girls. For TPA, significant variables for the overall sample were AC and PA equipment at home. For girls, BMI and AC were

significant predictors of TPA. Models accounted for 27–37% of the variance in PA. Conclusions: Demographic and environmental factors were predictors of PA. Improving athletic coordination may be important for increasing preschool girls' PA.

CARDIOVASCULAR SYSTEM PECULIARITIES OF YOUNG ATHLETES TRAINED IN DIFFERENT SPORTS

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An aim of our investigation is to estimate the heart structural and functional characteristics of Latvian young elite athletes trained in different sports. 20 winter biathlon skiers, 14 cyclists and 15 male basketball players participated in the investigation. The structural cardiac adaptation is estimated by echocardiography. The heart functional adaptation to the endurance training is determined on a cycle ergometer. The intensity of exercises increased step by step from 0,5 to 2 W/kg, the exercises intensity – heart rate relationship is determined. Echocardiography characteristics in all athletes do not exceed the upper limits for trained males. The largest heart stroke volumes are observed in cyclists ($96,2 \pm 16,2$ cm³) and biathlon skiers ($91,3 \pm 13,5$ cm³). The basketball players had the largest heart end diastolic volume, but their stroke volume was smaller ($76,7 \pm 15,7$ cm³). Basketball players had higher heart rate than cyclists and biathlon skiers in the same intensity exercises. The heart rate increase with growth of the power of exercises in basketball players is faster than in the athletes trained in biathlon and cycling. The data confirm the better cardiovascular system adaptation of the athletes trained in winter biathlon and cycling to endurance exercises than of the basketball players.

CONTRACTILE PROPERTIES OF PLANTARFLEXOR MUSCLES IN PRE- AND POST-PUBERTAL GIRLS

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The aim of this study was to compare isometric maximal voluntary contraction (MVC) force and electrically evoked twitch contraction characteristics of the plantarflexor (PF) muscles in pre- and post-pubertal girls. The subjects were 16 girls with mean age of 10.3 years and 15 girls with mean age of 16.1 years. MVC force of PF muscles was measured by custom-made dynamometer. Isometric twitches of the PF muscles were induced by supramaximal electrical stimulation of the tibial nerve in popliteal fossa by square-wave impulses with 1 ms duration. Twitch maximal force (PT), contraction time (CT), half-relaxation time (HRT), maximal rates of force development (RFD, dF/dt) and relaxation (RR, $-dF/dt$) were measured in resting condition and after MVC of 5 s duration, i.e. in postactivation potentiation (PAP) condition. MVC force relative to body mass (MVC: BM) and twitch PT relative to MVC force (PT:MVC) were calculated. The results indicated that 16-year-old girls had a greater ($p < 0.05$) MVC force, MVC: BM, and twitch PT, RFD and RR compared to 10-year-old girls. No significant differences in PT: MVC, and twitch PAP, CT and HRT were observed between the measured groups. It was concluded that puberty in girls is characterized by increased voluntary and electrically evoked force-generating capacity of PF muscles with no changes in PAP and time-course characteristics of twitch.

WHAT DO SELF-REPORTED QUESTIONNAIRES ON PHYSICAL ACTIVITY REALLY MEASURE IN ADOLESCENTS? RELIABILITY AND VALIDITY OF TWO DIFFERENT QUESTIONNAIRES

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Aim: To create and find accurate and reliable measurements of physical activity has been a challenge in epidemiological studies. This study has investigated the reliability and validity of two physical activity questionnaires in adolescents aged 13–18 years; 1. WHO, Health Behaviour in School-aged Children (HBSC) survey. 2. International Physical Activity Questionnaire (IPAQ). **Methods:** The questionnaires were administered twice for evaluating the reliability. The validity was assessed by comparing the answers from the questionnaires with the results from cardiorespiratory fitness test (VO₂peak) and seven days activity monitoring with ActiReg (physical activity level and energy expenditure). **Results:** Intraclass correlation coefficients for reliability for WHO HBSC were 0.71 for frequency and 0.73 for duration. There was a significant difference between genders, 0.87 for girls and 0.59 for boys. Spearman correlation coefficients for WHO HBSC and IPAQ recoded in three categories measured against VO₂peak were acceptable, i.e. the range 0.29 – 0.39. There was low correlation on both questionnaires measured against ActiReg. **Conclusion:** These data indicate that the WHO HBSC and IPAQ (recoded in three categories) questionnaire was an acceptable instrument to measure cardiorespiratory fitness, but none of the questionnaires were valid in the measurement of physical activity among adolescents 13–18 years of age.

COMPARATIVE ANALYSIS OF SKELETAL MUSCLE OXIDATIVE CAPACITY IN CHILDREN AND ADULTS: A 31P-MRS STUDY

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Purpose: the aim of the present study was to compare the skeletal muscle oxidative capacity *in vivo* in children and adults using 31-phosphorus magnetic resonance spectroscopy. Methods: Seven pre-pubertal boys (mean \pm SD, 11.7 \pm 0.6 yr) and ten men (35.6 \pm 7.8 yr) volunteered to perform finger flexions at a frequency of 0.7 Hz against a weight adjusted to 15% of the maximal voluntary contraction for 3-min. Skeletal muscle oxidative capacity was measured during the 15-min post-exercise recovery period from the rate constant of PCr time-dependent changes and from the theoretical maximum rate of oxidative phosphorylation (V_{max}) taking into account PCr and pH changes at the end of exercise and kinetics of PCr recovery. Results: end-of-exercise pH was not significantly different between children and adults (6.6 \pm 0.2 vs. 6.5 \pm 0.2) indicating that indices of PCr recovery kinetics can be reliably compared. The k_{PCr} and V_{max} values were about two fold higher in young boys as compared to men (k_{PCr} : 1.7 \pm 1.2 vs. 0.7 \pm 0.2 min⁻¹; V_{max} : 49.7 \pm 24.6 vs. 29.4 \pm 7.9 mM.min⁻¹, $P < 0.05$). Conclusions: the different variables measured during the post-exercise recovery period indicate a greater mitochondrial oxidative capacity in young children. This larger ATP regeneration capacity through aerobic mechanisms in children could be one of the factors accounting for their greater resistance to fatigue during high-intensity intermittent exercise.

STABILITY AND CHANGE OF OVERHAND THROWING MOVEMENTS IN ELEMENTARY SCHOOL BOYS

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The aim of the present study was to analyze the stability and change of overhand throwing skill components and throwing performance during elementary school years in boys. The second aim of the study was to ascertain whether the overhand throwing skill components act more as determinant or consequence of throwing performance during elementary school years in boys. Overhand throwing performance and developmental level of humerus, forearm and trunk movements of the 30 boys were assessed from Grades 1 to 3. The results of this study provide evidence for moderate to high stability of the overhand throwing performance (intra-class correlations ranging from 0.50 to 0.73). Skill components with humerus and forearm actions were found to be highly stable. In addition, the data from cross-lagged model revealed that overhand skill components have a stronger impact on throwing performance than performance on skill components.

FITNESS AND CARDIO VASCULAR DISEASE RISK FACTORS IN A REPRESENTATIVE POPULATION OF NINE-YEAR OLD CHILDREN IN RURAL NORWAY

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256 nine-year old children (age 9.3 ± 0.3) participated in a 2-year controlled intervention study of 60 minutes teacher controlled daily physical activity in rural Norway. The reported data are baseline data, and focuses on the relationship between fitness and CVD risk factors. To assess cardio respiratory performance (VO_{2peak}), the children ran until exhaustion on a treadmill. After an overnight fast, intravenous blood samples were taken to analyse insulin, glucose, triglyceride,

total cholesterol and HDL. Resting blood pressure was measured automatically four times, where the mean value of the last two measurements was used. Body weight and height were measured according to standard protocols. Waist circumference was measured at the level of the natural waist, i.e. at the narrowest part of the torso. Hip circumference was measured at the level of maximum protrusion of the buttock. The main finding is that fitness expressed as relative VO₂peak reflects cardiovascular health for girls. Girls belonging to the lowest quartile of fitness had poorer values in HOMA score, TG, systolic and diastolic BP, HDL, Total Ch/HDL ratio, and body fat % (all $p < 0.05$), than those belonging to the highest quartile. For boys, only body fat % and systolic BP were lower in the highest vs the lowest fitness group ($p < 0.05$). Boys had higher VO₂peak than girls regardless of how it was expressed (12%, $p < 0.05$). When using Cole et al.'s (2000) cut off point for children, 12.8% of the boys and 18.3% of the girls (ns) had a BMI score that classified them as overweight. 2.4% of the boys and 6.9% of the girls were obese (ns). In conclusion, differences were found in fitness, fatness and several CVD risk factors between sexes already at the age of 9 years. These differences may be due to genetic, behavioural or a combination of factors. In addition, fitness levels reflect cardiovascular health for girls.

CONTRIBUTION OF RECESS TO HABITUAL PHYSICAL ACTIVITY LEVELS IN BOYS AND GIRLS: THE A-CLASS PROJECT

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Recess could make a considerable contribution to the accumulation of daily physical activity in primary school children. However, reductions in recess time are a pressing concern. The aim of the study was determine how much recess contributes towards boys and girls'

weekday habitual physical activity (HPA). Fifty-eight boys and 87 girls aged 9–10 years from 8 Liverpool schools had their HPA assessed over seven consecutive days using accelerometry. Recess physical activity was extracted from each weekday using customised macros, and the relative contribution of recess to total HPA on each day was calculated. Analyses of variance were used to compare gender differences in the mean contribution of recess to HPA. Boys were significantly more active both habitually (73 ± 21 min; 63 ± 17 min) and during recess ($25.3 \pm 8.4\%$; $17.2 \pm 4.9\%$) than girls ($p < 0.01$). Recess contributed significantly more moderate-to-vigorous physical activity towards weekday HPA for boys (30.4%) than for girls (24%; $p < 0.01$). The results suggest that recess is an important non-curriculum school-based context for boys and girls to accumulate at least moderate intensity physical activity on a daily basis.

12-MONTH EFFECTS OF A PLAYGROUND INTERVENTION ON CHILDREN'S RECESS PHYSICAL ACTIVITY LEVELS

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INTRODUCTION: The promotion of physical activity to school age children is a public health priority. The school is a key setting for the promotion of health enhancing physical activity. Recess represents a non-curriculum context where children can be active on a daily basis. Whilst the short-term effects of playground interventions on recess physical activity have been investigated, the longer-term effects have

not been widely reported. **AIM:** The aim of this study was to investigate the 12-month effects of a playground intervention on children's moderate-to-vigorous (MVPA) and vigorous physical activity (VPA) during recess. **METHODS:** Two hundred and ninety-eight children (152 boys, 147 girls) from 26 Liverpool primary schools participated in the study. Fifteen schools received £20,000 to redesign the playground environment based on the Zoneparc playground. Eleven schools served as socioeconomic matched controls. Physical activity levels were quantified using a uni-axial accelerometer four times across the study. These were prior to, 6-weeks, 6-months and 12-months following the playgrounds being painted with multicolor playground markings. A three-level (time, pupil & school) multilevel analysis was used to determine the effects of the intervention across time on MVPA and VPA. **RESULTS:** A statistically positive intervention effect was found across time for both MVPA ($p = 0.04$) and VPA ($p = 0.02$). Children in the intervention schools engaged in 2.4% (95% CI: 0.1 to 4.9) and 1.2% (95% CI: 0.18 to 2.3) more MVPA and VPA respectively than children in the control schools. A significant positive intervention \times time interaction was found for MVPA ($p = 0.05$) and VPA ($p < 0.01$). Follow-up analyses revealed the intervention effect was significant for children at 6-weeks for MVPA and VPA, and at 6 months for VPA. **CONCLUSIONS:** The results indicate that developing school playgrounds based on the Zoneparc design is a suitable school based intervention for increasing children's recess MVPA and VPA over time. Changing the school playground appears to create physical activity opportunities during recess for children within a safe environment, and children take advantage of these opportunities in the longer-term.

INFLUENCE OF ACUTE AEROBIC EXERCISE ON SHORT TERM GLYCAEMIC CONTROL IN YOUTH WITH TYPE 1 DIABETES

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Aim: To evaluate the acute blood glucose (BG) effects of well anticipated recreational aerobic exercise in children and adolescents with type 1 diabetes mellitus (T1DM). **Methods:** Thirteen children and adolescents (aged 12.4 ± 2.3 years, disease duration 5.8 ± 3.6 years) were monitored over 196 acute exercise episodes. BG levels were assessed from capillary samples using patients' own automated blood glucose meters immediately before and after exercise, prior to bed (approx. 4 hours post exercise) and immediately on rising the next morning (approx. 13 hours post exercise). Participants were only permitted to undertake exercise if pre-exercise BG levels were 4 and 17 mmol.L-1 and no ketosis was present. The exercise bouts consisted of common recreational activities including running, circuit training and basketball at an intensity equivalent to 65%HRR. **Results:** The exercise episodes caused a significant drop in BG of 2.- 4.5 mmol.L-1 equating to a $20.1 \pm 40\%$ reduction from baseline (pre: 11.6 ± 3.7 ; post 9.1 ± 4.9 mmol.L-1, $P < 0.001$). The number of episodes whereby a drop of 25% or greater was experienced was 94/196 (48%). The magnitude of the drop in BG with exercise was significantly correlated with the pre-exercise BG value ($r = -0.26$, $P < 0.01$). There were 22 (11%) instances of mild hypoglycaemia following exercise. Additionally, the magnitudes of changes in BG with exercise were unrelated to individual's HbA1c, VO₂peak, daily insulin use or endothelial function. There were 99 (56%) observations of a night-time rise in BG between bedtime and rising next morning. The number of episodes where BG was; 3.9 mmol.L-1 on rising the following morning [nocturnal hypoglycaemia definition] was 13 (7.6%). **Conclusions:** If

exercise is instigated by type 1 diabetic children and adolescents when patients are in sound glycaemic control, with proper advice and guidelines, it can act as an effective means to lower BG without adverse effects.

EFFECT OF A 6-MONTH AEROBIC TRAINING PROGRAM ON BONE GROWTH AND BIOLOGICAL FACTORS IN OBESE CHILDREN

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Childhood obesity is now classified as a pandemic. Very few studies emphasized the effect of physical activity on bone growth and biological factors in obese children. The aim of our study was to investigate the effect of a physical training on bone and biological status in obese children. Subjects, 7–11 yr of age, were randomized to engage in physical training (n=16; 10.5 ± 1.3 years old) or control (n=21; 10.9 ± 1.3 years old) groups. All baseline subjects' characteristics were similar between groups. Trained group underwent a 6-month physical training (90 min. 2d/wk) doing individualized and group aerobic exercises (cycling, rowing, jumping, games, hip-hop...). Whole-Body composition and Bone Mineral Density (BMD) were measured by DXA. Usual sites (lumbar spine and total hip) were also measured by DXA. Pubertal status, energy output and diet were assessed by validated questionnaire. Leptin, adiponectin, glucose, insulin, and markers of bone turnover (osteocalcin and CTx) were dosed. The mean baseline leptin levels ± SD were 22.5 ± 22 and 14.1 ± 8.1 for trained and control groups respectively. The mean baseline adiponectin levels ± SD were 10.1 ± 3.0 and 10.4 ± 2.5 for trained and control groups respectively. The mean changes after training are indicated in Table 1. The 6-month physical training did not result in significant differences in body composition, bone and biological parameters. However, the interindividual variability of the response for the subjects was quite high (for example variation of plasma leptin ranging from -40.5 to 32.2 µg/L). We found correlations between plasma leptin and adiponectin with fat mass after training (respec-

tively $r = 0.53$ and $r = -0.33$; $p < 0.05$). Moreover, we found a negative correlation between plasma adiponectin and osteocalcin after training ($r = -0.39$; $p < 0.05$). Finally, these findings suggest that leptin and adiponectin are probably involved in the regulation of the body composition and might play a role in bone metabolism in obese children. Nevertheless in our study, BMD and lipid metabolism markers were not influenced by a 6-month physical training in a population of obese children.

Table 1. Mean changes after physical training in trained group compared to control group

	Trained group	Control group
Body composition		
Total mass (kg)	4.30 ± 2.6	3.16 ± 2.6
Fat mass (%)	0.25 ± 8.2	-1.73 ± 5.7
BMD results		
BMD whole-body (g/cm^2)	2.60 ± 1.84	2.64 ± 1.93
BMDL2-L4 (g/cm^2)	0.035 ± 0.03	0.023 ± 0.03
BMD total hip (g/cm^2)	0.036 ± 0.03	0.025 ± 0.04
Biological factors		
Leptin ($\mu\text{g}/\text{L}$)	1.21 ± 21.82	6.28 ± 9.96
Adiponectin ($\mu\text{g}/\text{L}$)	-1.11 ± 2.86	-0.15 ± 5.01
Glucose (mmol/L)	-0.14 ± 0.27	-0.24 ± 0.43
Insulin (mmol/L)	0.55 ± 1.76	0.60 ± 1.74
Osteocalcin ($\mu\text{g}/\text{L}$)	-4.43 ± 10.42	-4.00 ± 10.71
CTx (ng/L)	238.9 ± 496	167.10 ± 291.7

VALIDATION OF THE BOUCHARD 3-DAY DIARY WITH AN UNIAXIAL ACCELEROMETER AMONG A SAMPLE OF PORTUGUESE ADOLESCENTS

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The development of accurate methods for monitoring physical activity in children and adolescents continues to be a relevant research issue (Mota et al., 2002; Wickel et al., 2006). Validated measures of physical activity permit better understanding of its correlates and are of interest to determine the relationship of physical activity doses with physical fitness and health outcomes. Self-report questionnaires are non-reactive and convenient, although they require a substantial degree of subjectivity. Bouchard et al. (1983) purposed a 3-day diary that is being used in a considerable number of studies (Huang & Malina, 1996; Katzmarzyk & Malina, 1998). The goal of the present study is to validate an adapted version of the 3-day diary in a Portuguese version of adolescents aged 13–16 years. The sample consisted of 168 subjects with a chronological age of 14.4 ± 1.1 years. Somatic characteristics included body weight, stature, and sum of four skinfolds. Physical activity was estimated using the 3-day diary on two weekdays and one weekend day. In addition, an activity sensor (MTI actigraph, model 7164) was used as a criterion to validate the diary. The protocol was administered over the same period. Sampling period was set at 1 min. A total number of 504 days was simultaneously recorded using the two methods. After presenting the descriptive statistics by age-group and sex, data analysis tested sex differences, age-effect and determined the correlation between the two alternative methods of physical activity. Compared to females, boys are heavier, taller, possess less adiposity given by the sum of skinfolds and also more active both based on the diary and the accelerometer. Among boys, the older age-group (15–16 years) tend to be more active than their 13-to 14-year-old peers. Among girls a similar trend was noted, while contrasting the two age groups. Saturday seems to be the less active day, especially early adolescent males. Correlations between

measures of physical activity range from $r=0.34$ ($p<0.01$) for girls and $r=0.38$ ($p<0.01$) for boys. The smallest and strongest magnitude of association was observed, respectively among younger females in Fridays ($r=0.09$, n.s.) and among older boys in Saturdays ($r=0.51$, $p<0.01$). In summary, the magnitude of the relationship between measures of physical activity are no more than moderate as noted before between a weekly activity checklist and accelerometry (Mota et al., 2002). Bouchard C et al. (1983). *American Journal of Clinical Nutrition*. 37: 461–467. Huang Y & Malina RM (1996). *American Journal of Human Biology*. 8: 225–236. Katzmarzyk PT & Malina RM (1998). *Pediatric Exercise Science*. 10: 378–386. Mota J et al. (2002). *Pediatric Exercise Science*. 14: 269–276. Wickel EE et al. (2006). *Medicine and Science in Sports Exercise*. Vol. 38 (2): 373–379.

FREQUENCY, INTENSITY AND DURATION OF ACTIVITY BOUTS IN CHILDREN

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Aim: It is not clear how children's sporadic activity pattern varies between boys and girls, or between high- and low-active children. The aim of this study was to characterise the pattern of activity in boys and girls of varying activity levels. **Methods:** Physical activity was recorded every 2 s by accelerometry in 84 children (45 boys) (9.8 ± 0.3 yrs) for 7 days. Bouts (defined as a minimum of 4 s) of activity of at least light ($>LIGHT = >10$ ct/2s) and vigorous intensity ($>VIG = >176$ ct/2s) were recorded. Mean daily frequency, duration and intensity of these bouts were compared for boys and girls and for high, medium and low-active children. **Results:** Boys were more active than girls. This was most apparent in the frequency of $>VIG$ bouts (108 vs. 65 per day for boys & girls, respectively, $p<0.001$), although the boys' $>LIGHT$ activity bouts were also longer (11.0 vs. 9.8 s, $p<0.001$) and more intense (64.6 ct/2s vs. 61.7 ct/2s, $p<0.001$) than those of the girls. High-active children experienced more frequent (941 vs. 775 per day $p < 0.001$) and intense (66.5, vs. 60.7 ct/2s, $p<0.001$) daily bouts of $>LIGHT$ activity, and more frequent (138 vs. 66 per day, $p<0.001$)

and intense (267.4 vs. 257.0 ct/2s, $p < 0.001$) daily bouts of >VIG activity than low-active children. Conclusions: Although significant differences were present, the intensity and duration of activity bouts did not differ greatly between boys and girls or between low and high-active children. However, the frequency of >VIG bouts activity bouts was approximately 65% higher in boys than girls and 100% higher in high-active children compared with low-active children.

INSULIN RESISTANCE AND CYTOKINES IN ADOLESCENCE: WEIGHT STATUS AND EXERCISE AS MODERATORS

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Aim: To determine if cytokines associated with adiposity are also correlated with insulin resistance (IR) in early adolescence and if these relationships are modified by weight status, levels of vigorous physical activity (VPA), or maximal aerobic power (pVO₂max). **Methods:** Body mass, stature, and a fasting blood sample were obtained from 120 mid-pubertal adolescents (60 girls, 60 boys). Habitual VPA was obtained by a survey. Predicted VO₂max was determined using a cycle-ergometer test. Weight status was based on body mass index (normal weight = BMI < 75th %tile and overweight = BMI > 95th %tile). Glucose, insulin, adiponectin, resistin, tumor necrosis factor- α and interleukin-6 were measured, and IR was based on the Homeostatic Model Assessment. Adiponectin and TNF- α were associated with IR in all adolescents ($R^2=0.280$, $p < 0.001$, $R^2=0.054$, $p < 0.050$; respectively), but IL-6 was not ($R^2=0.055$, $p=0.054$). The degree of association between adiponectin and IR was stronger in overweight than in normal weight adolescents ($p < 0.050$). Resistin was related to IR only for the boys ($R^2= 0.069$, $p < 0.050$). Exercise did not modify

the association between these cytokines and IR; however, higher levels of VPA and pVO₂max were associated with a healthier cytokine profile. Conclusions: The pathophysiology of obesity is already established in early adolescence. Increased adiposity, resulting in reduced adiponectin and increased resistin and TNF- α may link these cytokines with insulin resistance in adolescence. Exercise may also have potential role improving the concentration of these cytokines. Supported by the Graduate Student Trust Fund, and the Department of Exercise and Sport Science UNC Chapel Hill (DAR), NINR R01837 (DAR, JSH), NIH K23 RR021979 (AMH)

EDUCATION LONGITUDINAL EFFECT OF SWIMMING ON LUNG FUNCTION PARAMETERS

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Aim. In the previous studies we observed that twelve week swimming tuition program increases lung volumes and flow rates. The purpose of this study was to determine the changes of spirometric parameters for the same students after three years after swimming tuition. **Methods.** Twenty-four healthy female students of the Latvian Academy of Sports Education volunteered for this study, all were non-smokers. Spirometric investigation due to ATS guidelines was performed three years after 12-week swimming tuition program. Swimming and other physical activities were determined by questionnaire. **Results.** All the spirometric parameters were normal. Three years after completing swimming tuition program revealed increased vital capacity and unchanged flow rates if compared with immediately after tuition results. Students who continued to swim after tuition had higher forced expiratory volume in one second, its ratio from vital capacity, and it positively correlated with duration of weekly swimming activities ($p < 0.05$). **Conclusions.** Swimming after acquiring basic swimming skills promotes development of respiratory system. It increases or maintains strength and speed of respiratory muscle contraction. This effect increases with the increase of time spent for swimming. Investigation was sponsored by ESF National program Nr.2004/0005/VPD1/ESF/PIAA/ 04/NP/3.2.3.1. / 0004/0066

EFFECT OF PHYSICAL ACTIVITY TO THE MOTOR CONTROL IN PRESCHOOL CHILDREN

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INTRODUCTION It has been shown that physical activity correlates positively with motor control e.g. balance in adults. The aim of the present study was to examine possible association between physical activity level, reaction time and balance in preschool children. **METHODS** 17 preschool children (5–7years), 10 girls and 7 boys, were studied. Physical activity was measured by pedometer (Omron, Japan) for one-week period. Balance was assessed by force platform (Metitur, Finland). Both visual and audible reaction times were measured. Subjects were divided in two groups (A=active / B=less active) according to their physical activity level. **RESULTS** Mean value of the daily steps taken was 12969, being higher (n.s.) in boys (13705) than in girls (12437). Steps in activity level groups A and B were 15527 vs. 10958 ($p=.002$) on non-preschool days, respectively. No difference was seen during the time spent in preschool. At the free time on the preschool days the amount of steps taken was 7468 for group A and 4073 for group B ($p=.011$). There was a difference in the balance test velocity moment between groups (A: $28.8 \text{ mm}^2/\text{s}$, B: $10.9 \text{ mm}^2/\text{s}$, $p=.034$). A high correlation was observed between daily steps and velocity moment ($r=0.60$, $P=0.012$). No differences were observed in the reaction times between groups or gender. **DISCUSSION** The present study did not demonstrate a clear association between physical activity and balance or reaction times. Velocity moment was even higher with the more active children. This could be explained by faster and more active control of balance as has earlier been shown in more physically active adults.

EPIDEMIOLOGICAL STUDY OF SCOLIOSIS AND POSTURAL FAULTS OF ROMANIAN PREPUBERTAL SCHOOL CHILDREN

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Aim. The aim of this study was to realise a school screening and an epidemiological investigation about scoliosis and posture in prepubertal Romanian children. **Methods** 252 children, 113 boys (B : 9.5 ± 0.8 yrs, 34.7 ± 9.7 kg, 137.7 ± 8 cm) and 139 girls (G : 9.5 ± 0.8 yrs, 32.8 ± 7.3 kg, 136.6 ± 7.2 cm) were clinically assessed (visual inspection, forward-bending test) and investigated by radiology (Cobb angle, apical vertebral rotation). Assessment of fat mat was done using skin-fold caliper technique. **Results** 94.4% presented one or many asymmetries or postural faults as follows: hyperkyphosis 49.2%, hyperlordosis 29%; pelvic deviations 10.3%; thoracic impairments 21.4%; shoulder imbalance 35.3%; knee deviations 20.2%; functional flat feet 50%, 46.4% asymmetric posture. 16.7% of all subjects had structural scoliosis (Cobb angle value > or = 10° + vertebral rotation). This concerned 22 girls (mean Cobb angle 12.4° ± 2.7) and 20 boys, (12.85° ± 1.8). The most prevalent curve was left thoracic 49.3% followed by left-thoracic-right lumbar 1.13% and left-lumbar 0.8%. Girl to boy's ratio for structural scoliosis was 0.89:1, and it increased with age. Body mass, BMI and body fat were lower (p<0.05) in girls with structural scoliosis than in girls presenting functional scoliosis. The prevalence of structural scoliosis increased with age. Ten-year age group presented the highest mean Cobb angle 13.9°. Girls with scoliosis were more prevalent than boys for each age group, except 10-year age group. In girls the scoliosis incidence increases rapidly up to 11 years age group, whereas in boys there is a decreased prevalence to 11 years age group. **Conclusions.** This study showed a high incidence of postural faults, asymmetrical posture and structural scoliosis in prepubertal children of Oradea, Romania. The prevalence was much more important than reported epidemiological data eventhough angular values were smaller than 20 degrees. Girls presenting scoliosis

have a different somatic morphologic type than normal population. This could be a valuable indication for preventive measures and subsequently therapeutically strategy.

UNDERSTANDING THE DECLINE IN THE PHYSICAL ACTIVITY OF ADOLESCENT GIRLS

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Physical activity (PA) declines with an increase in biological maturity. Therefore, it was hypothesized that early maturing girls would participate in less PA and experience different barriers to PA than late maturing girls. Aim: To explore the PA behaviors and barriers to PA between early, average and late maturing adolescent girls. Methods: Fifty seven girls aged 13–16 years wore an Actical accelerometer for 7 days. Custom software was used to reduce the raw data into minutes of moderate to vigorous PA per day (MVPA). Perceived barriers to PA over the 7 day period were assessed using a semi-structured open ended questionnaire. The data was categorized into one of four ecological categories; intrapersonal, interpersonal, institutional, community. Each girl was asked if they had reached menarche and if so when it had occurred. Girls were grouped into maturity categories based on age at menarche tertiles (i.e., early, average, and late). Differences in PA levels between maturity groups were obtained using ANOVA. Results: Only girls who had reached menarche (n=51) were retained for analysis.

PA Variable Mean (SD)	Early	Average	Late
MVPA	79 (27)*	94 (24)	111 (44)1
Sporadic MVPA	64 (20)*	78 (19)	90 (32)2
Short MVPA	9 (7)	11 (7)	12 (11)3
Long MVPA	6 (11)	5 (5)	8 (9)

*significantly different from late maturing girls (P<0.05);

1=MVPA accumulated in bouts of 1–9 minutes;

2=MVPA accumulated in bouts 10–19 minutes;

3=MVPA accumulated in bouts of 20+ minutes

Overall intra- and inter-personal barriers were listed more frequently with little difference between maturity groups. Conclusion: Early maturing girls participated in less MVPA than late maturing girls. Analyzing the pattern of PA accumulation suggests that sporadic MVPA is most affected. Research is needed to determine why early maturing girls participate in less PA, focusing on the specific intra- and inter-personal barriers.

A DESCRIPTIVE LOOK AT FITNESSGRAM® FOR THE STATE OF CALIFORNIA, 2006

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Introduction: Fitnessgram® is a national fitness test battery for youth developed by The Cooper Institute in response to the need for a comprehensive assessment protocol in physical education programs nationwide (Welk et al., 2002). Fitnessgram® tests the 5 components of health related fitness: cardiorespiratory endurance, muscular strength and endurance, flexibility and body composition. The purpose of this assessment is to describe the characteristics of California state youth, aged 10–15 years. Methods: Male and female students in the 5th (N = 237,024 and N = 227,269), 7th (N = 231,703 and N = 222,753), and 9th (N = 220,551, and N = 210,847) grade (10/11 yrs, 12/13 yrs, and 14/15 yrs, respectively) who attended school in the state of California in 2006 were tested with the Fitnessgram®. Demographic data on ethnicity, school, county, and birth date were recorded. Data analyzed included curlups, pushups, modified sit and reach for the right and left leg, and the body mass index. Univariate ANOVAs were used to analyze differences by grade, with a Scheffé post hoc to determine where the differences lie. Results: Males and females significantly differ by grade in curlups ($p < 0.001$), pushups ($p < 0.001$), and the modified left and right sit and reach ($p < 0.001$). In all of these tests, males and females improved as they got older, although on average, there was a slight decline in the right and left sit

and reach in 7th grade for both males and females. Conclusion: The initial assessment of these data shows that, in general, students' scores on each test improve as they get older. However, the decline in flexibility at 7th grade must be examined more closely, as it could be related to the timing of peak height velocity, although this would differ in females versus males. In addition, the overall fitness levels of these youth need to be examined further relative to secular trends in the US. The sample available for this assessment gives a plethora of opportunities for assessing the fitness status of children in California during the 2006 school year and provides a baseline to which future comparisons can be made.

ANAEROBIC ENDURANCE OF YOUNG FEMALE SUBJECTS

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Aim: To determine the anaerobic capacity of young women by applying the Performance Index (PI) to repeated maximal exercises. **Methods:** Physical education students, 5 untrained and 5 volleyball players aged 21–22 years, their body mass ranging from 55 to 86 kg, were studied. They performed series of 6 maximal exercises 15 s apart: on Monark 824E cycle ergometer (64 revolutions of flywheel) and on inclined plane device (every exercise consisting of 10 push-offs). Anaerobic endurance was measured by the PI, i.e. the ratio of mean-to-maximum value recorded in a series of 6 bouts. **Results:** The courses of changes were in most cases non-linear. Mean power output on the inclined plane device was 12.01 W/kg (range: 9.24 do 16.54) and maximum power output on cycle ergometer 7.58 W/kg (range: 6.73 – 8.13), mean PI values amounting to 0.875 (range: 0.744 – 0.967) and 0.803 (range: 0.748 – 0.857), respectively. No significant between-group differences in either variable and no significant correlations between PI and maximum values of variables in the series of exercises were found. **Conclusion:** As compared with earlier studies, female subjects had anaerobic endurance com-parable with that of the

male ones, the anaerobic capacity being much lower. The lack of significant correlation between maximum power output and PI enables classifying female subjects by anaerobic capacity and endurance.

OBESITY PREVALENCE AMONG INFANTS IN MADRID

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Obesity poses one of the greatest public health challenges for the 21st century in most European countries, not only in adults but also in children (1). Our sample included 79 boys (7.42 ± 0.65 years) and 85 girls (7.45 ± 0.66 years) from schools in the southern metropolitan area of Madrid. The obesity indicators were Body Mass Index (BMI) above 18.3 kg/m^2 (overweight) and 21.6 kg/m^2 (obese), and z-values above 1.00 (overweight) for the percentage of body fat (%BF) estimated by the Drinkwater method. Additionally, we also established the somatotype for both groups. The BMI indicates high prevalence of both overweight (22.8%) and obesity (19.0%) in boys and girls (22.8% and 20.0%, respectively). No significant differences for BMI were found ($t=3.34$; $p<0.05$) between boys (mean= $18.4 \pm 3.2 \text{ kg/m}^2$) and girls (mean= $18.5 \pm 3.1 \text{ kg/m}^2$). %BF data indicated more overweight cases in girls (30.6%) than in boys (24.1%), with significant differences in %BF values ($t=2.62$; $p<0.05$) between boys (mean= $16.1 \pm 4.9\%$) and girls (mean= $18.0 \pm 4.3\%$). Finally, the endomorphic component was increased ($t=2.4$; $p<0.05$) in girls (mean= 6.3 ± 2.0) compared with boys (mean= 5.5 ± 2.0). The prevalence of obesity in 7-to-8 year-old children from Madrid is quite high. Sport practice should be promoted among infants in order to generate more active attitudes and a functional vision of physical fitness and body shape.

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SEXSPECIFIC DIFFERENCES OF PERFORMANCE IN 8 TO 19 YEAR OLD PERFORMANCE SWIMMERS

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Present question is the starting time of sexspecific differences in performance swimmers with 8 to 19 years of age. Fundamentals are protocols of german national competitions. Results of 4446 males and females were evaluated by analysis of variance. During competitions with short distances (25, 50, 100 m) sex specific separation of performance capacity in favour of males are starting with 13 years of age. For 200 and 400 m competitions separation is starting mostly with 14 years. In swimming delphin technics this differences in performance capacity are starting one year later. It can be concluded that swimming performances during short distances should be differentiated intersexuell not before age of 13 years, for distances of 200 m and more the age of 14 years will be relevant.

SERUM LEPTIN BUT NOT ADIPONECTIN CHANGES DURING A 12 WEEK COMMUNITY BASED DIET AND EXERCISE INTERVENTION PROGRAM

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AIM. Results of a community-based lifestyle intervention program (Realfit) on serum leptin and adiponectin concentration, insulin resistance and aerobic capacity are reported. METHODS. Thirty-two overweight ($BMI=29.2 \pm 4.1$ kg/m²) adolescents (age 12–18) were included in the study. Before (T0), immediately after the 12 week intervention period (T1), and 20 weeks after ending the intervention (T2), serum leptin and adiponectin concentration, insulin resistance (HOMA-IR) and aerobic capacity (VO₂max with Åstrand test), were measured in successful (decreased BMI) or unsuccessful (no change or increased BMI) children. General Linear Model for repeated

measurements was used to analyze the differences between successful and unsuccessful children on outcome parameters. **RESULTS.** In the total group there was no significant development in leptin or adiponectin concentration, HOMA-IR or VO₂max. In the 25 successful subjects, leptin concentration ($p=.013$) and HOMA-IR ($p=.032$) decreased significantly compared to the unsuccessful subjects between T0 and T1. There was no significant difference in the development of VO₂ max ($p=.129$) and adiponectin concentration ($p=.605$) (T0-T1). Between T1 and T2 the difference in leptin development in both groups was reversed. **CONCLUSIONS.** A 12 week community-based diet and exercise intervention program improves leptin but not adiponectin, only on the short term.

GENDER DIFFERENCES IN ENERGY EXPENDITURE AND PHYSICAL ACTIVITY AMONG 11-YEAR OLD CHILDREN

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AIMS: The growing epidemic of obesity is becoming more and more pronounced, even among children. Physical inactivity, along with inadequate nutrition, is one of the main reasons of the growing prevalence of obesity. Therefore, as a part of a bigger survey, the aim of this study was to objectively evaluate physical activity and energy expenditure in 11-year old children. **METHODS:** Ninety children (50 girls and 40 boys, mean age $11,3 \pm 0,2$ years) from six different elementary schools in Zagreb (Croatia) were selected to participate in the study. Height and weight were measured and body mass index (BMI) was calculated. Physical activity and energy expenditure were assessed by a multisensor device (Sensewear Armband, BodyMedia, Pittsburgh, USA) that was worn for four consecutive days(1). Gender differences were tested using a t-test for independent samples. **RESULTS:** No significant differences between genders were observed for height ($154,1 \pm 7,8$ vs. $151,7 \pm 8,4$ cm) weight ($45,4 \pm 10,1$ vs. $47,2 \pm 13,6$ kg) or BMI ($19 \pm 3,2$ vs. $20 \pm 4,4$ kg/m²), for girls and boys, respectively. On the other hand, we observed significant differences between

groups regarding both total energy expenditure and active energy expenditure. Girls in this study had significantly lower total energy expenditure (2353 ± 402 kcal/day) than boys (2588 ± 592 kcal/day) ($p=0,03$). Similarly, girls are presented with lower active energy expenditure values (1089 ± 368 kcal/day) than boys (1268 ± 484 kcal/day) ($p=0,04$). On the contrary, no differences between groups were observed for physical activity duration (320 ± 113 vs. 339 ± 127 min for girls and boys, respectively, $p=0,44$).

CONCLUSIONS: Values of total energy expenditure in this study were higher in boys and similar to those predicted for this age and weight group (2). Subjects in this study exhibited rather high levels of activity expressed both as caloric expenditure and physical activity duration. In addition, active energy expenditure was different between genders. Higher values were found in boys, what is in accordance with results of the majority of studies performed in children of similar age (3,4). In conclusion, it seems that the average levels of physical activity of 11-year old children in Croatia are above current recommendations (5), and that gender difference is present with boys having higher values of total and active energy expenditure. However, it should be noted that individual variations regarding active energy expenditure and physical activity duration were rather high.

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METABOLIC AND SOMATIC RESULTS OF A HEALTHFUL TRAINING WITH ELEMENTS OF TOURISM AND RECREATION IN OBESE BOYS

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The aim of work was to observe metabolic and somatic results of a healthful training with elements of tourism and recreation in obese boys (N=13; 14.6 y.o. SD 0.96 y.; Body height 171.6 cm SD 8.03 cm). At the beginning and at the end of a three-week training program they performed a physical exercise of intensity at the level of anaerobic threshold. Anthropological measurements with body composition by bioimpedance method before and after this training program were determined. Physiological parameters throughout a continuous computer analysis were registered during exercise. Venous blood from elbow flexure was drawn out before and 3 min. after exercise to determine changes in levels of selected hormones: glucostatic as insulin, growth hormone, cortisol, and sexual ones as estradiol, progesterone, testosterone and prolactin. ANOVA (Analysis of Variance) and MRA (Multiple Regression Analysis) were used to calculate obtained results. During the period of presented training in a group of body composition independent variables BMI and body height, and also percentage of fat manifested the highest influence on hormonal changes as dependent variables. It showed a great significance of body proportion in energy expenditure during exercise. It suggested a significant relation between body proportion and maintenance of movement coordination during exercise, as well. Among presented hormones the highest significance insulin and prolactin introduced. A three-week healthful training program with elements of tourism and recreation manifested decreases of all body mass components and hormonal levels. This observation proved tendency to normalization of metabolism in examined obese boys.

NUTRITION, PHYSICAL ACTIVITY AND BODY FAT IN PRE-SCHOOL HUNGARIAN CHILDREN

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Our habits develop in childhood. The relative frequency of overweight and obesity increases at every age. The changed lifestyle: inadequate nutrition and decreasing habitual physical activity are the most likely reasons for it. The aim of the present study was to describe the relationships between some anthropometric variables and dietary habits and physical activity in children of 5–7 years of the capital. Data of this investigation were collected in Budapest kindergartens (N=485). Body dimensions and decimal age were taken and calculated by observing the suggestions of International Biological Program (Weiner and Lourie 1969). Relative fat content was estimated by Parçzkovi's skinfold method (1961). The questionnaire form of nutritional and activity habits were filled in by the parents. There were significant differences in height and body fat content between boys and girls. Most of the differences of dietary habits and the level of habitual physical activity were not significant. The period of breast-feeding, consumption of vegetables and sweets and the organized exercise differed between genders. The parents of the studied children were well informed about the up-to-day nutritional principles. Urbanised hypoactive children are more prone to become obese so in addition to stimulating individual responsibility community measures are also necessary.

SECULAR TRENDS IN PHYSICAL FITNESS IN 9 AND 15 YEAR OLD NORWEGIANS

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Background. Aerobic fitness is an important determinant of cardiovascular health. Much is known about trends in obesity, but few studies have analyzed trends in physical fitness. Methods. Two representative

samples of 9- and 15-year old youth from Oslo were tested with the same maximal cycle protocol in 2000 and in 2006. In 2000, 602 subjects (298 girls and 304 boys) participated, and in 2006, 605 participated (264 girls and 341 boys). Results. Physical fitness decreased 4.6% in 9-year olds ($p < 0.001$), but no difference was found in 15-year olds ($p = 0.869$). Maximal power output was 17% higher in 9-year old boys compared to girls and this difference was 29% in 15-year olds. BMI increased 2% in 9-year olds, but it also increased 3% in 15-year olds. Discussion. The same methods were used in the two studies 6 years apart, but also, the same persons tested the 9-year olds and the 15-year olds at the two occasions. It is therefore unlikely that the different change in the two age groups can be explained by methodological problems. Similar changes have been found in a Danish study (Wedderkopp et al 2004), where the 9-year olds decreased in fitness level, and no change was found in 15-year olds (the latter in press). A decrease in fitness level may increase the general insulin level and attribute the rising obesity problem.

OXYGEN UPTAKE RESPONSES IN YOUNG PATIENTS WITH CHRONIC CHEST DISEASES FOLLOWING SIMULATED PHYSICAL EXERCISE

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Aim: Exercise tolerance is limited in young patients with chronic chest diseases (CCD). The aim of the study was to investigate the oxygen uptake responses following simulated physical exercise (SPE) in young patients with CCD over a 24 hr period. **Methods:** Eighteen patients with cystic fibrosis (CF) (8 male) and 6 patients with non-CF bronchiectasis (1 male) (age 13.1 ± 3.1 y; peak oxygen uptake 35.1 ± 8.4 mL.kg⁻¹.min⁻¹) performed SPE on a cycle ergometer. Patients exercised intermittently for 2 min at moderate-to-heavy intensity (~80% AT and 50% D). Each 2-min exercise bout was interspersed with 1-min of recovery. Patients attempted to complete up to 10 exercise bouts. Following SPE patients performed tests 1, 2 and 3 post

3 min, 1 hr and 24 hr, respectively. Each test was identical and involved patients exercising at moderate intensity (~80% AT) continuously for up to 10 min. During each test oxygen uptake was measured using an on-line respiratory gas analysis system. Results: Repeated measures analysis of variance and subsequent Tukey tests revealed a significant increase in oxygen uptake between test 1 and test 2 (0.81 ± 0.26 to 0.85 ± 0.28 L.min⁻¹, $P < 0.01$), and a significant decrease in oxygen uptake between test 2 and test 3 (0.85 ± 0.28 to 0.81 ± 0.28 L.min⁻¹, $P < 0.01$). Conclusions: Oxygen uptake remained elevated 1 hr post exercise and fatigue is evident 24 hr later.

A LONGITUDINAL STUDY TO EXAMINE HEART SIZE, FITNESS AND SWIM TRAINING IN PRE-PUBERTAL CHILDREN

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The aim of this project was to examine the longitudinal effects of swim training on heart size and function in prepubertal age group swimmers (boys and girls). The overall fitness of the participants as influenced by the swim training was also investigated. This data represents the results of the first year of a six year longitudinal study. A total of twenty swimmers were tested. In addition five control subject, age-matched to five swimmers were tested. Methods: Five swim-trained children (2 boys and 3 girls) and five sedentary children (1 boy and 4 girls), aged 8–9 years, participated in the initial testing sessions. The swimmers had been training with a local club for a minimum of 1 year, 4 days per week. Participants completed an incremental exercise test to volitional exhaustion on a cycle ergometer to determine peak oxygen uptake. Cardiac output and stroke volume were measured non-invasively throughout the incremental exercise test using thoracic bioimpedance (PhysioFlow PF-05 Lab1, Manatec Biomedical, France). Fingertip blood samples were collected into a capillary tube and immediately analysed for whole blood lactate before and immediately post exercise testing (YS1 2300 Sport, Yellow Springs, Ohio, USA). In addition to height, weight and skin fold

measurements, body composition was assessed through plethysmography (Bodpod, Concord, California, USA). Results: The results showed no significant ($p > 0.05$) differences between groups for measured variables. Conclusion: The small sample size, subject age and limited total training time may account for the lack of difference observed between the two groups.

THE USE OF HIGH-FREQUENCY ACCELEROMETRY MONITORING TO ASSESS AND INTERPRET CHILDREN'S ACTIVITY PATTERNS

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Introduction: Children typically engage in short, intermittent bursts of physical activity. Accelerometers are capable of assessing rapid changes in intensity and duration of activity. The aim of this study was to characterise the duration and frequency of activity bouts of varying intensity. **Methods:** Fifty-one boys (age 9.35 ± 0.56 y) wore a uniaxial accelerometer for 7 consecutive days. Habitual activity was analyzed from 6 AM to 9 PM using a 2-second epoch. Intensity cut-off points for light (LPA; >10), moderate (MPA; >65), vigorous (VPA; >176), and hard (HPA; >316) were used. The daily number of physical activity bouts for each intensity category were calculated and expressed according to minimum bout lengths (4 s, 6 s, 8 s, 10 s, 60 s, 300 s, and 600 s). Mean bout duration (s) was also reported. **Results:** On average, children spent 105 minutes in LPA (range = 75–130), 70 minutes in MPA (range = 28–103), 16 minutes in VPA (range = 6–31) and 3 minutes in HPA (range = 1–11) each day. Mean bout duration (\pm SD) for LPA, MPA, VPA, and HPA was 11.6 ± 1.3 s, 9.1 ± 1.2 s, 5.9 ± 0.9 s, and 6.0 ± 2.0 s respectively. 95–96% of all LPA and MPA bouts and 99% of all VPA and HPA bouts were 10 s or shorter. **Conclusions:** As the majority of children's activity bouts are shorter than 10 s, the true nature of the pattern of children's habitual activity may be masked if accelerometer epochs > 10 s are used. High-frequency accelerometer monitoring should be employed in future research to increase the validity of results and improve comparability across studies.

ENDURANCE PERFORMANCE OF CHILDREN WITH DIFFERENT MODES OF TRANSPORT TO SCHOOL

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The effect of active transport to school (ATS) on health and well being outcomes in children needs to be reported from descriptive cross sectional studies and intervention programmes (Stratton et al., in press). Adults who chose active transport modes demonstrated reduced risk to their health (Andersen et al., 2000; Hayashi et al., 1999). Children who walk or cycle to school were also fitter than those who did not (Cooper et al., 2005; Andersen et al., in press). Few studies have analysed the fitness, overweight and socioeconomic status of children's with different modes of ATS. AIM: The aim of this investigation was to measure differences in BMI and endurance performance of children with different modes of ATS whilst controlling for indices of environmental deprivation and distance to school. METHODS: The Sportslinx project (Taylor et al., 2004) annually collects motor fitness and lifestyle data from all 9–10 year children in Liverpool schools. Distance from school was assessed for each individual using GIS (ArcView). BMI and 20 metre multi-stage shuttle run performance (20mMST) were measured using standardised techniques (Taylor et al., 2004). The data from 3,572 children tested in 2004 were used in this study. Environmental deprivation scores were utilised from the indices of multiple deprivation database (ODPM, 2004). Boys and girls were categorised as normal, overweight or obese according to international cut points (Cole et al., 2001). ANCOVA (sex x mode of transport; covariates were distance from school and environmental deprivation) was used to analyse the data. Significance was set at $P < .05$. RESULTS: Boys were significantly fitter than and leaner than girls ($P < .05$). Children who chose ATS options had better endurance performance than those who opted for motorised transport ($P < .05$). There was no interaction between sex and mode of transport to school ($P > .05$). Neither BMI, distance to school nor environmental deprivation affected these differences when added as covariates to the model. DISCUSSION: Children who

choose to cycle or walk to school had superior endurance performance possibly due to their engagement in a sustained bout of moderate to vigorous physical activity once or twice per day. Neither environmental deprivation, BMI nor distance to school affected children's endurance performance suggesting that ATS provides an equal access to a physical activity opportunity for children of this age. CONCLUSION: Children should choose ATS maintain endurance performance and promote healthy and active behaviour.

BODY MASS EXPECTED FOR BODY HEIGHT IN SCHOOLBOYS

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Aim: To establish normal limits for weight/height relationship in schoolboys. **Methods:** A group of 870 boys aged 8–20 years were studied. In all of them age, body height and mass, BMI and body fat content (from 3 skinfolds, by Parižkova's method) were determined. All variables were transformed to logarithms. **Results:** The body mass/body height relationship and BMI were determined for boys whose fat content (%) was within approximate normal limits for age ($n=745$). The antilogarithmic equation for weight/height was approximated by a quadratic one: $m = (0.00736 h^2 - 1.4335 h + 8715) \cdot 1.104$, where m – body mass, h – body height and the factor 1.104 is standard deviation. From the 125 boys with excessive body fat content, about 60% were classified as overweight by that equation or by BMI. However, in contrast to BMI, the weight-for-height norms are age-independent and thus easier to apply. **Conclusion:** Normal body fat content ought to be taken as criterion when constructing weight/height norms used to detect e.g. overweight.

DO FUNDAMENTAL MOTOR SKILLS MATTER IN INCREASING CHILDREN PHYSICAL ACTIVITY?

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The aim of this study was to determine relationships of physical activity (PA) and fundamental motor skills (FMS) during preschool years with the physical activity at the age of 13 years. The subjects (n = 287; 156 boys and 131 girls) were randomly selected, at the age of 3 to 4 years, from the population of STRIP project (n = 1062). Two different study groups were established: the control group and the intervention group. The parents of the children in the intervention group received three years of counseling to increase their children's daily physical activity between the ages of four and seven. During the three preschool years physical activity patterns were measured using the physical activity diary adapted from Barr et al. (1988) and the FMS were measured using the APM inventory (Numminen 1995). At the age of 13 years the PA of the same children were assessed using the self-administered questionnaire (PAI). The associations were measured using Pearson's correlation coefficient. In the intervention group PA correlated only very slightly with FMS during early childhood. However, the statistically significant correlations between early FMS and the PAI at the age of 13 years were stronger. In the control group hardly any correlations were found between PA and FMS during early childhood or at the age of 13 years. Based on this longitudinal study, it can be concluded, that early PA intervention seemed to stimulate the FMS development of young children. The same trend might occur during the following years, if children are giving possibilities to be physically active toward adolescence.

SENSITIVITY TO CHANGE OF AEROBIC EXERCISE PARAMETERS IN PATIENTS WITH JUVENILE MYOSITIS

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Aim: Juvenile myositis (JM) is a rare disease in which the immune system targets the microvasculature of the skeletal muscle and skin, leading to significant muscle weakness and exercise intolerance, though the precise etiology is unknown. The aims of this study were to investigate the changes in exercise capacity between children with myositis during an active and inactive disease period, and secondly to study the responsiveness of exercise parameters. **Methods:** In this study thirteen children with JM (mean age 11.2 ± 2.6 years) participated. Subjects performed a maximal exercise test using an electronically-braked cycle ergometer and a calibrated respiratory gas analysis system (Jaeger Oxycon Champion/Pro). Exercise parameters were analyzed including peak oxygen uptake (VO_{2peak}), peak work rate (W_{peak}), peak heart rate (HR_{peak}), and ventilatory anaerobic threshold (VAT). All children were tested during an active period of the disease as well as during a remission period. From these data four different responsiveness statistics were calculated: standardized response mean, Cohen's effect size, T-tests and % change from baseline. **Results:** The children performed significantly better during remission period compared to a period of active disease ($P < 0.05$). Most exercise parameters showed a very large responsiveness (Cohen's effect size > 0.8). The five most responsive parameters were W_{peak} , W_{peak} % of predicted, oxygen pulse (VO_{2peak}/HR_{peak}), O_{2peak} and power output at the VAT. **Conclusion:** We found that children with active disease had significantly reduced exercise parameters compared to a remission period. Moreover, we found that several parameters had a very good responsiveness. With the previously established validity and reliability, exercise testing has shown to be an excellent non-invasive instrument for the clinical follow-up of children with juvenile myositis.

RESPIRATORY GAS EXCHANGE AND METABOLIC RESPONSES DURING EXERCISE IN CHILDREN AND ADOLESCENTS WITH ACHONDROPLASIA

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Aim: Exercise intolerance and exercise induced fatigue is an often heard complaint in children with achondroplasia. Little research has been performed concerning the exercise response in subjects with achondroplasia. The aims of the present study were to determine whether subjects with achondroplasia have a different response to exercise and gas exchange compared to healthy peers, and whether exercise capacity might be related to anthropometric measurements or physical activity levels. **Methods:** Seventeen patients (7 boys and 10 girls; mean age 11.8 ± 3.3 ; range 6.9–19.4) diagnosed with achondroplasia participated in this study. Weight, standing height, sitting height, arm span and head circumference were measured in a standardized manner. A 3-day Bouchard physical activity record was used to estimate energy expenditure. The subjects performed a maximal graded treadmill exercise test using a modified Bruce protocol. Heart rate (HR) and gas exchange variables (peak oxygen uptake: VO_{2peak} , VO_{2peak}/kg , respiratory gas exchange ratio: RER, and minute ventilation: VE) during the test were measured using a heart-rate monitor (Polar) and a calibrated mobile gas analysis system (Cortex Metamax B3). All analyses were performed in SPSS 12.0. Z-scores were calculated using reference values for healthy children and adolescents. Independent samples T-tests were used to test differences between patients and the reference values. Correlations were calculated using Pearson's correlation coefficient for parametric values. Non-parametric statistics were used when variables were not normally distributed. **Results:** All anthropometrical measurements differed significantly from reference values. Mean standing height was -5.77 ± 0.98 ($p < 0.0001$) standard deviations lower compared to normal values. Physical activity levels were significantly lower in subjects with achondroplasia compared to reference values, and correlated

significantly with VO_{2peak} ($r = 0.594$, $p = 0.05$). All patients were able to perform the maximal exercise test without complications. HR_{peak} of the patients was 178.6 ± 14.9 (range 151–201) beats/min and RER_{peak} was 1.15 ± 0.1 (range 1.0 – 1.41). Z-scores for VO_{2peak} (-3.23 ± 0.66), VO_{2peak}/kg (-2.59 ± 0.70), and E (-2.20 ± 0.73) were significantly reduced compared to reference values for age and gender ($p < .001$). Peak ventilatory equivalent for VO_2 (VE_{peak}/VO_{2peak}) was higher in subjects with achondroplasia (45.25 ± 5.9) compared with reference values (37.9 ± 2.8) ($p < 0.001$). Peak O_2 pulse (HR_{peak}/VO_{2peak}) was significantly lower in subjects with achondroplasia (5.9 ± 1.9 ml/beat) compared to reference values (9.3 ± 2.3 ml/beat; $p < .0001$). Conclusions: Respiratory gas exchange during exercise in subjects with achondroplasia was different compared to age and gender matched reference values. Subjects with achondroplasia have a unique metabolic response to exercise compared to peers. Clinicians should take these difference into account when the exercise capacity of subjects with achondroplasia is being tested.

EFFECTS OF ADOLESCENT OBESITY AND PHYSICAL INACTIVITY ON VASCULAR STRUCTURE AND FUNCTION IN YOUNG ADULTHOOD

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Aim: To examine the longitudinal influence of body composition and physical inactivity in adolescence on vascular structure and function in young adulthood. **Methods:** Vascular testing including carotid intima media thickness (cIMT), brachial artery flow-mediated dilation (FMD) and nitroglycerin-induced dilation (NID) (0.4 mg) was done in 152 (mean age 23 yrs) adults (male=84; female=68). Measures of body composition (waist circumference, %body fat, BMI) were obtained at mean ages 15 and 19 yrs and physical inactivity (TVmin: minutes of TV watched/day) was measured at age 19 yrs. Linear

regression analysis was used to examine the relations of body composition and TVmin across tertiles of cIMT, FMD and NID, adjusted for age, sex, race, baseline artery diameter and BMI. Results: At age 15 yrs body composition did not predict any of the vascular measures; however, at age 19 yrs there was a positive relationship between %body fat (Plinear trend=0.003), BMI (Plinear trend <0.001) waist (Plinear trend <0.001) and cIMT. There was a negative relationship between waist circumference at age 19 and FMD (Plinear trend =0.05), but not NID (Plinear trend =0.15). TVmin was not related to any of the vascular measures. Conclusion: These data show that a significant longitudinal relation to young adult vascular structure and function is not identifiable until late adolescence, suggesting that reduction in obesity during childhood and adolescence may prevent adverse cardiovascular changes.

POSTPRANDIAL TRIACYLGLYCEROL (TAG) METABOLISM IN ADOLESCENT BOYS: A CASE FOR MODERATE INTENSITY EXERCISE

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Aim: To compare the effects of acute, 60 min, intermittent bouts of moderate and vigorous exercise on postprandial plasma triacylglycerol (TAG) metabolism in eight healthy, adolescent boys (mean(SD) age 13(0.3) y, body mass 44(11) kg, peak 2 52(7) mL·kg⁻¹·min⁻¹). **Methods:** Participants completed three conditions in a balanced order using a two-day model. On day one, they either rested for 150 min (CON), completed 6 × 10 min blocks of treadmill exercise at 53% peak VO₂ (MOD), or 6 × 10 min blocks at 76% peak VO₂ (VIG). Each exercise block was followed by a 10 min rest period. On day two following a 12 h fast, a capillary blood sample was taken for [TAG] (mmol·L⁻¹) and then a high fat milkshake was consumed (1.50 g fat,

1.22 g CHO, and 0.22 g protein; 81 kJ·kg BM⁻¹). Further blood samples were taken every hour over a 6 h postprandial rest period for [TAG]. Results: The 3 × 7 (condition by time) ANOVA revealed a significant main effect for condition (P=0.042). A priori simple contrasts at 3 h postprandially showed that the [TAG] on day two for both MOD (-33%, P=0.028) and VIG (-29%, P=0.042) were considerably lower than CON, but not different to each other (P=0.495). A one-way ANOVA for the total area under the [TAG] vs. time curve (mmol·L⁻¹ 6 h) was significant (P=0.036). A priori simple contrasts showed that MOD was lower than CON (-24%, P=0.050) and VIG (-20%, P=0.067) also demonstrated a strong trend. MOD and VIG were not different to each other (P=0.537). Conclusion: Both 60 min of moderate and vigorous intermittent exercise reduce postprandial [TAG]. However, the extra energy expended in the vigorous condition did not produce a dose-related reduction compared with the moderate intensity condition.

PHYSICAL FITNESS OF LITHUANIAN SCHOOLBOYS, EXTREMELY TALL OR SHORT FOR AGE

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Aim: To determine whether extremely tall and short Lithuanian schoolboys differ with respect to selected physical fitness tests. **Methods:** A group of 180 schoolboys from Kaunas (Lithuania), aged 14 – 16 years were studied. From these, three groups of subjects were selected: tall, above the 90th percentile (T; n = 23); short, below the 10th percentile (S; n = 25) and controls, between 25th and 75th percentiles (C; n = 72) of body height. All of them were subjected to the following EUROFIT fitness tests: standing broad jump (SBJ), sit-ups (SUP), bent-arm hang (BAH) and shuttle run 10×5 m (SHR). Fitness variables were adequately transformed, and subjected to one-way ANOVA with Scheffés' post-hoc test. The level of p<0.05 was considered significant. Results: Tall subjects performed significantly

($p < 0.001$) better than the short ones only with respect to SBJ. Compared to controls, short subjects performed significantly worse with respect to SBJ ($p < 0.001$) and SHR ($p < 0.05$). Conclusion: Physical education teachers should be aware of benefits/limitations in physical fitness that are due to different somatic build of schoolchildren. Thus, school marks should not only reflect the attained test scores but should also include child's capabilities and commitment. Apart from chronological age, somatic traits ought to be taken into consideration when constructing physical fitness norms for children and youths.

MMP2 AND MMP9 PLASMA LEVELS AS MARKERS OF BONE REMODELING: A STUDY ON YOUNG MALE TENNIS PLAYERS

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Introduction. Intensive physical activity is known to increase bone mass in pre- and early peripubertal years. This gain is associated with bone metabolism modifications. Extracellular matrix production and degradation by bone cells are critical steps in bone remodeling. Type I collagen is a major ECM component and is degraded by matrix metalloproteinases (MMPs) enzymes secreted in zymogen forms. Thus, the aim of this study was to investigate the effect of tennis on bone remodeling using the MMP2 and MMP9 plasma levels as biomarkers. **Methods.** Ten male tennis players (14.35 ± 0.88 years) and 10 controls (15.00 ± 0.66 years) participated in this study. Bone mineral content and bone mineral density (BMD) were determined by dual-energy X-ray absorptiometry. Blood samples were analyzed for MMP2 and MMP9 activities by gelatin zymography. **Results.** Mineral bone density has been found higher in the dominant arm ($P < 0.0001$).

Pro-MMP2 and pro-MMP9 was higher in the tennis players plasma than in the controls ($P < 0.05$). Conclusion. Tennis practice in children increases bone remodeling, which can be assessed by MMP dosage, in addition of densitometry technique.

MAJOR PWP-RELATED INITIATIVES IN CANADA: THE YEAR IN REVIEW

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The purpose of this paper is to highlight seven major initiatives in Canada over the past year that have a direct relationship with the interests and work of the PWP group. 1. In November, 2006 the Canadian Society for Exercise Physiology, in partnership with the Public Health Agency of Canada, initiated a project titled "Advancing the Future of Canada's Physical Activity (PA) Measurement and Guidelines". The project culminates with the publication of a journal supplement with 14 papers (November, 2007), including papers specifically addressing PA guidelines and measurement concerns for pre-school children, and school-aged children and youth. 2. In January, 2007 the Canadian Government implemented a Children's Fitness Tax Credit to reimburse parents for expenses related to eligible fitness activities. 3. In February, 2007 the Canadian Fitness and Lifestyle Research Institute released the first national direct measures data (pedometry) on PA levels of Canadian children and youth. The results indicated that 91% of Canadian children do not meet Canada's PA guidelines for children and youth. 4. In February, 2007 Canada resurrected the internationally renowned PA social marketing organization "ParticipACTION", which has an adult brand awareness of nearly 80% in Canada. 5. In March 2007, after nearly a year of study, the Standing Committee on Health of the Federal Parliament of Canada released its report on Healthy Weights for Healthy Kids, which includes 13 specific recommendations that the federal government should act upon to increase PA and reduce childhood obesity in Canada. 6. In April of 2007 Canadian researchers published the first clinical practice guidelines on the management and prevention of obesity in adults and children. The 26 published papers are all evidence-based and include

eight chapters specific to children and youth, including prevention and treatment guidelines. 7. Canada hosted the International Conference on PA and Obesity in Children in Toronto on June 24–27, 2007 with over 600 delegates from around the world.

APPLYING THE NEW WHO CHILD GROWTH STANDARDS IN CANADA: WHAT IS OUR PREVALENCE OF OBESITY?

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Statistics Canada

Aim: The aim of this paper is to compute and compare the prevalence of early childhood obesity using the World Health Organization (WHO) Child Growth Standards released in 2006 with those using the International Obesity Task Force (IOTF) cut-points. **Methods:** Directly measured height and weight data on a national sample of children aged 24–60 months from the Canadian Community Health Survey (CCHS, 2004, n=1222) and parental-reported height and weight from the National Longitudinal Survey of Children and Youth (NLSCY, 2002/03, n=5555) were used to calculate body mass index (BMI). Overweight and obese prevalence's were determined using the WHO and IOTF cut-points. **Results:** The overall prevalence of overweight (including obese) using the IOTF criteria was 21.3% and 35.8% for the CCHS and NLSCY respectively and 35.4%, and 45.4% using the WHO growth standards. The overall prevalence of obesity alone using the IOTF criteria was 6.3% and 20.0% for the CCHS and NLSCY respectively and 19.1%, and 33.5% using the WHO growth standards. The prevalence of overweight and obesity was higher in boys than girls, regardless of dataset or cut-points used. **Conclusion:** Monitoring trends in childhood obesity is important for public health surveillance and assessing the impact of program and policy interventions. The new WHO Child Growth Standards provide criterion-based (healthy development exposures) growth data, which differ fundamentally from the quasi-norm referenced growth data used for the development of the IOTF overweight and obesity cut-points. This study demonstrates that the prevalence of overweight and obesity

differs significantly depending on the method of data collection used and the cut-points employed. Reporting and interpreting obesity prevalence's and changes over time must be done with careful attention to the cut-points employed.

ACTIVE HEALTHY KIDS CANADA REPORT CARD ON PHYSICAL ACTIVITY FOR CHILDREN AND YOUTH

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Active Healthy Kids Canada

Aim: The aim of this paper is to describe the process and outcome of the Active Healthy Kids Canada (AHKC) 2007 National Report Card on Physical Activity for Children and Youth. **Methods:** Using academic experts across various disciplines of child and youth physical activity, categories and criteria for grade assignments were established. Data from multiple sources were used to inform the "grades" assigned on the Report Card and a group of research experts worked as a consensus panel to assign the grades. **Results:** An overall grade of "D" was assigned in each of the 2005 and 2006 Report Cards indicating a failing grade. Grades for each of the specific categories were assigned based on empirical evidence and/or expert consensus and can be found on the AHKC website at www.activehealthykids.ca. The overall and specific grades for the 2007 Report Card will be released at the International Conference on Physical Activity and Obesity in Children in Toronto on June 27th. The media and advocacy impact of the Report Card has been extensive with 40 million media impressions in 2006 through print, radio and television with an approximate ad value of nearly \$750,000. **Conclusion:** The AHKC Report Card provides comprehensive, evidence-based assessments of the "state of the nation" with respect to physical activity for Canadian children and youth. Scholarly dialogue and critiques of this process are encouraged to facilitate the evolution and refinement of the annual report card. The preparation and distribution of the report card is meant to serve as an accountability index for all Canadians, a surveillance mechanism, an advocacy tool for physical activity leaders and organizations, a

policy driver and a process for identifying research and surveillance needs. The Report Cards indicate substantial room for improvement but also provide recommendations for action to "improve the grade". The Report Card is a powerful advocacy instrument which can help to provide "The Power to Move Kids".

PHYSICAL AND MOTORIC DEVELOPMENT OF CHILDREN IN YOUNGER SCHOOL AGE PARTICIPATING IN EXERCISES OF CORRECTIVE GYMNASTICS

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In a modern school more and more frequently appear children with different faulty postures. This phenomenon is still dangerously extending because of XXI century civilization changes in our lifestyle to be non active. Children spent more time watching TV and using computer than participating in physical exercises. In Polish schools, in classes I-III, children with faulty postures participate in obligatory corrective gymnastics exercises. In presented work the results of research carried out in preliminary schools of West Pomeranian Region are shown. In this research 288 pupils of a younger school age (7-12 y.o.) are examined. In this group anthropometrical measurements are collected (body mass and body height) and the level of motoric efficacy is determined by the Test of Physical Fitness (developed by the International Committee on the Standardization of Physical Fitness Tests). The statistical analysis of obtained results allows showing a differentiation of a level of physical fitness. It is related to the kind of faulty posture. The lower level of physical fitness is presented by pupils with over- or underweight.

MUSCLE FORCE AND ACTIVATION PATTERN OF BOYS Vs. MEN IN ISOMETRIC ELBOW FLEXION

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Background: Specific muscle force (normalized to body size) is lower in boys compared with men. Possible reasons for this strength discrepancy are differences in muscle composition or activation. Reported differences in muscle composition are minor, at most. Therefore, muscle activation remains the main plausible reason for the observed differences in muscle force. Purpose: To compare maximal force, rate of force development, and neuro-motor activation between boys and men. Methods: Fifteen boys (9.6 ± 1.6 yrs) and 16 men (22.1 ± 2.8 yrs) performed fast, isometric, elbow-flexion contractions on the Biodex System II apparatus. Surface-EMG was used to monitor biceps and triceps neuro-motor activity. The derived variables were: Maximal force (torque) (MF), maximal rate of force development (RFD), EMG amplitude, electro-mechanical delay (EMD), and rate of muscle activation (Qpk – the rate of EMG rise during peak RFD). Results: Muscle force was significantly ($p < 0.05$) lower in the boys, relative to both the upper-arm's lean cross-sectional area (0.79 ± 0.18 vs. 0.99 ± 0.22 N•m•cm⁻²), and to biceps (agonist) EMG activity (763 ± 522 vs. 1215 ± 470 N•m•mV⁻¹). Biceps Qpk was also lower in the boys (0.93 ± 0.45 vs. 2.37 ± 1.36 mV•ms), as was RFD, normalized to either MF (8.38 ± 1.95 vs. 9.78 ± 1.58 N•m•s⁻¹/N•m), or Qpk (195 ± 163 vs. 395 ± 293 N•m•s⁻¹/mV.s). Biceps EMD, on the other hand, was significantly longer in the boys (75.5 ± 28.2 vs. 47.5 ± 17.6 ms). The corresponding difference in triceps (antagonist) EMD was not significant. No group differences were observed in co-contraction, as indicated by the agonist/antagonist EMG-amplitude ratio. Conclusions: Our study suggests that children's lower rate of force development is due to slower muscle activation and a longer delay between neuro-motor activation and onset of force development. Co-contraction was not found to contribute to the observed difference in maximal force. These findings, may reflect a lesser recruitment of higher-threshold motor units which could, in turn, explain children's lower maximal force.

SOMATIC AND MOTOR DEVELOPMENT IN MORE AND LESS ACTIVE BOYS

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In Hungary, growth and development of pubertal children have been often investigated by means of cross-sectional studies (Bodzsar and Papai 1994, Mohacsi et al. 1994, Mészáros et al. 1981). However, it is well known that longitudinal studies improve our understanding in this area (Eiben 1992). Regular physical activity is one of the most important preconditions of harmonic child development. Differences in size and body composition between active and inactive children were highly significant (Malina et al. 1986, Mészáros et al. 2000). The connection between the reduced physical activity and increase in the prevalence of overweight has been investigated in several countries. The aim of the study was to compare the development in body dimensions (body height, body mass, and relative body fat content) and in four motor test scores (30m dash, standing long jump, fist ball throw and 1200m run) in more ($n=97$) and less active ($n=211$) Hungarian boys. Standard anthropometric methods were used (Weiner and Lourie 1969). Body fat content was estimated by the method of Parizkova (1961). For the statistical analysis t-tests for independent samples and ANOVA for repeated measures were used. When comparing means of body dimensions of more active boys versus less active boys no significant differences were found in body height, however, in the less active ones body mass and body fat content were significantly more by every 6 months of the investigation. Motor performances of the more active boys were significantly higher than for the less active ones. We observed that the fist ball throw test was the fastest and continuously developing motor performance ability at the time of investigation. The development in motor performance did not differ in the two groups, but the physically more active children showed better motor performance at each time of investigation.

PHYSICAL FITNESS IN CHILDREN WITH OSTEOGENESIS IMPERFECTA: AN RCT

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Aim: To study the effects of a physical training program on exercise capacity, muscle strength and subjective fatigue levels in patients with mild to moderate forms of Osteogenesis Imperfecta (OI). **Methods:** Thirty-four children with OI type I or IV were randomly assigned to either a 12 week graded exercise program or care as usual for three months. Exercise capacity and muscle strength were studied; subjective fatigue, perceived competence and Health-related Quality of Life were secondary outcomes. All outcomes were measured at baseline (T=0), after intervention (T=1), and after six and nine months (T=2 and T=3, respectively). **Results:** After intervention (T=1) O₂peak, O₂peak/kg, Wmax and muscle strength were significantly improved (17%, 18%, 10%, and 12%, respectively) compared to control values. Subjective fatigue decreased borderline statistically significantly. Follow-up at T=2 showed a significant decrease of the improvements measured at T=1 of O₂peak. O₂peak/kg, Wmax and subjective fatigue showed no significant difference. At T=3, we found a further decrease of the gained improvements. **Conclusion:** A supervised training program can improve aerobic capacity and muscle strength and reduces levels of subjective fatigue in children with OI type I and IV in a safe and effective manner. After stopping the program however, the improvements seem to disappear in time. Continuation of the exercise program seems warranted.

PHYSICAL PERFORMANCE CHARACTERISTICS OF FINNISH YOUTHS AGED 10 AND 14 YEARS – SPECIAL REFERENCE TO ANTHROPOMETRICS, HORMONAL LEVELS AND OXYGEN TRANSPORT CAPACITY OF THE RED BLOOD CELLS

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The take-off for growth spurt has been shown to be at around the age of 11 in European males and the peak at 14 [1, 2]. Previous research among adolescent males suggests that running speed attains maximal growth before, maximal aerobic power coincident and strength/power after peak height velocity [3]. The purpose of this study was to examine the physical performance characteristics of 10 and 14-year-old Finnish males with special reference to anthropometrics, hormonal levels and oxygen transport capacity of the red blood cells. The subjects of this study were 10 ($n=27$, 1.45 ± 0.06 m, 36.0 ± 5.7 kg, $13.1 \pm 6.5\%$) and 14 ($n=23$, 1.72 ± 0.08 m, 61.0 ± 10.9 kg, $10.5 \pm 6.6\%$) years-old Finnish males. The anthropometrics were determined by sum of skinfolds [4], total fat mass, total muscle mass, average lean mass of arms, average lean mass legs and circumferences of lower (shank, thigh, pelvis) and upper (chest, upper arm) body with conventional methods and with InBody720 body composition analyzer. From the venous blood sample the erythrocytes, haemoglobin, hematocrit, cortisol, growth hormone and free testosterone were analyzed. The subjects' physical performance was measured in speed (30 m sprint), strength (107 degree bilateral isometric leg press and grip strength) and endurance (maximal oxygen uptake on a treadmill and YoYo shuttle run). The differences between age groups were analyzed using independent samples T-test and the relationships between physical performance variables and other measured variables with Pearson's correlation. The main findings of this study according to statistical analysis were:

- A significant difference was found between groups 10y and 14y in all other measured variables except sum of skinfolds and concentration of cortisol and growth hormone
- Concentration of haemoglobin was related to better maximal oxygen uptake in 14y

- Concentration of growth hormone was related to better endurance performance in 14y
- Concentration of free testosterone was related to better maximal oxygen uptake in 14y
- Concentration of cortisol was related to better strength in 14y
- Concentration of cortisol was related to better speed and endurance in both groups
- Less amount of fat and smaller circumferences were related to better speed and endurance performance in both groups
- Less amount of fat and smaller circumferences were related to better grip strength in 10y
- Less amount of fat and smaller circumferences were related to better leg strength in 14y

From the results of this study it can be summarized that the rapid development through maturation in Finnish males begins between 10 to 14 years of age and marked differences in anthropometrics, hormonal levels, oxygen transport capacity of the red blood cells and various physical performance tests can be detected between these age groups. The effects of hormonal changes to physical performance at the age of 14 are evident proven by relationships found between all analyzed hormones and strength, speed or endurance. Better overall physical performance profile in both age groups were related to less amount of fat and smaller circumferences which can be most likely to be explained by both heredity and better engagement to sport activities. References [1] Largo & al. (1978) *Ann Hum Biol.*, 5,421–434. [2] Preece & Baines (1978) *Ann Hum Biol.*, 5,1–24.[3] Malina & al. (2004) *Growth, maturation and physical activity*. Champaign, IL: Human Kinetics. [4] Durnin & Womersley (1974) *Br J Nutrition.*, 32:77–97.

FITNESS AND FATNESS IN CHILDREN: EXAMINING RISK OVER TIME IN A LARGE COHORT OF SCHOOL-AGED CHILDREN

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Aim: Obesity and poor physical fitness in children are risk factors for a variety of health problems later in life. In this study, we examine children with both poor fitness and overweight from a large-school based cohort and explore factors that predict movement into and out of this group over a two-year period. **Method:** We selected 2388 children aged 9 or 10 from 50 schools in the Niagara region of Ontario, Canada. 1709 (71%) of these had complete data at both time points. Children were considered high-risk if they were overweight according to age- and sex-adjusted cut-points for BMI and below the 20th percentile of VO₂max. We examined movement between groups using logistic regression, with predictors including baseline age, sex, generalized self-efficacy (CSAPPA), self-reported participation in physical activity, and physical maturity (years from peak height velocity, estimated from anthropometric measurements). **Results:** 208 children (11.6%) were at high risk at study baseline. 48 of these (23.1%) were no longer in this group at 2-year follow-up, while 112 (7.1%) students not at risk at baseline moved into the high-risk group at follow-up. Movement from the high- to the low-risk group was predicted by sex, baseline physical maturity, and self-efficacy. Movement from the low- to the high-risk group was predicted by sex, baseline physical maturity, and change over time in physical activity. **Discussion:** Results confirm that ages 9 to 12 see the development of overweight and poor fitness in a substantial number of children, and that this is associated with declines in physical activity. Substantial improvement in children overweight and low-fitness at age 9 is not uncommon, however. The effect of physical maturity in predicting such improvement confirms that some of these children will attain a

normal BMI and/or VO₂max through growth, while self-efficacy may predict future improvements by increasing the likelihood of self-directed improvements in physical activity.

ASSESSMENT OF PHYSICAL ACTIVITY IN ADOLESCENTS

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Physical activity assessment, especially in adolescents is very sophisticated and time consuming. The biggest restriction in physical activity assessment is connected with methodology that should be relatively easy for participants, but in the same time valid. In the present study easy method – Netherland_Health Education Project Questionnaire (Saris, Doesburg, Lemmens, Reingis, 1974) – was used for the assessment of overall physical activity in more than 500 students. For each participant of the study Physical Activity Score was calculated, also the overall time spent in training groups and activities was enrolled. Though the answer of this questionnaire reflects not specific activities but child behaviour in everyday situation at home or at school, there are significant correlations between physical activity score assessed by this questionnaire and the real participation in physical activities. The used questionnaire gives an overview of children physical activity and allows to differentiate the children by this characteristic. As the questionnaire is quite short and children complete it with pleasure it could be used in different studies where physical activity is one of the factors useful to consider.

RELATIONSHIP BETWEEN OBESITY AND LIFE STYLE IN CHILDREN FROM ANAPOLIS – GOIAS – BRAZIL

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The aim of the present study was to analyze the relationship between levels of obesity and life style (physical activity and eating habits) in children aged between 7–9 years-old, from Anipolis-GO. A sample of 1982 students from both sex, from public and private schools were evaluated. The presence of overweight and obesity was identified by BMI, according to Cole et al (2000) cut-off points and a validated life style questionnaire (BARROS, 2003). From 1260 students from public schools, 10,31% were overweight, and 4,04% were obese. From private schools' students, it was indicated a presence of 18,55% overweight children and 6,65% obese ones. On the eating habit classification, from both public and private schools, it was observed that most of the students (84,8%) showed irregular eating habits, according to patterns offered by pyramid referential. Regarding levels of physical activity, it was observed that students from private schools, 31,3% are sedentary, 29,4% not enough active, 24,4% moderately active and only 15% are active. Students from public schools, 21,3% are sedentary, 22,5% are not enough active, 25,4% are moderately active and 30,7% are active. Our results showed that the prevalence of overweight and obesity was higher in students from private schools than in those from public ones. Regarding life style, it was observed that physical activity and time spent outside school were factors that influence overweight and obesity in all sample analyzed.

A NEW METHOD FOR THE MEASUREMENT OF HAND DIMENSIONS IN YOUNG SPORTSMEN

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In handball and basketball the higher the finger length the better will be the accuracy of shot or throw. All shots and throws are finished with wrist and fingers. It can be proposed that athletes with longer fingers and higher hand surface parameters have higher grip strength. The aim of this study was to present a new method for the measurement of hand dimensions in young sportsman. The outlines of the hands were drawn on paper with a thin marker. Three groups of hand anthropometric parameters were measured: five fingers spans, five fingers lengths and five perimeters of the hand. In ten 10–11-year-old and eleven 16–17-year-old boys, the hand anthropometry was repeated with a one-hour interval for two times to calculate the reliability of measurement (intraclass correlations). The reliability of the hand anthropometrical parameters (fingers spans, lengths and perimeters) in both groups of children was very high ($r = > 0.92$). Future research should include the use of specific hand anthropometric parameters in sport practice with young handball and basketball players.

BODY COMPOSITION AND PSYCHOLOGICAL FUNCTIONS IN HUNGARIAN GIRLS (2.5-YEAR FOLLOW UP)

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It has been revealed that menarche has a significant influence on the psychological functions in children (Brooks-Gunn and Rubble, 1983). They tend to be embarrassed by the fact that their bodies are more womanly in shape than those of their female classmates that emphasize a lean look. The aim of the study was to analyze the differences in anthropometric data and psychological functions in Hungarian teenage

girls. All together 146 girls were included in the analysis. The mean of their calendar age was 10.99 at the time of first measurement. The subjects were divided into two groups according to the onset of menarche (G1; n=104 biologically matured, G2; n=42 non-matured). Anthropometric measurements were carried out 8 times in every 4th month during 2.5 years observation. Body mass related body fat was estimated by the caliper metric method of Parizkova (1961). Self-administered questionnaires were used to describe state and trait anxiety (Spielberger et al., 1973) and self-efficacy towards physical activity (Schwarzer, 1998). Distribution of the data was checked by Shapiro-Wilk's W test. Differences between the groups were analyzed by independent t-test or Mann-Whitney U-test depending on respective distributions. Significant differences were found in height, body weight, calendar age and body mass related fat percentage between the two groups ($p < 0.05$). No differences were found in state and trait anxiety and in self-efficacy towards physical activity between the two groups. Our conclusion is that the differences between anthropometric characteristics are the consequences of the process of biological maturation, but the pace of their social maturation is not the same. Other factors (family background, type of the settlement where they live) may markedly influence the cultural (social) behavior. The differences in the questionnaires were not significant because these girls were socially pre-matured.

THE RELATIONSHIP BETWEEN EARLY OXYGEN RECOVERY AND THE SCHWACHMAN SCORE IN CHILDREN WITH CYSTIC FIBROSIS

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Aims: There is an increasing awareness amongst clinicians of the value of exercise testing as a measure of health and functional capacity. The aim of the study was to investigate the relationship between early oxygen recovery following a maximal exercise test and disease severity in children with Cystic fibrosis (CF). **Methods:** Fifteen

children with CF (5 male) and a mean (SD) age 13.1 ± 2.9 y underwent maximal cardiopulmonary exercise testing on a cycle ergometer. On-line respiratory gas analysis was used for measuring oxygen uptake. Gas measurements were recorded during exercise to peak oxygen uptake and during the first 10 minutes of recovery. Early oxygen recovery was characterised by the half-time ($t_{1/2}$), the time to reach 50% of the peak oxygen uptake value. Early oxygen recovery was correlated against the Schwachman score (SS), a validated clinical severity score in children with CF. Results: The mean (SD) patients' peak oxygen uptake, peak oxygen uptake $t_{1/2}$, and SS was $32 \pm (7)$ mL.kg⁻¹.min⁻¹, $57.3 \pm (16.2)$ s and $79 \pm (14)$, respectively. A significant correlation was found between the peak oxygen uptake $t_{1/2}$ and the SS ($r = -0.72$; $P < 0.02$). Children with a greater severity of disease as assessed by the SS, therefore, had a prolonged early oxygen recovery. Conclusions: Early oxygen recovery, as assessed by the peak oxygen uptake $t_{1/2}$, following maximal exercise has value in objectively assessing disease severity in children with CF.

HEART SIZE, LEAN BODY MASS AND THE SEX DIFFERENCE IN PEAK OXYGEN UPTAKE IN PREPUBERTAL CHILDREN

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Aim: The purpose of this study was to test the hypothesis that prepubertal sex differences in aerobic fitness (peakVO₂) can be explained by boys' larger lean body mass (LBM), peak cardiac output (Q) and heart size. **Method:** Ten prepubertal boys and 10 prepubertal girls were matched for LBM (25.9(1.9) boys vs 25.3(2.3) kg girls). Left ventricular mass (LVM) and LV end diastolic volume (LVEDV) were measured using magnetic resonance imaging. Peak VO₂ was determined on a cycle ergometer following an incremental exercise protocol to exhaustion, and Q was recorded using thoracic bioimpedance. **Results:** Boys' peak VO₂ (1.46(0.21) vs 1.23(0.79) L.min⁻¹) and arteriovenous oxygen difference (14.7(2.1) vs 12.6(1.6) mL.100mL⁻¹) were

significantly ($p < 0.05$) higher than girls' values; but there were no significant sex differences in peak Q (10.0(1.3) vs 10.0(1.40) L.min⁻¹), LVM (98(14) vs 92(20) g) or LVEDV (76(8) vs 70(12) mL). Conclusions: LBM, heart size and peak Q do not explain the sex difference in prepubertal children's aerobic fitness. Peripheral rather than central factors may underlie boys' higher peak VO₂.

EFFECT OF STRENGTH TRAINING ON BODY COMPOSITION, RESTING BLOOD PRESSURE, AND VASCULAR ENDOTHELIAL FUNCTION IN ADOLESCENCE

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Aim. The increased awareness of the cardiovascular and metabolic benefits of strength exercise has led to its popularity in adults. To our knowledge no data are available regarding the effect of strength training on cardiovascular health in adolescence. The purpose of this study was to investigate the effects of a 10-week strength training program on body composition, resting blood pressure, and vascular endothelial function in adolescence. **Methods.** 43 adolescents aged 11 to 13 were invited to participate in the program. They were divided into two groups. A) Training group (n=22): students received strength training 2 times per week for 10 weeks. B) Control group (n=18): students in this group did not receive any strength training. Assessments of anthropometric measures, body composition, resting blood pressure, heart rate, and the endothelial function of the brachial artery (endothelium-dependent dilation, EDD) were carried out in all students within 3 weeks before the start of the program and after the 10-week training period. Repeated measures analysis of variance with time and group as factors was performed. **Results.** There were no statistically significant differences of all variables between the two groups at baseline. Mean attendance of the training class was 83%. Significant increase in height and weight was observed in all students

over the study period. Body mass index and percentage of body fat remain similar in both groups at 10 weeks. Waist circumference decreased significantly in both groups after the study period, more in the training group. [Training: 67.4(7.3) cm to 64.7(6.8) cm; Control: 63.1(5.8)cm to 62.4(4.4)cm, $p=0.06$]. Systolic blood pressure tended to be decreased [Training: 112(10) mmHg to 108(11) mmHg; Control: 108(11)mmHg to 107(9)mmHg, $p=0.06$], while resting heart rate remained similar in both groups at 10 weeks. EDD improved significantly in the Training group at 10 weeks, but not in the control group. [Training: 8.4(1.1)% to 9.7(1.3)% Control: 9.0(1.3)% to 9.1(1.1)%, $p<0.004$] Conclusions. Strength training can effectively improve cardiovascular health in adolescence in terms of decreasing the degree of central obesity, decreasing resting systolic blood pressure, and in improving the vascular endothelial function.

PARTICIPATION IN A SPORTS CLUB BY CHILDREN AND THEIR PARENTS IS ASSOCIATED WITH HIGHER FITNESS OF CHILDREN

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The aim of the study was to examine whether children participating in a sports club (SP-group) are actually fitter and/or healthier than children that do not participate in a sports club (non-SP-group). Methods: 540 children from two provinces of Switzerland were randomly selected and stratified by age (1th and 5th grade), geographic region (urban, rural) and by ethnicity (10–30% migrants). Height, mass, and skinfold thickness (sum of four skinfolds) were measured. Overall fitness was assessed with different sport motor tests, aerobic fitness was measured with the 20m shuttle run test (20mSRT). Physical activity (time spent in activities which caused sweating and higher ventilation) and ethnicity (group 1: Switzerland, North- and Central-Europe, USA/Canada; group 2: mixed from group 1 and 3, group 3: migrants from South-and East-Europe, Asia, Africa, South-America) were acquired with questionnaires. Results: BMI and the sum of

skinfolts did not differ between the groups. The SP-group showed significantly better results for the 20mSRT (6.3 ± 2.2 vs. 5.0 ± 2.0 paliers, $p < .001$) and for most of the sport motor tests compared to the non-SP-group. The SP-group reported significantly more physical activity than the non-SP-group (88.1 ± 44.4 vs. 66.6 ± 46.5 min*day⁻¹, $p < .001$). Children from migrant families showed a significantly lower aerobic fitness (5.4 ± 2.2 vs. 6.2 ± 2.2 , $p < 0.01$) and a higher skinfold thickness (33.7 ± 14.3 vs. 30.1 ± 13.0 mm, $p < 0.05$) than children from Switzerland or the Western world. In conclusion, children and their parents should be actively supported to participate in a sports club, since this is an easy tool to improve total physical activity, fitness and body fat content. Migrant families should be motivated in particular.

INSTRUCTION TO AUTHORS

Acta Kinesiologiae Universitatis Tartuensis is a multidisciplinary (publishing papers on diverse subjects from sports and exercise sciences) annual publication.

Manuscripts are accepted for consideration with the understanding that their contents not been published elsewhere. Manuscripts are read through by the editor and by two reviewers in blind review process, which takes 8–10 weeks.

Manuscripts are to be submitted in English. Submit three clear copies of the manuscripts to the editor. Maximum volume of text is 10 pages, maximum total volume is 15 pages. Type the manuscripts double-spaced on one side of A4 paper with margin of 3 cm on the left side.

The manuscripts should be arranged an following

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Title of the article in capital letters, names of authors, authors institution, name and address of the principal author, up to 5 key words. For blind review, a second title page is needed that contains only the title.

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The text should contain the following sections: Introduction, Materials and Methods, Results, Discussion, References, Acknowledgements if any. Tables and Figures should be presented on separate sheets. Figures should be professional in appearance and have clean, crisp lines. Identify each Figure by marking lightly on the back, indicating. Figure number, top side and abbreviated title of manuscripts. Legends for the Figures should be submitted on a separate sheet. Tables should be double-spaced on separate sheet and include a brief title. The SI units should be used in presenting results.

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1. Sarna S., Kaprio J. (1994) Life expectancy of former elite athletes. *Sports Med.* 17 (3): 149–151
2. Gurdipe E. (1975) Tracer methods in hormone research. Springer Verlag, New York
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