

.....
 European Journal of Public Health, Vol. 23, No. 5, 794–798

© The Author 2012. Published by Oxford University Press on behalf of the European Public Health Association. All rights reserved.
 doi:10.1093/eurpub/cks149 Advance Access published on 28 October 2012

Psychosocial correlates of physical activity in school children aged 8–10 years

Ana C. Seabra¹, André F. Seabra¹, Denisa M. Mendonça², Robert Brustad³, José A. Maia¹, António M. Fonseca¹, Robert M. Malina⁴

1 Center of Research, Education, Innovation and Intervention in Sport (CIF2D), Faculty of Sport, University of Porto, Portugal

2 Institute of Public Health (ISPUP), Institute of Biomedical Sciences Abel Salazar, University of Porto, Portugal

3 School of Sport and Exercise Science, University of Northern Colorado, USA

4 Department of Kinesiology and Health Education, University of Texas at Austin and Tarleton State University, Stephenville, Texas, USA

Correspondence: Ana Cristina Maia Nunes Seabra, Faculty of University of Porto, Portugal, Rua Dr. Plácido Costa, 91-4200 Porto, Portugal, tel: +35 1225074789, fax: +35 1225500689, e-mail: anaseabr@gmail.com

Background: Understanding correlates of physical activity (PA) among children in different populations may contribute to fostering active lifestyles. This study considered gender differences in relationships between biologic (body mass index, BMI), demographic (socioeconomic sport status, SES) and psychosocial correlates of PA and level of PA in Portuguese primary school children. **Methods:** 683 children, aged 8–10 years, from 20 different elementary schools in northern Portugal were surveyed. Weight status was classified using International Obesity Task Force (IOTF) criteria for the BMI. Family SES was estimated from school records. PA level and psychosocial correlates (attraction to PA, perceived physical competence and parental socialization) were obtained with interview and standardized questionnaires, respectively. Sex-specific hierarchical multiple regression analyses (SPSS 18.0) were conducted and included two blocks of predictor variables (biologic and demographic, and psychosocial). **Results:** Level of PA was significantly higher in boys than girls. Enjoyment of participation in vigorous PA was positively associated with level of PA. Perceived acceptance by peers in games and sports and parental encouragement were positively and significantly related to PA in girls. Perceived physical competence was positively and significantly related to PA in boys. Weight status and SES were not associated with PA. **Conclusions:** Boys and girls differed in perceived attractiveness of PA and perceived physical competence, both of which influenced level of PA. Differences in perceptions may be important aspects of motivation for PA in school children.

Introduction

A physically active childhood may prevent early onset of risk factors for several chronic diseases that manifest in adulthood¹ and may translate into a physically active adulthood.² Nevertheless, the majority of children in developed and developing countries are not sufficiently active,³ so discussions in public health increasingly emphasize the need for intervention programs aimed at increasing childhood physical activity (PA).

Youth PA tends to decline with age, especially during adolescence, and boys tend to be more engaged in PA than girls.⁴ Non-obese (normal weight) and high socioeconomic status (SES) youth tend to be more active than obese and low SES youth.^{5,6} The limited effectiveness of interventions in producing substantial and sustainable effects on PA in children^{7,8} highlights a need for further study of correlates of PA in children.^{9,10}

Traditional health behaviour theories^{11,12} focus on individual psychological processes and have been used to describe, explain and predict PA behaviours. The theories were originally developed for adults and may have limited applicability to PA in children, given the interacting demands of physical growth, biological maturation and behavioural development.¹³

The Youth Physical Activity Promotion (YPAP) model, which has a social-ecological perspective, provides a reasonably coherent framework for understanding correlates of PA in children.¹⁴ Accordingly, correlates of PA in the model include psychological attributes (predisposing factors), social influences (reinforcing factors) and environmental influences (enabling factors).

Predisposing factors include personal knowledge and perceptions that reflect interest in PA evident in outcome expectation (enjoyment of, attraction to PA) and efficacy expectation (perceived competence for PA). Reinforcing factors are rewards or feedback associated with PA that may encourage or discourage adoption and/or continuation of PA. Parents are important reinforcing or social agents who influence health-related behaviours including PA. Enabling factors are related to the environment and include access to play spaces, equipment and transportation to facilities, and opportunity for physical education classes.

The utility of the YPAP model¹⁵ and relationships between predisposing and reinforcing factors with PA^{15,16–20} have been addressed. In general, children who are more attracted to PA and who perceive themselves as physically competent will persist in current and future PA. Parents who believe in the importance of PA, are physically active (role models), encourage their children to be active and/or provide instrumental support, tend to have more physically active children.

Relatively few studies have considered gender differences in PA-related psychosocial characteristics of the YPAP model, while studies more often focused on boys.^{18,20,21} Moreover, limited research has examined familial SES and weight status (weight-for-height) relative to psychological and social correlates of PA in children.¹⁸ Because girls may be at risk for low PA,⁵ better understanding of gender differences may contribute to more appropriate PA interventions.

This study considers predisposing and reinforcing factors for PA in a cross-sectional sample of Portuguese school children 8–10 years

of age. Level of PA and psychosocial correlates of PA are initially compared between boys and girls. Relationships of biologic (BMI) and demographic (SES) characteristics and psychosocial correlates of PA with level of PA in the boys and girls are then systematically evaluated.

Methods

Sample

A random sample of 20 public elementary schools (from a total of 40) throughout the municipality of Maia in northern Portugal was selected. The study was approved by the research committee of the university and by authorities at individual schools. Four weeks before data collection, families of all children enrolled in the schools were mailed a passive consent form that instructed parents to return the form if they did not want their child to participate in the study. This was the customary protocol for research conducted in Portuguese schools. The refusal rate was 45% ($n = 566$), resulting in a final sample of 683 children (331 girls, 352 boys; 55% response rate) aged 8–10 years. Data were collected between February and March 2010.

Measures

Anthropometry

Weight was measured to the nearest 0.1 kg using a Tanita scale (BC-418MA, Tanita Corporation, Tokyo, Japan). Children wore light clothing with shoes removed. Height was measured with shoes removed to the nearest 0.1 cm using a portable stadiometer (Siber Hegner®). BMI (kg/m^2) was calculated. Weight status was classified as normal, overweight or obese using age- and sex-specific BMI cutoffs.²²

Socioeconomic status

Participation in subsidized education materials and meal programs was used as a proxy for SES. Children from families with incomes at or below one-half the minimum wage were eligible for free educational materials and meals. Those with incomes more than one-half but less than or equal to the minimum wage were eligible for reduced-price meals, whereas children from families with incomes above minimum wage were not eligible for subsidies. SES was classified into three categories: high (unsubsidized), medium (reduced price) and low (free). Family income and corresponding categories were determined by school authorities, and were extracted from official school records.

Psychosocial variables

The short version of the Children's Attraction to Physical Activity scale (CAPA), a scale for measuring interest in engaging in PA, was used.²³ The Portuguese version included 14 items that measured five dimensions of attraction to participation in PA: enjoyment of vigorous PA, perceived importance of participating in PA, liking of games and sports, perception of physical exertion as fun and perceived peer acceptance in games and sports.

Perceived physical competence (PPC) was assessed with a five-item scale²³ adapted from Harter.²⁴ The scale assessed self-appraisal of competence for performing PA behaviours.

Parental influence on socialization (PSI) into PA was assessed with a nine-item scale,^{21,23} which assessed three dimensions of parental support: role modelling behaviour, encouragement, and parental enjoyment of PA. The items were described as social and psychological influences on PA behaviours.²³

The CAPA, PPC and PSI scales were scored on a four-point format (one to four) using a 'structured-alternative'²⁴ approach. Children were presented with two opposing choices and asked to

	Really true for me	Sort of true for me			Sort of true for me	Really true for me
1.	—	—	Some kids do not like to exercise very much	BUT	Other kids like to exercise a whole lot	—

decide which statement best reflected their own feelings. This format was used as a means of reducing 'social desirability' tendencies that often occur in responses of children to questionnaires. Once children made their choice, they then had to select if it was 'somewhat true' or 'really true'. A sample item from the original CAPA scale for the liking of vigorous PA²³ is indicated.

The psychometric properties of the scales have been validated and are regarded as reliable indicators.^{15,19,21,23} The scales were translated from English into Portuguese, modified as necessary and back translated into English. A pilot study was conducted to assure that the contents of each scale were understood by children. Reliability coefficients (Cronbach alpha) indicated acceptable internal consistency for all scales (>0.70).

Leisure time physical activity

Leisure time physical activity was measured by individual interviews using the Godin-Shephard²⁵ questionnaire. Interviews were conducted at school and placed questions in the context of the daily leisure routines. Children were asked to report the number of times per week that they were engaged in different physical activities for periods of at least 15 min. Three PA categories were derived: mild (three METs, activities such as casual walking, stretching and fishing); moderate (five METs, activities such as fast walking, tennis, leisurely bicycling and non-competitive swimming); and strenuous (nine METs, activities such as running, soccer, basketball, judo, roller skating, vigorous swimming). A total score was derived by multiplying the frequency of each category by its MET value, and summing the products.²⁵

Reliability

A pilot study of all variables using a test-retest protocol was conducted in a random subsample of 41 children. Intra-class correlation coefficients (R) were high for height and weight, $0.90 \leq R \leq 0.99$; CAPA subscales, $0.96 \leq R \leq 0.99$; PPC scale, $R = 0.99$ and PSI subscales, $0.98 \leq R \leq 0.99$; and moderate for weekly PA, $0.77 \leq R \leq 0.90$.

Analyses

Characteristics of the sample were expressed either as means and standard deviations or proportions. Independent sample t -tests and Pearson chi-squares were used to evaluate differences in means and proportions between boys and girls.

Linear mixed models were used to account for the multilevel structure of the data (students nested into schools). The models considered potential clustering effects resulting from school influences (robust standard errors). Weight status and SES were included as dummy variables using normal weight and low SES as the respective references. Candidate variables for the multivariable model were screened with univariate methods. Stepwise procedures were used to select the statistically significant variables to enter/remove in the final multivariable model. At each step, the independent variable not in the model that had the smallest P -value was entered, and variables already in the model were removed if their P -value became larger than the significance level. The model was

terminated when no more variables were eligible for inclusion or removal.

A significance level of $\alpha = 0.05$ was used in multivariable analyses. Interaction effects between sex and psychosocial variables were initially tested. Results indicated significantly different effects for boys and girls. Subsequent analyses were thus sex specific. Regression coefficients and respective 95% confidence intervals (CI) were estimated. In the final models, adjusted coefficients for the statistically significant variables are presented as adjusted for the remaining significant variables in the model. SPSS version 18.0 was used in all analyses.

Results

Characteristics of the children are summarized in table 1. The sample includes slightly more boys (51.5%) than girls (48.5%), and $\approx 60\%$ are classified by school records as higher SES. Approximately 25% and 12% of girls are overweight and obese, respectively; corresponding values for boys are 26% and 12%. Boys have, on average, significantly higher scores than girls on liking games and sports ($t = 2.92$, $P = 0.004$), liking to participate in vigorous PA ($t = 5.99$, $P < 0.001$), enjoyment of physical exertion ($t = 2.84$, $P = 0.004$) and PPC ($t = 5.53$, $P < 0.001$). Other psychosocial correlates do not differ between boys and girls. Levels of PA are significantly higher in boys than girls ($t = 7.39$, $P < 0.001$).

Crude and adjusted coefficients and 95% CI with PA level as the dependent variable in sex-specific linear multiple regression analyses are presented in table 2. SES and weight status are not associated with PA level in either boys or girls. Attraction to vigorous PA is positively associated with PA in both sexes. Among girls, perceived acceptance by peers in games and sports and parent encouragement for PA are significantly and positively associated with PA. Among boys, PPC is significantly and positively associated with PA. Overall, 7.8% and 8.6% of the variance in weekly PA in boys and girls, respectively, is explained by the psychosocial correlates.

Discussion

Relationships between demographic (SES), biologic (BMI) and psychosocial correlates (CAPA, PPC, PSI) with weekly PA were considered in a cross-sectional sample of Portuguese boys and girls aged 8–10 years. Consistent with previous research,^{4,26} boys

were more active than girls. PSI into PA did not differ significantly between boys and girls. Boys scored higher than girls on all subscales related to attraction to PA and had higher PPC. The observations were consistent with previous studies in different cultural settings.^{21,27} Boys enjoyed games and sports, liked vigorous aspects of PA and perceived themselves as excelling in PA, whereas girls viewed themselves more competent in non-physical domains and had more negative PPC. The latter may have influenced

Table 1 Means (standard deviations) for age, body size, psychosocial correlates of PA and level of PA of girls and boys; frequencies (percentages) by weight status and SES; and tests of significance of sex differences

Characteristics	Girls (n = 331)	Boys (n = 352)	P-value
Age, years	8.82 (0.76)	8.83 (0.78)	0.886 ^a
Height, m	1.36 (0.07)	1.36 (0.07)	0.578 ^a
Weight, kg	35.32 (8.79)	35.14 (7.93)	0.778 ^a
BMI, kg/m ²	18.96 (3.28)	18.84 (3.10)	0.605 ^a
Weight status			0.591 ^b
Normal weight, n (%)	209 (63.1)	217 (61.6)	
Overweight, n (%)	82 (24.8)	93 (26.4)	
Obesity, n (%)	40 (12.1)	42 (11.9)	
SES			0.850 ^b
Low, n (%)	87 (26.3)	80 (22.7)	
Medium, n (%)	46 (13.9)	49 (13.9)	
High, n (%)	198 (59.8)	223 (63.4)	
Psychosocial variables			
Attraction to PA			
Importance of PA	3.62 (0.54)	3.67 (0.55)	0.240 ^a
Liking games and sports	3.46 (0.66)	3.60 (0.57)	0.004 ^a
Peers acceptance in games and sports	2.95 (0.94)	2.98 (0.93)	0.604 ^a
Enjoyment of vigorous PA	2.91 (0.96)	3.31 (2.90)	<0.001 ^a
Enjoyment of physical exertion	2.42 (0.78)	2.60 (0.85)	0.005 ^a
Perceived physical competence	2.84 (0.63)	3.09 (0.58)	<0.001 ^a
Parental socialization influences			
Parental role modelling	3.14 (0.71)	3.19 (0.73)	0.344 ^a
Parental enjoyment	3.13 (0.72)	3.16 (0.75)	0.598 ^a
Parental encouragement	3.22 (0.75)	3.28 (0.71)	0.226 ^a
Physical activity (MET/15 min/Week)	38.48 (19.72)	51.57 (25.70)	<0.001 ^a

a: t-test.

b: Chi-square test.

Table 2 Results of multiple regression analyses with level of PA as the dependent variable and weight status, SES and psychosocial factors as independent variables

Explanatory variables	Girls			Boys		
	Crude b (95% CI)	Adjusted b (95% CI)	P-value	Crude b (95% CI)	Adjusted b (95% CI)	P-value
Weight status						
Overweight, n (%)	4.25 (−0.35–8.85)			0.03 (−5.40–5.47)		
Obesity, n (%)	−2.80 (−8.82–3.21)			−4.77 (−12.64–3.09)		
SES						
Medium, n (%)	−2.70 (−8.60–3.21)			−5.17 (−12.51–2.18)		
High, n (%)	2.19 (−2.06–6.43)			0.85 (−4.38–6.07)		
Psychosocial Variables						
Attraction to PA						
Importance of PA	4.02 (0.19–7.86)			7.24 (2.72–11.77)		
Liking games and sports	2.31 (−0.83–5.44)			8.31 (3.99–12.63)		
Peers acceptance in games and sports	3.95 (1.78–6.12)	2.98 (0.80–5.17)	0.008	4.65 (2.03–7.27)		
Liking vigorous PA	3.95 (1.85–6.05)	3.07 (0.96–5.17)	0.004	7.27 (4.11–10.42)	6.90 (3.74–10.07)	<0.001
Fun of physical exertion	3.08 (0.43–5.73)			4.18 (1.26–7.09)		
Perceived physical competence	2.36 (−0.96–5.69)			5.32 (1.04–9.59)	4.26 (0.06–8.46)	0.047
Parental socialization influences						
Parental role modelling	1.17 (−1.77–4.12)			2.52 (−0.91–5.95)		
Parental enjoyment	0.57 (−2.31–3.45)			4.55 (1.22–7.87)		
Parental encouragement	4.20 (1.52–6.89)	3.34 (0.69–5.99)	0.014	0.90 (−2.71–4.51)		

motivation to perform, develop physical competence, and/or enjoy participation in sport and other PA.

As significant gender differences were noted for PA and several psychosocial correlates, gender-specific multiple regression analyses were done. Participation in PA among Portuguese primary school girls was positively associated with the subscale related to peer acceptance in games and sport. Girls apparently placed greater emphasis on friendship, and participation in PA increased when girls perceived acceptance by peers, which was consistent with the observation that girls who have peers with whom they can share their activities were more active.²⁸ Being with friends and making new friends were also expressed by children, girls more often than boys, as a primary reason for participation in sport, a major context of PA among youth.²⁹ Participation among girls was motivated by enjoyment and the development and maintenance of social support networks, particularly opportunities to engage with their friends.³⁰ Given the value placed on peer relationships, PA intervention programs for girls should perhaps consider placing more emphasis on developing favourable peer relations through different forms of team activities that nurture the development of relationships among participants.

Attraction to participation in vigorous PA was a significant correlate of PA in both boys and girls. The finding highlights the importance of developing PA programs that specifically target boys and girls, with the particular objective of promoting involvement in vigorous PA. This may be especially relevant for girls, as some data have suggested that girls felt threatened with extremely vigorous PA and competitive sports.³¹ Other research has indicated that competitive PA may not be enjoyable for young children,³² leading to the suggestion that such activities should be discouraged at these ages. Participation in PA was also more enjoyable when children (9–15 years) were not forced to compete and win, but were encouraged to experiment with different activities.³²

PPC is an important predisposing factor in YPAP model,¹⁴ suggesting that a greater sense of physical competence leads to greater participation in PA.^{19,33} PPC was positively related with involvement in PA among Portuguese boys, consistent with observations that boys with higher levels of PPC were more likely to approach achievement tasks with a high expectancy of success, leading to greater persistence and effort in PA than boys with low PPC.^{19,20} By inference, some boys may benefit from the enhancement of PPC. Specific instruction and practice of movement skills in preschool and primary grades may be effective in improving PPC and in turn increasing participation in PA.³⁴

Parents are viewed as central to reinforcing the well-being of their children and in shaping healthy behaviours, including PA.³⁵ Children's perceptions of parental behaviours relative to PA may be moulded in several ways, for example, encouragement and facilitation of participation at home and/or in the community, or active parental participation with them. Parents who accept the importance of PA, are role models by their own participation, encourage children to be active and/or provide instrumental support tend to have children who are more physically active.^{16,17,35}

In the present study, parental encouragement was perceived as a positive influence on PA only by girls. Interventions should perhaps be directed towards increasing parental support and encouragement of PA for daughters. This may require parental education on how to influence daughters to be physically active. Somewhat surprisingly, PSI was not related to PA in boys, contrary to evidence suggesting that parents more often encourage involvement in PA by sons more so than daughters.^{36,37} In traditional societies such as Portugal, however, boys are generally more encouraged and expected to participate in PA and sports than girls.³⁸

In contrast to expectations, parental role modelling and enjoyment of PA did not significantly impact participation of their children in PA in this Portuguese primary school sample. This should perhaps come as no surprise. Friends and peers generally have a more positive influence on PA than parents.³⁹ Children

also spend a greater part of the day in school and organized activities after school so that opportunities for parental role modelling are relatively infrequent. It is also possible that parents of the children are not regularly active so that opportunity for direct observation of parental involvement and in turn role modelling are lacking. Unfortunately, parental PA was not assessed in the present study. Child PA may also be mediated by differences in parental encouragement and support, with role modelling via parental PA having little impact⁴⁰ or an attenuated role.²¹ The potential influence of other adults (teachers, coaches) in the PA of children needs further attention.

Observations derived from the cross-sectional sample of Portuguese primary school children aged 8–10 years were generally consistent with the literature on correlates of PA, although weight status (BMI) and SES did not influence level of PA. Several limitations should be recognized. The study was cross-sectional, which limits conclusions regarding causal relationships between PA and psychosocial correlates. PA and psychosocial data were based on self-report. Although the questionnaires were reliable and valid in young children,^{27,32} and researchers were present to assist children with completion of the questionnaires, self-report measures may be prone to certain forms of bias, especially present habits. The proxy indicator of SES (subsidized school education materials and meal programs) may not have been sufficiently discriminatory of actual SES. The study is also limited to the Portuguese cultural context. Other potential correlates of PA—coaches and teachers, physical fitness, movement proficiency and the physical and built environments—were not considered.^{6,7} The results should thus be interpreted with care.

Allowing for the limitations, the results provide potentially important observations on several psychosocial correlates of PA in Portuguese children of primary school age, and as such have implications for the promotion of PA. Primary school boys and girls differed in level of PA and perceptions of the attractiveness of PA and physical competence. PA interventions should incorporate these differences to increase their effectiveness. Perceived acceptance by peers in games and sports, attraction to participation in vigorous PA and parental encouragement were relevant influences on PA in girls, whereas enjoyment of participation in vigorous PA and perceptions of physical competence in PA were more relevant among boys. Prospective studies are needed to evaluate whether efforts to modify psychosocial correlates of PA will lead to improvements in level of PA.

Acknowledgment

This study was supported by the Portuguese Foundation of Science and Technology: SFRH/BD/42347/2007.

Conflicts of interest: None declared.

Key points

- This study aimed to assess gender differences in relationships between biologic (BMI), demographic (SES) and psychosocial correlates of PA and level of PA in Portuguese primary school children.
- Perceived acceptance by peers in games and sports, enjoyment of participation in vigorous PA and parental encouragement were relevant correlates of PA in girls.
- Enjoyment of participation in vigorous PA and perceptions of physical competence in PA were relevant correlates of PA in boys.
- Gender differences among primary school children should be considered in the development of interventions to enhance PA among youth.

References

- 1 Strong WB, Malina RM, Blimkie CJ, et al. Evidence-based physical activity for school-age youth. *J Pediatr* 2005;146:732–7.
- 2 Telama R. Tracking of physical activity from childhood to adulthood: a review. *Obes Facts* 2009;2:187–95.
- 3 Bouchard C, Blair SN, Haskell WL. Why study physical activity and health? In: Bouchard C, Blair SN, Haskell WL, editors. *Physical Activity and Health*. Champaign: Human Kinetics, 2006: 3–19.
- 4 Baptista F, Santos DA, Silva AM, et al. Prevalence of the Portuguese population attaining sufficient physical activity. *Med Sci Sports Exerc* 2012;44:466–73.
- 5 Seabra AF, Mendonca DM, Thomis MA, et al. Correlates of physical activity in Portuguese adolescents from 10 to 18 years. *Scand J Med Sci Sports* 2011;21: 318–23.
- 6 Drenowatz C, Eisenmann JC, Pfeiffer KA, et al. Influence of socio-economic status on habitual physical activity and sedentary behavior in 8- to 11-year old children. *BMC Public Health* 2010;10:214.
- 7 Pate RR, O'Neill JR. After-school interventions to increase physical activity among youth. *Br J Sports Med* 2009;43:14–8.
- 8 van Sluijs EM, Kriemler S, McMinn AM. The effect of community and family interventions on young people's physical activity levels: a review of reviews and updated systematic review. *Br J Sports Med* 2011;45:914–22.
- 9 Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc* 2000;32:963–75.
- 10 Van Der Horst K, Oenema A, Ferreira I, et al. A systematic review of environmental correlates of obesity-related dietary behaviors in youth. *Health Educ Res* 2007;22: 203–26.
- 11 Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process* 1991;50: 179–211.
- 12 Prochaska J, Velicer W. The Transtheoretical Model of health behavior change. *Am J Health Promot* 1997;12:38–48.
- 13 Malina RM, Bouchard C, Bar-Or O. *Growth, maturation and physical activity*. Champaign: Human Kinetics, 2004.
- 14 Welk GJ. The youth physical activity promotion model: a conceptual bridge between theory and practice. *Quest* 1999;51:5–23.
- 15 Rowe DA, Raedeke TD, Wiersma LD, Mahar MT. Investigating the youth physical activity promotion model: internal structure and external validity evidence for a potential measurement model. *Pediatr Exerc Sci* 2007;19:420–35.
- 16 Davison KK, Downs DS, Birch LL. Pathways linking perceived athletic competence and parental support at age 9 years to girls' physical activity at age 11 years. *Res Q Exerc Sport* 2006;77:23–31.
- 17 Dollman J. Changing associations of Australian parents' physical activity with their children's sport participation: 1985 to 2004. *Aust N Z J Public Health* 2010;34: 578–82.
- 18 Lau PW, Lee A, Ransdell L. Parenting style and cultural influences on overweight children's attraction to physical activity. *Obesity (Silver Spring)* 2007;15:2293–302.
- 19 Paxton RJ, Estabrooks PA, Dziewaltowski D. Attraction to physical activity mediates the relationship between perceived competence and physical activity in youth. *Res Q Exerc Sport* 2004;75:107–11.
- 20 Welk G, Wood K, Morss G. Parental influences on physical activity in children: an exploration of potential mechanisms. *Pediatr Exerc Sci* 2003;15:19–33.
- 21 Brustad RJ. Attraction to physical activity in urban schoolchildren: parental socialization and gender influences. *Res Q Exerc Sport* 1996;67:316–23.
- 22 Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000;320: 1240–3.
- 23 Brustad RJ. Who will go out and play? Parental and psychological influences on children's attraction to physical activity. *Pediatr Exerc Sci* 1993;5:210–23.
- 24 Harter S. The perceived competence scale for children. *Child Dev* 1982;53:87–97.
- 25 Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci* 1985;10:141–6.
- 26 Pereira SA, Seabra AF, Silva RG, et al. Prevalence of overweight, obesity and physical activity levels in children from Azores Islands. *Ann Hum Biol* 2010;37: 682–91.
- 27 Eccles J, Wigfield A, Harold RD, Blumenfeld P. Age and gender differences in children's self- and task perceptions during elementary school. *Child Dev* 1993;64: 830–47.
- 28 Allender S, Cowburn G, Foster C. Understanding participation in sport and physical activity among children and adults: a review of qualitative studies. *Health Educ Res* 2006;21:826–35.
- 29 Siegel SR, Peña Reyes ME, Cárdenas Barahona EE, Malina RM. Participation in organized sport among urban Mexican youth. In: Coelho e Silva MJ, Figueiredo AJ, Elferink-Gemser M, Malina RM, editors. *Youth Sports*. Coimbra: Coimbra University Press, 2009: 38–48.
- 30 Barr-Anderson DJ, Young DR, Sallis JF, et al. Structured physical activity and psychosocial correlates in middle-school girls. *Prev Med* 2007;44:404–9.
- 31 Raman A, Fitch MD, Hudes ML, et al. Baseline correlates of insulin resistance in inner city high-BMI African-American children. *Obesity (Silver Spring)* 2008;16: 2039–45.
- 32 Macphail AP, Gorley T, Kirk D. Young people's socialisation into sport: a case study of an athletics club. *Sport Educ Soc* 2003;8:251–67.
- 33 Ommundsen Y, Klasson Heggebo L, Anderssen SA. Psycho-social and environmental correlates of self-reported physical activity among 9 and 15 year old Norwegian boys and girls. *Int J Behav Nutr Phys Act* 2006;3:1–13.
- 34 Vedul-Kjelsas V, Sigmundsson H, Stensdotter AK, Haga M. The relationship between motor competence, physical fitness and self-perception in children. *Child Care Health Dev* 2012;38:394–402.
- 35 Duncan SC, Duncan TE, Strycker LA. Sources and types of social support in youth physical activity. *Health Psychol* 2005;24:3–10.
- 36 Fredricks JA, Eccles JS. Family socialization, gender, and sport motivation and involvement. *J Sport Exerc Psychol* 2005;27:3–31.
- 37 Savage J, DiNallo J, Downs D. Adolescent body satisfaction: the role of perceived parental encouragement for physical activity. *Int J Behav Nutr Phys Act* 2009;6:1–8.
- 38 Silva P, Botelho-Gomes P, Goellner S. Masculinities and sport: the emphasis on hegemonic masculinity in Portuguese physical education classes. *Int J Qual Stud Educ* 2012;25:269–91.
- 39 Coppinger T, Jeanes YM, Dabinett J, et al. Physical activity and dietary intake of children aged 9–11 years and the influence of peers on these behaviours: a 1-year follow-up. *Eur J Clin Nutr* 2010;64:776–81.
- 40 Gustafson SL, Rhodes RE. Parental correlates of physical activity in children and early adolescents. *Sports Med* 2006;36:79–97.