

## Effects of a 5-month football program on perceived psychological status and body composition of overweight boys

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**The effects of a 5-month intervention of football instruction and practice on the perceived psychological status and body composition of overweight boys were examined. Twelve boys (8–12 years; body mass index  $\geq$  85th percentile) participated in a structured 5-month football program, consisting of four weekly 60–90 min sessions with mean heart rate  $> 80\%$ HRmax [football group (FG)]. A control group (CG) included eight boys of equivalent age from an obesity clinic located in the same area as the school. Both groups participated in two sessions of 45–90-min physical education per week at school. Indicators of perceived psychological status included body image, self-**

**esteem, attraction to participation in physical activity, and perceived physical competence measured with standardized questionnaires. Body composition was evaluated using dual-energy X-ray absorptiometry. From baseline through 5 months, FG improved ( $P < 0.05$ ) in all indicators of psychological status ( $\% \Delta = +11.7$  to  $+29.2\%$ ) compared with CG ( $\% \Delta = -32.1$  to  $+0.5\%$ ). Changes in percentage body fat and lean body mass, however, did not differ between FG and CG. The findings suggest that a 5-month football intervention program was effective in improving the psychological status of overweight boys but did not significantly alter body composition.**

Childhood obesity has reached epidemic proportions and is a major public health concern (Wang & Lobstein, 2006). The increasing prevalence of childhood obesity is associated with a range of adverse metabolic health effects, including increased incidence of type 2 diabetes and elevated risk of cardiovascular disease (Dietz, 2004). Although the physiological health consequences of childhood overweight and obesity are well established, psychological consequences associated with obesity are considered less often (Cornette, 2008). Some evidence suggests that children who are overweight and/or obese have poor body image, lower self-esteem, and present less confidence in their physical competence and attraction to participation in physical activity (PA) (Griffiths et al., 2010). Because of the increase in childhood overweight and obesity and associated psychological consequences, which can persist into adulthood and adversely affect quality of life, intervention programs targeting young children have been suggested.

PA is accepted as an effective treatment for childhood overweight and obesity and associated psychological consequences (Parfitt & Eston, 2005). In general, regular

PA is associated with improvements in body composition (Brown & Summerbell, 2009), body image (Gehrman et al., 2006), self-esteem (Ekeland et al., 2005), self-perception of physical competence (Jones et al., 2010), and attraction to participation in PA (Welk et al., 2003). Intervention PA programs for overweight and obese children have generally incorporated a variety of aerobic and resistance activities to accommodate individual differences in interests (running and walking); however, they rarely linked children's interests in team games and sport activities (see, e.g., Nassis et al., 2005; Meyer et al., 2006).

Youth sports have been more recently invoked as a potentially important means to ease the worldwide epidemic of childhood overweight and obesity (Malina, 2009). Youths in several cultures have indicated fun (enjoyment), improvement in skills, and being with friends or members of a team as major motivations for participation in sport. Football is one of the most popular and widely practiced team sports worldwide and has been suggested as an effective PA intervention in adults (Krstrup et al., 2010). Traditionally played as 11 vs 11,

but also as small-sided games (e.g., 3 vs 3, 5 vs 5, 7 vs 7), football is associated with relatively high-energy expenditure and a high-aerobic component, with mean heart rates (HR) of 75–85% of maximum HR (Randers et al., 2010). Recreational football also involves multiple aerobic and anaerobic actions (sprints, jumps, duels, and tackles) and high-impact activities that stimulate the musculoskeletal system (Krustrup et al., 2010).

The efficacy of a recreational football program on the health and fitness of overweight children has been recently investigated (Weintraub et al., 2008; Faude et al., 2010). Results suggested that football has medium to large beneficial effects in weight control, PA, and physical fitness. However, psychological consequences were not assessed. Overweight children tend to score lower on scales of body image, self-esteem, perceived physical competence, and attraction to participation in PA (Wardle & Cooke, 2005). Football is a team-based activity with greater chances to enhance perceived psychological status of the participants. Thus, a recent study showed that the participants in a football training intervention improved their life satisfaction and subjective health more favorably than an age-matched population-based reference group (Wold et al., 2013). It is important also to note that football as a highly popular sport, socially and culturally meaningful and accessible to all social strata, has got a potential to operate as an effective tool for the prevention/reduction of childhood overweight and obesity and the enhancement of perceived psychological status of youth.

Thus, the aim of this interventional study was to examine the effect of a 5-month football intervention program on perceived psychological status (body image, self-esteem, perceived physical competence, and attraction to participation in PA), weight status [body mass index (BMI)], and body composition (percentage body fat and lean body mass) of overweight boys. It was hypothesized that a regular PA in a football intervention program has the potential to improve the body composition and the psychological status of overweight boys.

## Material and methods

### Subjects

The football group (FG) consisted of 12 overweight boys recruited from a single school in the Porto district, Portugal, whereas a control group (CG) of eight overweight boys of equivalent age followed at an outpatient hospital obesity clinic in the same area as the school that did not engage in formal sport activities during the study period. Sample size calculations were performed a priori for repeated measures analysis of variance using the G\*Power software 3.1.9.2 (Universität Düsseldorf, Germany) (Faul et al., 2007). Hypothesizing an effect size (Cohen's *d*) of 0.8 (Cohen, 1988) for a required power of 95% at  $P < 0.05$ , a sample size of at least eight in each group was required.

Eligibility for recruitment and participation in this study required children to be 8–12 years old and to have BMI  $\geq$  85th percentile for age and gender (CDC/NDHS, 2000). Children using medication or with diagnosed medical conditions that would limit their ability to perform activities (e.g., cardiovascular disease, type 1 diabetes, renal

insufficiency, liver disease) were excluded. Children who participated in a structured exercise, nutrition, and/or weight loss program for at least 1 year prior to the study were also excluded.

The study was approved by the ethics committee of the Faculty of Sport of the University of Porto and by school and hospital authorities. After explaining the study protocol to the children and their parents, informed consent was obtained. Study participation was voluntary; the children were free to withdraw at any time; all of the children participants in both groups completed the study.

### Standard PA program and football intervention program

The standard PA program (implemented with FG and CG) comprised two 45–90-min mandatory physical education lessons per week undertaken in the gym/playground of the schools. Additionally, FG completed a 5-month football intervention program administered at school after school hours (16:00–17:30), four days per week for 60–90 min per session. Each session consisted of a warm-up (10–20 min), technical exercises and small-sided games (40–60 min), and cool-down (10 min). The football training was designed to keep the HR  $> 80\%$  of maximum HR as confirmed by HR monitoring (Polar Team 2 Pro System, Polar Electro, Kempele, Finland). The training sessions were conducted by two physical education teachers. None of the football participants dropped out during the duration of the intervention.

### Anthropometry and body composition

Body mass, height, and sitting height were measured following standardized procedures. Body mass was measured using a physician's digital scale (Tanita®, BC-418MA, Tanita Corporation of America, Arlington Heights, Illinois, USA), height using a fixed stadiometer (Holtain Ltd., Crosswell, UK), and sitting height using a portable stadiometer (Holtain Ltd.). BMI ( $\text{kg}/\text{m}^2$ ) was calculated. The children were classified as overweight and/or obese relative to the gender- and age-specific BMI cut-offs of the U.S. Centers for Disease Control and Prevention (CDC/NDHS, 2000). Body fat and lean body mass were estimated by dual-energy X-ray absorptiometry (DXA; Hologic QDR 4500A, Hologic Inc., Waltham, Massachusetts, USA). The equipment was calibrated according to the manufacturer's instruction and the assessments performed by a trained technician. The subjects were scanned in a supine position using standard protocols. The scans were performed in high resolution. The same investigator analyzed all scans. Body fat was converted to percentage of body mass.

### Indicators of perceived psychological status

Body image was examined using Collins' child figure drawings scale (Collins, 1991). The scale includes seven silhouette figures of boys and girls ranging from very thin to obese. The children were asked to indicate the figure that best represented how they currently looked (perceived) and how they wanted to look (ideal). Body dissatisfaction was the difference between the perceived and ideal scores. Negative and positive scores indicated a desire to be fatter or thinner, respectively. Moderate to high test–retest reliability and validity have been previously shown for the scale in children (Vander Wal & Thelen, 2000).

Self-esteem was measured using Rosenberg's self-esteem scale (Rosenberg, 1979). The responses to the 10 items were rated on a 4-point scale (strongly disagree to strongly agree), yielding scores between 10 and 40, with higher scores indicating higher self-esteem. This scale is the most widely used measure of global self-esteem and is valid and reliable for students in third to eighth grades (DeBate et al., 2009).

Attraction to PA was assessed using the children's attraction to PA (CAPA) scale (Brustad, 1993). The CAPA included 14 items

that measured five dimensions of attraction to participation in PA: attraction to vigorous PA, perceived importance of participating in PA, liking of games and sports, perception of physical exertion as fun and important, and perceived peer acceptance in games and sports. Perceived physical competence was assessed using a 4-item scale that required the subjects to appraise their competence to perform PA behaviors (Brustad, 1993). The psychometric properties of the CAPA and perceived physical competence scales have been validated and are regarded as reliable (Brustad, 1993).

The CAPA and perceived physical competence scales were scored on a 4-point format (1–4) using a “structured-alternative” approach (Harter, 1982). Children were presented with two opposing choices and asked to 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 select if it was “somewhat true” or “really true.” A sample question from the scale is “Some kids have more fun playing games and sports than anything else” but “Other kids like doing other things.”

#### Biological maturity status

Biological maturity status (maturity offset) was estimated as the predicted time before or after peak height velocity using the gender-specific equations of Mirwald et al. (2002), where  $R = 0.94$ ,  $R^2 = 0.89$ , and standard error of the estimate = 0.57. The protocol requires height, sitting height, estimated leg length (height minus sitting height), body mass, and chronological age.

#### PA

Daily PA was assessed at baseline using GT1M accelerometers (Actigraph, Pensacola, Florida, USA). All participants provided five consecutive days of accelerometer data with  $\geq 500$  min of valid data per day. The accelerometer was set to use an epoch of 1 min. Mean minutes of moderate-to-vigorous intensity PA per day were derived using age-specific count ranges (Freedson et al., 2005) to provide an estimate of volume and intensity of PA for each participant.

#### Dietary intake

Dietary intake was assessed at baseline from a 3-day dietary record, including two weekdays and one weekend day, completed by parents. Portion sizes of foods and beverages consumed were estimated using household measures (cups, glasses, spoons, slices, etc.) and other props (cups, glasses, food wrappers, or containers) as aids. Nutrient and energy analysis was performed using the software Food Processor SQL (ESHA Research Inc., Salem, Oregon, USA). This program uses nutritional information from the United States that has been adapted for use with typical Por-

tuguese foods and beverages. Means for specific nutrients and energy based on the 3-day diet record were used in the analysis. Although somewhat subjective, the food record is commonly used to estimate current and usual diet in groups or individuals.

#### Testing

Children came to the Faculty of Sports, University of Porto, for testing at the beginning of the study and after 5 months. The baseline and final assessments were conducted in the first week of January and of June 2011, respectively. Assessments were done at the Faculty of Sport – University of Porto at similar times during the day under similar conditions in order to minimize any circadian variation in the measured variables.

#### Reliability

Test–retest reliability for responses was assessed through a pilot study in which data for a random subsample of 10 children was compared across a 2-week period. Technical errors in measurement for anthropometric dimensions were 0.20 cm and 0.30 cm for height and sitting height, respectively, and 0.35 kg for weight. Intra-class correlation coefficients ( $R$ ) were  $0.96 \leq R \leq 0.99$  for CAPA,  $R \leq 0.99$  for perceived physical competence,  $0.86 \leq R \leq 0.92$  for self-esteem, and  $0.84 \leq R \leq 0.90$  for body image.

#### Statistical procedures

Descriptive statistics (means and standard deviations) were calculated for FG and CG at baseline and at the conclusion of the study. None of the anthropometric, body composition, and psychological variables showed significant deviations from a normal distribution (Shapiro–Wilk test). Baseline differences in mean anthropometric, body composition, and psychological characteristics between FG and CG were tested with unpaired sample  $t$ -tests. Percentage changes ( $\% \Delta$ ) between baseline and after 5 months were also calculated; the difference was then divided by baseline value. Effect size was calculated using Cohen’s  $d$  and interpreted as small ( $\geq 0.20$ ), medium ( $\geq 0.50$ ), or large ( $\geq 0.80$ ) (Cohen, 1988). The effect of the football program in FG relative to CG was evaluated with a two-factorial repeated measures analysis of covariance (factor 1: group, factor 2: time) with weight, BMI, percent body fat, and psychological variables at baseline as covariates. The significance level in all analyses was set at 0.05. Statistical analyses were conducted using SPSS version 21.0 (IBM Corp., Armonk, New York, USA).

## Results

The anthropometric, body composition, and psychological characteristics at baseline are shown in Table 1. With

Table 1. Baseline characteristics of participants by intervention assignment

Characteristics	Football group	Control group	<i>P</i> -value	Cohen’s <i>d</i>
Age (years)	10.3 (1.8)	10.6 (2.2)	0.728	–0.15
Height (cm)	147.2 (10.5)	147.1 (14.7)	0.983	0.01
Weight (kg)	50.3 (11.9)	60.7 (14.0)	0.126	–0.80
BMI (kg/m <sup>2</sup> )	22.9 (2.8)	27.7 (1.7)	0.001	2.01
Percentage body fat (%)	37.6 (4.4)	41.3 (5.4)	0.091	–0.75
Lean body mass (kg)	30.0 (6.3)	32.8 (9.2)	0.480	–0.35
MVPA (min/day)	112.4 (51.0)	107.6 (57.1)	0.870	0.09
Energy intake (kcal/d)	1758.4 (436.9)	1499.3 (91.8)	0.224	0.82

BMI, body mass index; MVPA, moderate-to-vigorous intensity physical activity.

the exception of BMI, no statistical differences between FG and CG were observed. CG had significantly higher BMI than FG at baseline (mean difference: +4.8 kg/m<sup>2</sup>,  $P = 0.001$ ). There were no significant differences between groups in maturity offset daily PA and dietary intake. The average training time and HR in each football session was 84.4 ± 6.5 min and 156.3 ± 6.4 beats per min, respectively. Adherence measured by the number of sessions attended during the intervention program was 85% for the FG.

Changes in anthropometric and body composition in each group are shown in Table 2. As expected, boys in both groups exhibited a significant increase in height ( $F_{(1,18)} = 77.68$ ,  $P < 0.001$ , Cohen's  $d = -3.57$ ) during the interval of the study. However, the gain in height was more pronounced in FG ( $F_{(1,18)} = 5.71$ ,  $P = 0.030$ , Cohen's  $d = -1.14$ ). Both groups showed a significant increases in weight ( $F_{(1,18)} = 7.29$ ,  $P = 0.016$ , Cohen's  $d = -0.22$ ) and lean body mass ( $F_{(1,18)} = 10.68$ ,  $P = 0.005$ , Cohen's  $d = -1.32$ ), while no significant changes were observed for the BMI and percentage of body fat after 5 months ( $P > 0.05$ ).

Significant greater changes were observed in perceived psychological status in FG (%Δ = +11.7 to +29.2%) compared with CG (%Δ = -32.1 to +0.5%) (Table 2). The analyses for body image, self-esteem, and perceived physical competence indicated a significant main effect for group and a significant time by group interaction effect. FG participants improved their body

image (lower values represent better body image) ( $F_{(1,18)} = 6.79$ ,  $P = 0.021$ , Cohen's  $d = -1.44$ ) and self-esteem ( $F_{(1,18)} = 4.96$ ,  $P = 0.046$ , Cohen's  $d = -1.27$ ), and perceived themselves as more successful and physically competent ( $F_{(1,18)} = 4.96$ ,  $P = 0.039$ , Cohen's  $d = -1.20$ ) than CG. The significant interaction showed that, whereas FG increased their body image ( $F_{(1,18)} = 6.28$ ,  $P = 0.030$ , Cohen's  $d$  CG = -0.47, Cohen's  $d$  FG = 1.40), self-esteem ( $F_{(1,18)} = 5.05$ ,  $P = 0.043$ , Cohen's  $d$  CG = 0.18, Cohen's  $d$  FG = -1.68), and perception of physical competence ( $F_{(1,18)} = 4.83$ ,  $P = 0.042$ , Cohen's  $d$  CG = 0.63, Cohen's  $d$  FG = -1.16) throughout the intervention, perceptions of psychological status tended to be more constant at follow-up in CG.

Significant main effects for group ( $F_{(1,18)} = 5.98$ ,  $P = 0.032$ , Cohen's  $d = -1.54$ ) and time ( $F_{(1,18)} = 15.43$ ,  $P = 0.003$ , Cohen's  $d = -1.05$ ), and a significant time by group interaction effect ( $F_{(1,18)} = 5.53$ ;  $P = 0.034$ , Cohen's  $d$  CG = 0.19, Cohen's  $d$  FG = -1.73) were observed for the CAPA scale. Boys in FG were more attracted to participation in PA. The significant interaction suggested that FG increased in attraction to participate in PA, while CG remained constant in their attraction to PA across the intervention period.

## Discussion

Childhood obesity is associated with several adverse psychological and physical health consequences (Dietz, 2004; Cornette, 2008). Hence, the potential of PA interventions to improve body composition and the psychological factors of overweight/obese youths merits serious consideration and may be important in designing effective approaches to overweight/obesity prevention in childhood. The present study was set in this context and specifically examined the effects of a 5-month football intervention program on the body composition and psychological factors of overweight children.

The 5-month football intervention (60–90 min, four times a week, intensity > 80% HRmax) resulted in beneficial changes in psychological factors in overweight children. Participants in the football intervention (FG) experienced significantly greater improvements in body image, self-esteem, attraction to participate in PA, and perceived physical competence compared with the CG. The results were consistent with a previous study highlighting the importance of PA in enhancing the psychological health of overweight and obese children (Parfitt & Eston, 2005). Similarly, results of a randomized controlled trial study that analyzed the efficacy of a recreational football program on the self-esteem of overweight children concluded that football can be an effective intervention for the improvement of self-esteem (Faude et al., 2010). In fact, the most immediate consequence of being overweight as perceived by children themselves is social discrimination, the low-self-esteem, and consequently an impaired school

Table 2. Anthropometric, body composition, and psychological characteristics of participants at baseline and follow-up by intervention assignment

	Group	Baseline*	Post*
<b>Anthropometric/Body composition</b>			
Height (cm) <sup>†</sup>	FG	147.2 (10.5)	150.0 (10.5) <sup>‡</sup>
	CG	147.1 (14.7)	148.7 (15.0) <sup>‡</sup>
Weight (kg)	FG	50.3 (11.9)	53.0 (12.4) <sup>‡</sup>
	CG	60.7 (14.0)	62.3 (15.4) <sup>‡</sup>
BMI (kg/m <sup>2</sup> )	FG	22.9 (2.8)	23.2 (2.8)
	CG	27.7 (1.7)	27.7 (2.0)
Body fat (%)	FG	37.6 (4.4)	36.7 (4.2)
	CG	41.3 (5.4)	41.8 (6.0)
Lean body mass (kg)	FG	30.0 (6.3)	31.5 (7.7) <sup>‡</sup>
	CG	32.8 (9.2)	34.2 (10.0) <sup>‡</sup>
<b>Psychological</b>			
Body image <sup>†</sup>	FG	1.7 (0.5)	1.1 (0.5) <sup>‡§</sup>
	CG	2.3 (1.3)	2.3 (0.8)
Self-esteem <sup>†</sup>	FG	24.4 (4.8)	26.6 (3.7) <sup>‡§</sup>
	CG	21.4 (5.6)	21.1 (4.2)
Attraction to physical activity <sup>†</sup>	FG	45.3 (6.2)	51.4 (4.8) <sup>‡§</sup>
	CG	43.9 (6.0)	40.7 (6.7)
Perceived physical competence <sup>†</sup>	FG	3.1 (0.4)	3.5 (0.4) <sup>‡§</sup>
	CG	2.8 (0.4)	2.6 (0.8)

\*Data presented as mean (standard deviation).

<sup>†</sup>Significant interaction time\*group ( $P < 0.05$ ).

<sup>‡</sup>Baseline to post difference within the group ( $P < 0.05$ ).

<sup>§</sup>Significant different from CG in post intervention ( $P < 0.05$ ).

function in comparison with healthy children (Schwimmer et al., 2003), and the present findings suggest that football participation was an effective short-term strategy for improving the perceived psychological status of overweight/obese boys 8–12 years of age (late childhood/early adolescence). The results also suggested an increase in the likelihood of the adoption and maintenance of PA among the boys (Neumark-Sztainer et al., 2004).

Football is the most popular and preferred sport at all ages and across social and economic strata of the Portuguese population. From 1996 to 2009, the number of children participating in football more than doubled, from 44 125 to 89 138 (Portuguese Institute of Sport, 2011). Football is a relatively inexpensive and accessible sport that offers children opportunities for enjoyable PA with potential health benefits (Hansen et al., 2013). As a team sport/activity, the focus of football is on the group in contrast to the individual, which may provide a buffer to social evaluation especially among overweight youth. Football and other team activities also have the potential to promote teamwork and sharing. Moreover, football offers an achievement context for pleasant and rewarding experiences for youth participants, and based on the present results, this extends to those who are overweight. Such favorable experiences may, in turn, function to enhance attraction to participation in PA and to contribute to enhanced self-esteem, and self- and body satisfaction. The attainment of potential benefits, of course, assumes appropriate opportunities for overweight children, game modification as necessary, and satisfactory adult instruction and supervision.

The football intervention program, on the other hand, had limited effects on body composition and weight status. Over the 5-month intervention, both groups experienced significant gains in weight, lean body mass, and height, resulting in negligible change in BMI. Changes in body size in both groups are well within the ranges expected with normal growth (Malina et al., 2004). Several previous football intervention studies have also reported no significant changes in BMI in overweight children, suggesting that weight and height increased with normal growth over the intervention period (Weintraub et al., 2008; Faude et al., 2010). The findings were also consistent with previous research reporting small mean changes in the BMI of overweight children after individual-based PA interventions (Brown & Summerbell, 2009).

DXA was used to assess changes in body composition after the football intervention. Although the changes were not significant, FG did experience small differences in percentage body fat (approximately 1% less body fat) in contrast to CG. The findings were consistent with a recent intervention that noted negligible changes in percentage body fat and lean body mass after an activity intervention in obese children (Thivel

et al., 2011). However, it is important to note that several studies have noted a beneficial impact of some PA programs on the body composition of overweight and obese children (Gutin et al., 2002; LeMura & Maziekas, 2002). Several factors may underlie the seemingly inconsistent observations for overweight/obese children. It is possible that a greater volume of activity than provided by the intervention is required to influence body weight and composition in growing children. The intervention might not have been of sufficient frequency or duration, and to influence body composition, but was sufficient to maintain body weight over the short term, consistent with a recent meta-analysis (Gonzalez-Suarez et al., 2009). A systematic review of PA interventions has suggested that longer and intensive interventions are needed to achieve more positive changes in the body composition of children and adolescents and should include a broader range of weight-related outcome measures (Brown & Summerbell, 2009).

The football intervention was limited to a single sport activity. It has been suggested that more marked effects of activity interventions on body composition would be achieved with multicomponent interventions including diet and perhaps behavior modification with overweight/obese children (Nemet et al., 2002). Combining a football intervention with a dietary intervention to reduce energy intake may be more effective in modifying weight status and body composition. Several studies have recommended balanced diets and regular PA in school settings to achieve optimal weight control during childhood (Brown & Summerbell, 2009). A difficulty in this context is the definition of weight control and “optimal weight gain” in normally growing and maturing children (Malina, 2010). Although the football intervention program did not result in improved body composition after 5 months, the findings should not be dismissed in light of the preceding discussion. On the contrary, the findings can be viewed as encouraging in that they stimulated interest in football and perhaps other activities, which may lead to the adoption and maintenance of a more physically active lifestyle among the youths over the long term.

Observations of this study should be tempered with several limitations. First, subjects were not randomly assigned to FG and CG. This was in part by design since it was of interest to assess the feasibility of the football intervention before attempting randomized trials in the future. The absence of randomization introduced greater potential for confounding than a randomized controlled trial, but in the current study, both groups were similar in most physical and psychological characteristics. Moreover, several statistical adjustments were utilized in the analyses, which alleviated some of the potential problems. Second, sample sizes were small, which might have reduced the statistical power for group comparisons and, in turn, the generalizability

of the results. Nevertheless, the *post hoc* statistical power tests for detecting anthropometric, body composition, and psychological differences between the two groups ranged from 61% to 92%. Third, self-report psychological measures may be prone to certain forms of bias. However, all questionnaires used were reliable and valid in child populations and have been widely used (Brustad, 1993; DeBate et al., 2009; Vander Wal & Thelen, 2000). Moreover, members of the research team were present to assist children with completing the questionnaires. Fourth and unfortunately, physical fitness data were not collected for the overweight boys who participated in the football intervention. Although beyond the scope of this study, it is possible that improvement in perceived psychological status may have been influenced by improvements in physical fitness of the boys. Finally, neither PA outside of the intervention nor dietary intake was formally controlled. This may have influenced the ability to detect changes,

specifically in body weight and composition. All children, however, were instructed to maintain their normal PA and dietary intake during the intervention.

### Perspectives

A 5-month football intervention program (60–90 min, four times a week) can be effectively implemented in the elementary school setting and was effective in enhancing the psychological well-being of overweight children. In contrast, the football intervention had limited effects on body weight and composition. The results highlight a need for further research in the context of replication and potential translation into more pronounced benefits in longer-term and larger-scale studies.

**Key words:** Body image, self-esteem, perceived competence, attraction to physical activity, percentage of fat, body mass index, soccer.

### References

- Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obes Rev* 2009; 10 (1): 110–141.
- Brustad R. Who will go out and play? Parental and psychological influences on children's attraction to physical activity. *Pediatr Exerc Sci* 1993; 5 (3): 210–223.
- CDC/NDHS. CDC Growth charts: United State. Centers for Disease Control and Prevention/National Center for Health Statistics (CDC/NDHS). 2000.
- Cohen J. Statistical power analysis for the behavioral sciences. 2nd edn. Hillsdale, NJ: Lawrence Earlbaum Associate, 1988.
- Collins M. Body figure perceptions and preferences among preadolescent children. *Int J Eat Disord* 1991; 10 (2): 199–208.
- Cornette R. The emotional impact of obesity on children. *Worldviews Evid Based Nurs* 2008; 5 (3): 136–141.
- DeBate R, Pettie Gabriel K, Zwald M, Huberty J, Zhang Y. Changes in psychosocial factors and physical activity frequency among third- to eighth-grade girls who participated in a developmentally focused youth sport program: a preliminary study. *J Sch Health* 2009; 79 (10): 474–484.
- Dietz W. Overweight in childhood and adolescence. *N Engl J Med* 2004; 350 (9): 855–857.
- Ekeland E, Heian F, Hagen K. Can exercise improve self-esteem in children and young people? A systematic review of randomised controlled trials. *Br J Sports Med* 2005; 39 (11): 792–798.
- Faude O, Kerper O, Mulhaupt M, Winter C, Beziel K, Junge A, Meyer T. Football to tackle overweight in children. *Scand J Med Sci Sports* 2010; 20 (Suppl. 1): 103–110.
- Faul F, Erdfelder E, Lang A, Buchner A. G\*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods* 2007; 39 (2): 175–191.
- Freedson P, Pober D, Janz K. Calibration of accelerometer output for children. *Med Sci Sports Exerc* 2005; 37 (11 Suppl. ): S523–S530.
- Gehrman C, Hovell M, Sallis J, Keating K. The effects of a physical activity and nutrition intervention on body dissatisfaction, drive for thinness, and weight concerns in pre-adolescents. *Body Image* 2006; 3 (4): 345–351.
- Gonzalez-Suarez C, Worley A, Grimmer-Somers K, Dones V. School-based interventions on childhood obesity: a meta-analysis. *Am J Prev Med* 2009; 37 (5): 418–427.
- Griffiths L, Parsons T, Hill A. Self-esteem and quality of life in obese children and adolescents: a systematic review. *Int J Pediatr Obes* 2010; 5 (4): 282–304.
- Gutin B, Barbeau P, Owens S, Lemmon C, Bauman M, Allison J, Kang H, Litaker M. Effects of exercise intensity on cardiovascular fitness, total body composition, and visceral adiposity of obese adolescents. *Am J Clin Nutr* 2002; 75 (5): 818–826.
- Hansen PR, Andersen LJ, Rebelo AN, Brito J, Hornstrup T, Schmidt JF, Jackman SR, Mota J, Rêgo C, Oliveira J, Seabra A, Krstrup P. Cardiovascular effects of 3 months of football training in overweight children examined by comprehensive echocardiography: a pilot study. *J Sports Sci* 2013; 31 (13): 1432–1440.
- Harter S. The perceived competence scale for children. *Child Dev* 1982; 53 (1): 87–97.
- Jones R, Okely A, Caputi P, Cliff D. Perceived and actual competence among overweight and non-overweight children. *J Sci Med Sport* 2010; 13 (6): 589–596.
- Krstrup P, Aagaard P, Nybo L, Petersen J, Mohr M, Bangsbo J. Recreational football as a health promoting activity: a topical review. *Scand J Med Sci Sports* 2010; 20 (Suppl. 1): 1–13.
- LeMura L, Maziakas M. Factors that alter body fat, body mass, and fat-free mass in pediatric obesity. *Med Sci Sports Exerc* 2002; 34 (3): 487–496.
- Malina RM. Children and adolescents in the sport culture: the overwhelming majority to the select few. *J Exerc Sci Fit* 2009; 7 (2): S1–S10.
- Malina RM. Childhood and adolescent physical activity and risk of adult obesity. In: Bouchard C, Katzmarzyk PT, eds. Physical activity and obesity.

- 2nd edn. Champaign: Human Kinetics, 2010: 111–113.
- Malina RM, Bouchard C, Bar-Or O. Growth, maturation and physical activity. Champaign: Human Kinetics, 2004.
- Meyer A, Kundt G, Lenschow U, Schuff-Werner P, Kienast W. Improvement of early vascular changes and cardiovascular risk factors in obese children after a six-month exercise program. *J Am Coll Cardiol* 2006; 48 (9): 1865–1870.
- Mirwald R, Baxter-Jones A, Bailey D, Beunen G. An assessment of maturity from anthropometric measurements. *Med Sci Sports Exerc* 2002; 34 (4): 689–694.
- Nassis G, Papantakou K, Skenderi K, Triandafillopoulou M, Kavouras S, Yannakoulia M, Chrousos G, Sidossis LS. Aerobic exercise training improves insulin sensitivity without changes in body weight, body fat, adiponectin, and inflammatory markers in overweight and obese girls. *Metabolism* 2005; 54 (11): 1472–1479.
- Nemet D, Barkan S, Epstein Y, Friedland O, Kowen G, Eliakim A. Short and long-term beneficial effects of a combined dietary-behavioral-physical activity intervention for the treatment of childhood obesity. *Med Sci Sports Exerc* 2002; 34 (3): 487–496.
- Neumark-Sztainer D, Goeden C, Story M, Wall M. Associations between body satisfaction and physical activity in adolescents: implications for programs aimed at preventing a broad spectrum of weight-related disorders. *Eat Disord* 2004; 12 (2): 125–137.
- Parfitt G, Eston R. The relationship between children's habitual activity level and psychological well-being. *Acta Paediatr* 2005; 94 (12): 1791–1797.
- Portuguese Institute of Sport. *Estatísticas do desporto de 1996 a 2009*. Lisboa: Instituto do Desporto, 2011.
- Randers M, Nybo L, Petersen J, Nielsen J, Christiansen L, Bendiksen M, Brito J, Bangsbo J, Krstrup P. Activity profile and physiological response to football training for untrained males and females, elderly and youngsters: influence of the number of players. *Scand J Med Sci Sports* 2010; 20 (Suppl. 1): 14–23.
- Rosenberg M. *Conceiving the self*. New York: Basic Books., 1979.
- Schwimmer JB, Burwinkle TM, Varni JW. Health-related quality of life of severely obese children and adolescents. *JAMA* 2003; 289 (14): 1813–1819.
- Thivel D, Isacco L, Lazaar N, Aucouturier J, Ratel S, Doré E, Meyer M, Duché P. Effect of a 6-month school-based physical activity program on body composition and physical fitness in lean and obese schoolchildren. *Eur J Pediatr* 2011; 170 (11): 1–9.
- Vander Wal J, Thelen M. Eating and body image concerns among obese and average-weight children. *Addict Behav* 2000; 25 (5): 775–778.
- Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obes* 2006; 1 (1): 11–25.
- Wardle J, Cooke L. The impact of obesity on psychological well-being. *Best practice & research. Clin Endocrinol Metabol* 2005; 19: 421–440.
- Weintraub D, Tirumalai E, Haydel K, Fujimoto M, Fulton J, Robinson T. Team sports for overweight children: the Stanford Sports to Prevent Obesity Randomized Trial (SPORT). *Arch Pediatr Adolesc Med* 2008; 162 (3): 232–237.
- Welk G, Wood K, Morss G. Parental influences on physical activity in children: an exploration of potential mechanisms. *Pediatr Exerc Sci* 2003; 15 (1): 19–33.
- Wold B, Duda J, Balaguer I, Smith O, Ommundsen Y, Hall H, Samdal O, Heuzé J, Haug E, Bracey S, Castillo I, Ramis Y, Queded E, Krommidas C. Comparing self-reported leisure-time physical activity, subjective health, and life satisfaction among youth soccer players and adolescents in a reference sample. *Int J Sport Exerc Psychol* 2013; 11 (4): 328–340.