

# Effects of obesity on perception of ability and perception of body image in Portuguese children and adolescents

MIGUEL PERALTA <sup>1</sup>✉, ADILSON MARQUES <sup>2</sup>, JOÃO MARTINS <sup>3,4</sup>, HUGO SARMENTO <sup>5,6</sup>, FRANCISCO CARREIRO DA COSTA<sup>2,4</sup>

<sup>1</sup>*Faculdade de Motricidade Humana, Universidade de Lisboa, Lisboa, Portugal*

<sup>2</sup>*Centro Interdisciplinar de Estudo da Performance Humana, Universidade de Lisboa, Lisboa, Portugal*

<sup>3</sup>*Laboratório de Pedagogia, Universidade de Lisboa, Lisboa, Portugal*

<sup>4</sup>*Faculdade de Educação Física e Desporto, Universidade Lusófona de Humanidades e Tecnologias, Lisboa, Portugal*

<sup>5</sup>*Research Center in Sports Sciences, University Institute of Maia, Avioso São Pedro, Portugal*

<sup>6</sup>*Centro de Estudos em Educação, Tecnologias e Saúde (CI&DTES), Viseu, Portugal*

## ABSTRACT

Worldwide, the prevalence of child obesity is increasing, which is the cause of great preoccupation for governments and health politics developers. The purpose of this study was to examine differences of ability and body image perceptions related to weight status in children and adolescents and explore them as correlates of BMI. Two thousand five hundred and sixty nine adolescents participated in the study (1303 boys, 1266 girls; M age=13.3±2.4 years). The students were questioned about perceptions of ability and body image, and the body mass index was calculated. Findings revealed that overweight participants felt less athletic, agile, fast and fit and had overall lower self-image perception than normal weight participants; regardless of the age, perceptions of elegance and body mass decreased significantly with increasing BMI. Taking in consideration the dangers of overweight related to the perception of body image, it is important to start to develop effective intervention programs that combine physical activity and psychological support, exploring the benefits of strength training. **Key words:** WEIGHT STATUS, PHYSICAL ACTIVITY, INTERVENTION PROGRAMS, STUDENTS.

✉ **Corresponding author.** Faculdade de Motricidade Humana, Universidade de Lisboa, Estrada da Costa, 1499-002 Cruz Quebrada, Portugal.

E-mail: miguel.peralta14@gmail.com

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## INTRODUCTION

Obesity is associated with several immediate and future health risks factors (Canale et al., 2013; de Vries et al., 2014; Landsberg et al., 2013), such as later heart disease and other chronic diseases including hyperlipidaemia, hyperinsulinemia, hypertension, and early atherosclerosis. Taking all into consideration, obesity and overweight can be considered two important health factors. Worldwide, the prevalence of child obesity is increasing (Alwan & World Health Organization, 2011), which is the cause of great preoccupation for governments and health politics developers. Also, rising prevalence of obesity can be seen as a worldwide health concern, as excess weight gain within populations estimates an increased monetary burden from several diseases, most notably cardiovascular diseases, diabetes, and cancers (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011).

Overweight and obesity status is reported to impact children and adolescents physical self-perception (Schwimmer, Burwinkle, & Varni, 2003), especially when considering girls (Franklin, Denyer, Steinbeck, Catterson, & Hill, 2006). In addition, when comparing with normal weight children, obese children perceived themselves as fatter, less coordinated and competent in sport and exercise (Morano, Colella, Robazza, Bortoli, & Capranica, 2011) and tend to have greater dissatisfaction with their body image (Morano et al., 2011; Pallan, Hiam, Duda, & Adab, 2011). Physical self-perception has been identified as an important correlate of physical activity, motor competence and performance in childhood (Raudsepp, Liblik, & Hannus, 2002; Southall, Okely, & Steele, 2004). Moreover, perceived competence has a mediating role on physical activity, as part of an important causal mechanism partially responsible for the physical inactivity and obesity (Stodden et al., 2008).

Body mass index (BMI) is one of the most used variables for obesity calculation and its cut off points are widely recognized (Cole, Bellizzi, Flegal, & Dietz, 2000), as it is a strong indicator of obesity. In spite of that, BMI has some limitations in the assessment of the individual as it does not take into account the distribution of body fat. BMI's measurement does not provide any information regarding where body fat is stored. Nevertheless, BMI is a useful variable to assess body composition.

Physical activity is one modifiable key behavior for obesity prevention (Craigie, Lake, Kelly, Adamson, & Mathers, 2011), as children and adolescents obesity can be fought with physical activity intervention programs. However, most programs rarely show maintenance of improvements after their end (Pate et al., 2005), revealing the need for a better understanding of BMI (as measure of obesity) related factors in order to contribute to the development of effective interventions. Furthermore, effective policies to promote healthier weight also have economic benefits (Wang et al., 2011). Therefore, the purpose of this study was to examine differences of ability and body image perceptions between normal weight and overweight and obese children and adolescents and explore them as correlates of BMI.

## METHOD

### *Participants*

The participants were 2569 adolescents (1303 boys, 1266 girls) aged 10-18 years (Mean=13.3±2.4), attending from grade 5 to 12. Adolescents were from six Portuguese public elementary schools in the urban area of Lisbon. Informed written consent was obtained from the students and their legal guardians. The study was conducted according to ethical standards in sport and exercise science research (Harriss & Atkinson, 2011) and the protocol received approval from both the Ethics Committee of Faculty of Human Kinetics of the University of Lisbon and the Portuguese Minister of Education.

### **Body mass index**

The measurement of height was made using a stadiometer (recorded to the nearest 0.5 cm). For the measurement of weight participants were wearing shorts and a t-shirt, without shoes (recorded to the nearest 0.5 kg). BMI was then calculated: weight divided by height (square meters). Adolescents BMI classification was determined based on International Obesity Taskforce criteria (Cole et al., 2000). Age specific cut-off points were defined as correspondants from adult BMI cut-offs of 25 kg/m<sup>2</sup> and 30 kg/m<sup>2</sup> for overweight and obesity respectively.

### **Self-perceptions**

This study explores two dimensions of self-perceptions, the perception of ability and the perception of body image, based on Lintunen's scale (1990) and already utilized in the Portuguese context (Marques, Martins, Diniz, & Carreiro da Costa, 2014). The first dimension, perception of ability, was assessed by 5 items (perception of athletics qualities; perception of agility; perception of fitness; perception of speed; perception of strength) using a 5-point Likert scale (1=Low, 5=High). The second dimension, perception of body image, was assessed by 4 items (perception of elegance; perception of stature; perception of body weight; appearance satisfaction) using a 5-point Likert scale (1=Low, 5=High).

### **Statistical analysis**

The effects of BMI on each independent variable were assessed by a univariate analysis of variance. Beta coefficients with 95% confidence intervals (CI) were calculated. Analyses were adjusted for gender. All statistical analyses were performed using IBM SPSS Statistics 22.0. The level of significance was set at 0.05.

## **RESULTS**

Distribution of the sample for age groups was as follows: 45.6% for 10-12 age group; 34.6% for 13-15 age group; and 19.8% for 16-18 age group. Overall, 77.5% of participants were normal weight and 22.5% were overweight, being the BMI z-score mean  $0.0 \pm 1.0$ .

Table 1 shows the score obtained by normal weight and overweight participants in each age group (10-12; 13-15; and 16-18 years). Regarding the perception of ability, for all age groups, overweight participants felt less athletic ( $p < 0.001$ ), agile ( $p < 0.001$ ), fast ( $p < 0.001$ ) and fit ( $p < 0.001$ ) than normal weight participants. These differences range for 0.5 to 0.7 points in the scale, which reveals a large influence of weight status in these perceptions. However, for the 13-15 age group, overweight participants felt stronger than normal weight participants ( $p = 0.019$ ), having a 0.3 score difference.

Regarding the perception of body image, regardless of age, overweight participants had overall lower self-image perception than normal weight participants. Their perception of elegance ( $p < 0.001$ ), appearance satisfaction ( $p < 0.001$ ), and perception of body weight ( $p < 0.001$ ) were significantly lower than those for normal weight participants. These differences range for 0.5 points to 1 point in the scale, revealing a large influence of weight status in perception of body image. Despite of that, overweight participants had higher values of perception of stature than normal weight participants, being this result significant for the youngest age group only ( $p < 0.001$ ) and by a small difference (0.2 points).

Table 1. Perceptions score obtained by normal weight and overweight participants in each age group.

	10-12			13-15			16-18		
	NW	OW	<i>p</i>	NW	OW	<i>p</i>	NW	OW	<i>p</i>
BMI z-score	-	1.12±0.8	<0.001	-	1.64±0.9	<0.001	-	1.67±1.0	<0.001
	0.51±0.6			0.32±0.7			0.28±0.7		
Perception of athletics qualities	3.6±1.0	3.1±1.0	<0.001	3.5±1.0	3.0±1.1	<0.001	3.5±1.0	3.0±1.2	<0.001
Perception of agility	3.8±0.9	3.3±0.9	<0.001	3.7±0.9	3.1±0.8	<0.001	3.6±0.8	3.1±0.9	<0.001
Perception of fitness	3.8±1.0	3.1±1.0	<0.001	3.7±0.9	3.0±1.1	<0.001	3.6±0.9	3.1±1.0	<0.001
Perception of speed	3.7±0.9	3.2±0.9	<0.001	3.6±0.9	3.0±0.9	<0.001	3.6±0.9	3.1±1.0	<0.001
Perception of strength	3.5±0.9	3.5±0.9	0.698	3.3±0.9	3.6±0.8	0.019	3.3±0.8	3.7±0.9	0.058
Perception of elegance	3.7±0.9	2.9±0.9	<0.001	3.7±0.8	2.8±0.8	<0.001	3.7±0.9	2.7±0.8	<0.001
Perception of stature	3.2±0.9	3.4±0.9	<0.001	3.2±1.0	3.3±1.0	0.562	3.0±0.9	3.2±0.8	0.534
Perception of body weight	3.5±0.8	2.8±0.8	<0.001	3.4±0.7	2.6±0.8	<0.001	3.2±0.7	2.5±0.7	<0.001
Appearance satisfaction	4.0±1.0	3.5±1.1	<0.001	3.8±1.0	3.0±1.1	<0.001	3.7±1.0	3.2±1.0	<0.001

Analysis were adjusted for the gender

NW – Normal weight

OW – Overweight

Table 2 presents the changes in self-perception as a function of age in overweight and normal weight participants. BMI tends to increase significantly with age regardless the weight category ( $p<0.001$ ). In normal weight population, the perception of ability decreases significantly with age. Perception of athletics qualities ( $p=0.003$ ), perception of agility ( $p=0.004$ ), perception of fitness ( $p<0.001$ ), perception of speed ( $p=0.008$ ) and perception of strength ( $p<0.001$ ) slightly decreased between 10 and 18 years old. For overweight participants, this tendency was significant only for the perception of agility ( $p=0.036$ ). Despite not being significant, it is important to notify increasing of perception of strength with age for the overweight population. For the overweight participants this variable were already high from the 10-12 age group (3.5 points), making a significant increase difficult.

The perception of body image also tends to decrease with age among normal weight and overweight participants. This decrease was significant for the perception of stature ( $p=0.020$ ), the perception of body weight ( $p<0.001$ ) and the appearance satisfaction ( $p<0.001$ ) among normal weight participants. Whereas among overweight participants, the only significant decreases concerned the perception of body weight ( $p=0.005$ ) and the appearance satisfaction ( $p<0.001$ ), being the last variable minimum reached by the middle age group (13-15).

Table 2. Changes in self-perception as a function of age in overweight and normal weight participants.

	NW				OW			
	10-12	13-15	16-18	<i>p</i>	10-12	13-15	16-18	<i>p</i>
BMI z-score	-0.51±0.6	-0.32±0.7	-0.28±0.7	<0.001	1.12±0.8	1.64±0.9	1.67±1.0	<0.001
Perception of athletics qualities	3.6±1.0	3.5±1.0	3.5±1.0	0.003	3.1±1.0	3.0±1.1	3.0±1.2	0.110
Perception of agility	3.8±0.9	3.7±0.9	3.6±0.8	0.004	3.3±0.9	3.1±0.8	3.1±0.9	0.036
Perception of fitness	3.8±1.0	3.7±0.9	3.6±0.9	<0.001	3.1±1.0	3.0±1.1	3.1±1.0	0.472
Perception of speed	3.7±0.9	3.6±0.9	3.6±0.9	0.008	3.2±0.9	3.0±0.9	3.1±0.9	0.108
Perception of strength	3.5±0.9	3.3±0.9	3.3±0.8	0.001	3.5±0.9	3.6±0.8	3.7±0.9	0.723
Perception of elegance	3.7±0.9	3.7±0.8	3.7±0.9	0.791	2.9±0.9	2.8±0.8	2.7±0.8	0.099
Perception of stature	3.2±0.9	3.2±1.0	3.0±0.9	0.020	3.4±0.9	3.3±1.0	3.2±0.8	0.078
Perception of body weight	3.5±0.8	3.4±0.7	3.2±0.7	<0.001	2.8±0.8	2.6±0.8	2.5±0.7	0.005
Appearance satisfaction	4.0±1.0	3.8±1.0	3.7±1.0	<0.001	3.5±1.1	3.0±1.1	3.2±1.1	<0.001

Analysis were adjusted for the gender

NW – Normal weight

OW – Overweight

Table 3 presents the results from the binary logistic regression analysis. Regardless the age, the results indicated that perception of body image lowered with increasing BMI, as the perceptions of elegance and body mass decreased significantly with increasing BMI ( $p < 0.001$ ). This trend is significantly corroborated by the item "appearance satisfaction" for the 10-12 group ( $\beta = -0.07$ , CI: -0.13 to -0.02,  $p = 0.013$ ) and for the group 13-15 years ( $\beta = -0.12$ , CI: -0.180 to -0.056,  $p < 0.001$ ).

Concerning the perception of ability, it was found that increasing BMI is related to lower athletics qualities, agility, speed and fitness perceptions. This trend is significant only for the perception of fitness among 10-12 years ( $\beta = -0.15$ , CI: -0.22 to -0.07,  $p < 0.001$ ) and for the perception of speed among 13-15 years ( $\beta = -0.12$ , CI: -0.21 to -0.03,  $p = 0.007$ ). Finally, it was found that perception of strength increases with increasing BMI for the 10-12 ( $\beta = 0.20$ , CI: 0.12 to 0.27,  $p < 0.001$ ), 13-15 ( $\beta = 0.29$ , CI: 0.22 to 0.37,  $p < 0.001$ ), and 16-18 ( $\beta = 0.26$ , CI: 0.15 to 0.36,  $p < 0.001$ ) age groups.

Table 3. Binary logistic regression analysis by age group.

Explanatory variables	10-12 years		13-15 years		16-18 years	
	$\beta$ (95% CI)	$p$	$\beta$ (95% CI)	$p$	$\beta$ (95% CI)	$p$
Perception of athletics qualities	-0.04 (-0.11 to 0.03)	0.243	-0.05 (-0.13 to 0.03)	0.250	-0.02 (-0.13 to 0.10)	0.757
Perception of agility	-0.03 (-0.10 to 0.04)	0.392	-0.06 (-0.15 to 0.03)	0.188	-0.05 (-0.17 to 0.08)	0.462
Perception of fitness	-0.15 (-0.22 to -0.07)	<0.001	-0.03 (-0.12 to 0.06)	0.536	-0.07 (-0.18 to 0.04)	0.218
Perception of speed	-0.02 (-0.10 to 0.06)	0.669	-0.12 (-0.21 to -0.03)	0.007	-0.04 (-0.16 to 0.08)	0.496
Perception of strength	0.20 (0.12 to 0.27)	<0.001	0.29 (0.22 to 0.37)	<0.001	0.26 (0.15 to 0.36)	<0.001
Perception of elegance	-0.20 (-0.27 to -0.13)	<0.001	-0.28 (-0.36 to -0.19)	<0.001	-0.36 (-0.48 to -0.24)	<0.001
Perception of body weight	-0.25 (-0.32 to -0.17)	<0.001	-0.28 (-0.37 to -0.19)	<0.001	-0.32 (-0.44 to -0.21)	<0.001
Appearance satisfaction	-0.07 (-0.13 to -0.02)	0.013	-0.12 (-0.180 to -0.056)	<0.001	0.01 (-0.08 to 0.09)	0.863

Analyses were adjusted for gender.

## DISCUSSION

This study sought to analyze the differences of ability and body image perceptions between normal weight and overweight and obese children and adolescents and explore them as correlates of BMI. In this study five main results were observed: (1) regarding the perception of ability, for all age groups, overweight participants felt less athletic, agile, fast and fit than normal weight participants; (2) for the perception of body image, regardless of age, overweight participants had overall lower self-image perception than normal weight participants; (3) normal weight participants' perception of ability decreases significantly with age, while for overweight participants, this tendency was significant only for the perception of agility; (4) perception of body image tends to decrease with age among normal weight and overweight participants; (5) regardless of the age, perceptions of elegance and body mass decreased significantly with increasing BMI.

Results on the perception of ability were consistent with previous literature reporting that non-overweight children had significantly lower perceived physical competence scores when compared with overweight children (Franklin et al., 2006; Gonçalves, Silva, & Antunes, 2012; Southall et al., 2004). In addition to the immediate impact of obesity and overweight in children, they also impact the physical self-perception of children entering adolescence (Franklin et al., 2006). These can be considering worrying results as physical self-perception has already been identified as an important correlate of physical activity, motor competence and performance in childhood (Raudsepp et al., 2002; Southall et al., 2004). Furthermore, previous studies have showed that in addition to lower perceptions of their physical ability, overweight children and

adolescents had significantly lower actual physical competences than their normal weight peers (Morano et al., 2011; Southall et al., 2004), and children with low actual and perceived physical ability could be lead into a negative spiral of disengagement in physical activity, resulting in lower physical activity levels (Stodden et al., 2008). In fact, the less an individual engages in physical activity, the more his physical competence decreases causing the reduction of its self-perceptions. Therefore, in order to restore a better self-perception of ability in overweight adolescent, we could focus on improving children and adolescents actual physical competence (Southall et al., 2004; Stodden et al., 2008). This measure could possibly allow diminishing the negative spiral of disengagement in physical activity, as result of improving perceived and actual physical competence. Southall et al. (2004) presented another proposal to improve overweight children's and adolescents' perceived and actual physical competence. This complementary mean consisted in giving overweight children and adolescents an appropriate social support from parents, teachers, coaches and peers, which could help to restore a better self-perception in order to maximize their participation in physical activities and combat the cycle of obesity.

Despite having a lower overall perception of ability, overweight children and adolescents had a higher perception of strength than their normal weight peers. Although the results were only significant to the 13-15 age group, it might be interesting to offer overweight children and adolescents physical activities enhancing strength in order to provide them opportunities to engage in physical activity where their self-perception are higher, especially because strength training reduces adiposity in overweight teenagers (Davis et al., 2009). Besides that, perception of strength was found as a positive correlate of BMI.

Overweight children's and adolescents' perception of elegance, appearance satisfaction and perception of body weight were significantly lower than those of normal weight children and adolescents. These results were consistent with previous studies in which overweight children and adolescents had positive associations with body image dissatisfaction among youth (van den Berg, 2012). Also, overweight adolescents had more body image disturbances and more body related negative attitudes than their normal weight peers (Marsh, Hau, Sung, & Yu, 2007; Shin & Shin, 2008).

Perceptions of elegance, stature and body weight were negatively correlated to BMI. Many authors have studied the relationship between body image, self-esteem and weight status (Kostanski & Gullone, 1998; Nanu & Baban, 2011; Shin & Shin, 2008), identifying a negative relationship between body image satisfaction or self-esteem and overweight. In fact, self-esteem had a stronger association with body image dissatisfaction than with actual body weight (Kostanski & Gullone, 1998). Also, participants who evaluated themselves as normal weight scored higher in body esteem than participants who considered being overweight (Nanu & Baban, 2011).

Body image dissatisfaction has been found to mediate the association between obesity and self-esteem (Shin & Shin, 2008). Obese children with greater body image dissatisfaction have significantly lower self-esteem (Latzer & Stein, 2013). Whereas, adolescents who considered their weight normal had higher scores in body esteem when compared to adolescents that recognize their overweight status, even if they were really overweight (Nanu & Baban, 2011).

Negative perception of body image among overweight adolescents has dangerous effects on their health, as some studies have supported associations between higher BMI or body image dissatisfaction and internalizing problems such as depression, anxiety, hopelessness, and low self-esteem (Erermis et al., 2004; Falkner et al., 2001). Furthermore, overweight and obesity are related to lower health related quality of life and BMI is inversely related to health-related quality of life (Tsiros et al., 2009). Taking in consideration the dangers of overweight related to the perception of body image, it is important to start to develop effective

intervention programs that combine physical activity and psychological support, exploring the benefits of strength training.

Results showed a significant decrease of the perceived athletic competence with age in normal weight population, whereas for overweight adolescents, this tendency is significant only for the perception of agility. Furthermore, the perception of body image also decreases with age among all groups studied. The influence of age on self-esteem is still not clearly defined. In fact, global self-esteem varies with age, having a particular sensitive decrease during puberty (12 and 13 years old) (Fourchard & Courtinat-Camps, 2013), as this period of adolescence is characterized by great physical and psychological transformations. Although most of the physical self-perceptions decrease with age, for overweight youngsters the perception of strength tend to increase with age, even if it is not significant. This result strengthens the valorization of activities requiring strength for overweight children and adolescents, especially as self-perception of strength significantly increases with increasing BMI.

This study had some limitations which need acknowledging. The cross-sectional nature of the study excludes any relation of causality with the variables of interest. Although BMI has limitations as a measure of adiposity, it is strongly associated with body fat among youth, being a most appropriate measure for school-based studies such as this. The reporting of self-perceptions can be subjected to bias. Strengths of this study were the use of a large sample of children and adolescents and the variety of self-perceptions variables analyzed.

## CONCLUSIONS

Overweight participants presented lower scores in perception of athletics qualities, agility, speed, fitness, and body image, regardless of the age. Additionally, perception of ability and agility, for normal and overweight participants respectively, and perceptions of body image decrease with age. Intervention programs aimed to reduce obesity and improve children and adolescents' levels of physical activity should have in consideration these mediating variables, regardless of age and sex. Furthermore, promoting physical activities that develop strength and strength perception could be important for intervention programs success, especially for overweight children and adolescents.

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