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(Article begins on next page)

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Anthropometric characteristics of primary school-aged children: accuracy of perception and differences by gender, age and BMI

E. Cattelino,¹ M. Bina,² A. M. Skanjeti¹ and E. Calandri¹

Abstract

Background Body perception has been mainly studied in adolescents and adults in relation to eating disorders and obesity because such conditions are usually associated with distortion in the perception of body size. The development of body perception in children was rather neglected despite the relevance of this issue in understanding the aetiology of health eating problems. The main aim of this study was to investigate body weight and body height perception in children by gender, age and body mass index (BMI), taking into account differences among underweight, healthy weight, overweight and obese children.

Methods A school-based sample of 572 Italian children (49% boys) aged 6–10 were involved in a cross-sectional survey. Current weight and height were measured by standard protocols, and BMI was calculated and converted in centile categories using the Italian growth curves for children. Perceived weight and height were assessed using visual methods (figures representing children of different weight and height).

Results About a third of the children do not show to have an accurate perception of their weight and height (weight: 36%; height: 32%): as for weight, an error of underestimation prevails and as for height, an error of overestimation prevails. In general, children who have different weight and height from the average tend to perceive their physical characteristics closer to average. However, overweight children underestimate their weight much more than obese children.

Conclusions Distortions in the perception of their physical features, weight and height, appear to be related to the aesthetic models of Western culture. The tendency to underestimate weight, particularly in overweight children, has implications in interventions for health promotion and healthy lifestyle in school-aged children.

Introduction

Body perception has mainly been studied in relation to eating disorders and obesity as they are usually associated with distortion in the perception of body size with an overestimation in eating disorders and an underestimation of overweight and

obesity, but fewer studies have investigated the development of body perception in non-pathological conditions. Moreover, most studies have been conducted on adolescents and adults; thus, investigation of the specific development of body perception in childhood has been neglected ([Smolak 2004](#)). Finally, for the most part research has investigated body size perception,

without distinguishing between perception of height and weight, despite the fact that these two characteristics seem to assume different significance and relevance in self-assessment (Baumgartner & Bombi 2005).

It is known that body size perception is not necessarily congruent with real auxological characteristics and that it may vary in relation to different ethnic, socio-cultural and biological characteristics [age, gender, body mass index (BMI)] (Maximova *et al.* 2008; Martin *et al.* 2009; Saxton *et al.* 2009; Standley *et al.* 2009; Pauline *et al.* 2012). In general, it was shown that the accuracy in body self-perception tends to improve from pre-school age until late adolescence (Li *et al.* 2005; Martin *et al.* 2009; Park 2011), and that girls show higher accuracy. Moreover, a more frequent underestimation of body size compared with its overestimation was demonstrated (Martin *et al.* 2009; Standley *et al.* 2009). With regard to gender, women show a tendency to overestimate their weight, right from adolescence, whereas for men underestimation is more frequent (Emslie *et al.* 2001; Brener *et al.* 2004). With regard to school age, the only study we found in the literature (Saxton *et al.* 2009) reports a greater tendency to underestimate weight between the age of 7 and 9 compared with the overestimation and greater accuracy of girls in weight perception. However, there is a lack of research related to body size perception in this age group (Edwards *et al.* 2010).

The most studied issue, even in childhood, has been the relationship between distortions in body perception and weight-related disorders and dysfunctional eating behaviours. Recent studies have shown that children aged 8–10 years, as in adolescence, attempt to lose weight and restrictive eating behaviours (often in people with normal weight or underweight) are associated with greater overestimation of body size, whereas obese or overweight individuals tend to underestimate their weight (Gualdi-Russo *et al.* 2008; Intagliata *et al.* 2008).

A correct assessment of one's own weight is important as it favours people's weight control, especially in overweight cases. Childhood overweight and obesity are associated to significant health consequences and costs to society (Murasko 2014). As a matter of fact, overweight children and adolescents are more likely to become overweight or obese adults and are at a higher risk of cardiovascular disease, endocrine and metabolic disturbances, debilitating health problems, and psychological problems (WHO 2013). Severe underweight is a risk for health too. It is actually used as an indicator of acute malnutrition or is associated to severe and definite health problems. In Western society, childhood underweight is a much less widespread problem than overweight.

These findings suggest the importance of investigating body perception in childhood to better understand both body perception development and the aetiology of health problems related to weight and nutrition.

Starting from this theoretical framework, the present study has the following objectives:

- To describe the auxological characteristics (weight, height and BMI) of children and their self-perception of weight and height, taking into account differences related to gender and age;
- To investigate the adequacy of weight and height self-perception (accurate perception, underestimation or overestimation of weight and height) by gender, age, actual weight or height, and BMI, considering specifically children at risk of health problems (underweight, overweight and obese children).

Method

Participants

The study involved 572 children (49% boys), aged between 6 and 10 years (mean 8.5), attending various state primary schools in north-western Italy. Six schools in two regions, Piedmont and Lombardy, participated in the study; 25 classes (11 classes of first and second grades and 14 classes of third, fourth and fifth grades) were randomly selected from each school. The majority (96%) of the parents of the children attending the selected classes granted parental consent to participate in the study and completed the data collection. Older children ($n = 381$, 67%, between the ages of 8 and 10, attending third and fifth grades, mean age = 9.31) were compared with younger children ($n = 191$, between the ages of 6 and 7 attending first and second grades, mean age = 7.07). All participants had a normal level of intelligence as assessed by the Raven's Coloured Progressive Matrices (Belacchi *et al.* 2008); three children who had shown a serious cognitive deficit (Raven's score less than fifth percentiles) were excluded from the study.

Gender distribution of the participants is comparable with those of the primary school student's population in north-western Italy. Moreover, family structure (more than 85% of children live with both parents) and parental levels of education (primary school 2%, secondary or professional school 39%, diploma 45%, degree 14%) were not substantially different from those of the population (ISTAT 2011a).

Measures

Anthropometry

Children's height and weight were measured according to standard protocols (Weiner & Lourie 1981; Lohman *et al.* 1997), respectively, using a pocket rule to the nearest 0.1 cm and a scale to the nearest 0.1 kg. Participants were weighed and measured wearing light clothing and without shoes. BMI was defined as weight (kg)/height (m)². According to standardized growth curves for height, weight and BMI related to the population of north-central Italy aged between 2 and 20 years (Cacciari *et al.* 2006), three categories of weight and height were set using percentile values (<25th cent./25th–75th cent./>75th cent.). With regard to BMI, the criteria set by the International Obesity Task Force (cut-off points by gender for exact ages between 2 and 18 years) were used to identify underweight (Cole *et al.* 2007), normal weight, overweight and obese children (Cole *et al.* 2000). Therefore, five BMI categories were set: underweight (BMI under the cut-off points for grade 3 thinness set by Cole *et al.* 2007), lower healthy (BMI from grade 3 thinness cut-off points to the 50th percentile of the reference grow curve excluded), higher healthy (BMI from 50th percentile to overweight cut-off points set by Cole *et al.* 2000), overweight (BMI from the overweight cut-off points to the obesity cut-off points set by Cole *et al.* 2000) and obese (over the obesity cut-off points).

Weight and height perception

Height and weight self-perception were evaluated using a visual rating (Saxton *et al.* 2009) previously assessed in Italy (Cannoni & Di Norcia 2011; Lombardo *et al.* 2014). This approach requires the submission on a single sheet of five gender-specific figures of children having different weights arranged in scale from the thinnest to the fattest. Children were to choose the figure most similar in size to them. Before showing the figures, the researcher asked children how they assessed themselves physically: 'thin', 'just right' or 'plump'. Then, the researcher showed the five figures of children having different weights and asked children to choose the one they thought was the most similar to them. The same procedure was then carried out to evaluate self-perception of height by showing five gender- and weight-specific figures of children having different heights arranged in scale from the shortest to the tallest. Children were shown figures of children similar in weight to the one chosen during the weight perception task, but having different heights.

Accuracy of weight and height perception

Perception was considered accurate in relation to the choice of two possible figures close to the actual height and weight of children. For children having weight and height <25th cent., perception is considered accurate for the choice of figures 1–2 (figures 3–5 = overestimation); for children having weight and height between 25th and 50th cent., perception is considered accurate for the choice of figures 2–3 (figure 1 = underestimation; figures 4–5 = overestimation); for children having weight and height between 50th and 75th cent., perception is considered accurate for the choice of figures 3–4 (figures 1–2 = underestimation; figure 5 = overestimation); for children having weight and height >75th cent., perception is considered accurate for the choice of figures 4–5 (figures 1–3 = underestimation).

Socio-personal data

Self-report questionnaire filled in by parents was used to learn about children's date of birth, family structure and parental levels of education in order to evaluate socio-cultural characteristics of the participants' families.

Procedure: Parental consent to children's participation in research was required in compliance with the privacy laws and the code of ethics by the Italian Association of Psychology. Consenting parents filled in the socio-personal data questionnaire at home.

All other instruments were given out to children individually at school by trained researchers. Height and weight self-perception were evaluated before the measurement of anthropometric data in order to avoid possible distortions.

Results

Measured and perceived auxological characteristics

Anthropometric measures, weight and height perception, and accuracy of weight and height perception were described by gender and age comparing distributions in four groups of participants: males and females aged 6–7 years and males and females aged 8–10 years (Table 1). Chi-square analysis and analysis of correct standardized residuals were performed to investigate possible differences among groups. Table 1 shows the participants' auxological data subdivided into four groups by gender and age. The percentages of children having weight

Table 1. Descriptive statistics by gender and age

	Total		Girls 6–7 years		Boys 6–7 years		Girls 8–10 years		Boys 8–10 years		χ^2
	n	%	n	%	n	%	n	%	n	%	
Weight											
<25th percentile	119	21	16	16 (–1.3)	10	11 (–2.5)	50	27 (2.3)	43	22 (0.7)	11.07
25th–75th percentile	284	50	54	54 (1.0)	49	54 (0.9)	86	45 (–1.4)	95	50 (–0.1)	
>75th percentile	169	29	30	30 (0.1)	32	35 (1.3)	53	28 (–0.6)	54	28 (–0.5)	
Height											
<25th percentile	108	19	18	18 (–0.2)	14	15 (–0.9)	43	23 (1.5)	33	18 (–0.2)	6.28
25th–75th percentile	280	49	55	55 (1.3)	41	45 (–0.8)	87	45 (–1.2)	97	51 (0.8)	
>75th percentile	184	32	27	27 (–1.2)	36	40 (1.6)	62	32 (0.0)	59	31 (–0.3)	
BMI											
Underweight	26	4	4	4 (–0.3)	3	3 (–0.6)	11	6 (1.0)	8	4 (–0.3)	15.57
Healthy weight	204	36	35	35 (–0.2)	27	30 (–1.3)	65	34 (–0.6)	77	41 (1.8)	
Healthy weight	147	26	33	33 (1.8)	26	29 (0.7)	52	27 (0.5)	36	19 (–2.6)	
Overweight	135	24	19	29 (–1.2)	20	22 (–0.4)	44	23 (–0.3)	52	27 (–0.3)	
Obese	60	10	9	9 (–0.5)	15	16 (2.0)	20	10 (0.0)	20	9 (0.0)	
Perceived weight											
Fig. 1	31	6	5	5 (–0.2)	14	15 (4.6)	4	2 (– 2.5)	8	4 (–0.9)	36.34*
Fig. 2	167	29	36	36 (1.6)	33	36 (1.6)	47	24 (1.8)	51	27 (–0.8)	
Fig. 3	262	46	43	43 (–0.6)	34	37 (–1.8)	97	51 (1.6)	88	47 (0.3)	
Fig. 4	99	17	15	15 (–0.7)	9	10 (– 2.0)	40	21 (1.6)	35	18 (0.5)	
Fig. 5	13	2	1	1 (–0.9)	1	1 (–1.8)	4	2 (–0.2)	7	4 (3.7)	
Perceived height											
Fig. 1	9	1	1	1 (–0.5)	1	1 (1.1)	3	2 (0.0)	4	2 (0.7)	6.06
Fig. 2	69	14	17	17 (1.0)	15	17 (0.8)	22	11 (–1.2)	25	13 (–0.3)	
Fig. 3	200	35	35	35 (0.0)	28	31 (–0.9)	69	36 (0.3)	68	36 (0.4)	
Fig. 4	221	39	39	39 (0.1)	33	36 (–0.5)	76	40 (0.3)	73	39 (0.0)	
Fig. 5	63	11	8	8 (–1.1)	14	15 (1.5)	22	11 (0.2)	19	10 (–0.5)	
Accuracy of weight perception											
Underestimation	144	25	30	30 (1.2)	44	48 (5.6)	35	18 (– 2.7)	35	18 (– 2.6)	40.45*
Accurate	369	65	62	62 (–0.6)	45	50 (– 3.3)	132	69 (1.5)	130	69 (1.5)	
Overestimation	59	10	8	8 (–0.8)	2	2 (– 2.8)	25	13 (1.5)	24	13 (1.3)	
Accuracy of height perception											
Underestimation	63	11	13	13 (0.7)	13	14 (1.1)	15	8 (–1.7)	22	12 (0.3)	4.31
Accurate	388	68	67	67 (–0.2)	62	68 (0.1)	135	70 (0.9)	124	65 (–0.8)	
Overestimation	121	21	20	20 (–0.03)	16	18 (–0.9)	42	22 (0.3)	43	23 (0.7)	

Note. Adjusted standardized residuals in cross-tabulation appear in parentheses beside group percentage frequencies. In bold residuals > |1.98|.

*indicate significance at $P < 0.001$.

BMI, body mass index.

(29%) and height (32%) >75th percentile were higher than the 25% expected according to growth curves. Considering the BMI, a small percentage of underweight individuals (4%) came together with a high percentage of overweight (24%) and obese (10%) children. These data are in line with recent research on Italian children aged 7–17 years living in Northern Italy (Spinelli *et al.* 2012).

Distributions for weight, $\chi^2(6, n = 572) = 11.07, P = 0.086$; height, $\chi^2(6, n = 572) = 6.28, P = 0.392$; and BMI, $\chi^2(12, n = 572) = 15.57, P = 0.212$, did not show significant differences related to gender and age.

With regard to self-perception (Table 1), the greater percentage of children selected figure 3 for weight (46%) and figure 4

for height (39%). The analysis of the mean scores (range 1–5) of weight and height perception showed that the mean score of weight perception, M [standard deviation (SD)] = 2.75 (0.86), was lower than those of height perception, M (SD) = 3.43 (0.91). Such difference resulted significant based on the t -test analysis, $t(572) = -13.43, P < 0.001$. Concerning height perception, no differences are shown between the four groups of participants defined by gender and age, $\chi^2(12, n = 572) = 6.06, P = 0.913$. In contrast, with regard to the perception of weight, younger males selected figure 1 with higher probability than the other groups, whereas older females selected the same figure in a lower percentage, $\chi^2(12, n = 572) = 36.34, P < 0.001$. Moreover, the comparison between mean scores of weight perception

(range 1–5) in the four group by gender and age, performed through one-way analysis of variance and Tukey's post hoc pairs comparison test, shows that the means of males aged 6–7 years [M (SD) = 2.45 (0.91)] were significantly lower than those of the other groups [6- to 7-year-old females: M (SD) = 2.71 (0.82), 8- to 10-year-old males: M (SD) = 2.90 (0.87); 8- to 10-year-old females: M (SD) = 2.96 (0.78)], $F(3, 571) = 8.87$, $P < 0.001$. The same analysis did not show significant differences with regard to the mean scores of height perception (6- to 7-year-old males: M (SD) = 3.48 (0.98); 6- to 7-year-old females: M (SD) = 3.36 (0.89), 8- to 10-year-old males: M (SD) = 3.41 (0.91); 8- to 10-year-old females: M (SD) = 3.47 (0.90)], $F(3, 571) = 0.49$, $P = 0.687$.

Accuracy of weight and height perception

Because over half of the children showed a perception of their height (68%) and of their weight (64%) congruent with the actual measurements, there is about a third of the sample showing some errors. In particular, there is a greater tendency to underestimate one's weight (Table 1). With regard to the accuracy of height perception the chi-square test did not show significant differences in the four groups of children define by gender and age, $\chi^2(6, n = 572) = 4.31$, $P = 0.635$. On the contrary, significant differences were found with respect to the correctness of weight self-perception, $\chi^2(6, n = 572) = 40.45$, $P < 0.001$. More specifically, the analysis of correct standardized residuals showed that younger boys perceive themselves less correctly than the other groups; in particular, a greater percentage of these children underestimate their weight.

Relationships between accuracy of weight and height perception and anthropometric measures

To investigate the relationships between accuracy of weight and height perception, on the one hand, and actual anthropometric measures (weight, height and BMI), on the other hand, categories concerning accuracy of weight and height perception were crossed, respectively, with categories concerning actual weight and height (Table 3); moreover, accuracy of weight and height perception were also crossed with categories concerning BMI (Table 2). Chi-square test and analysis of correct standardized residual were performed for each cross-tabulation.

Results show a significant relationship between weight perception and actual weight [$\chi^2(4, n = 572) = 247.15$, $P < 0.001$] and between height perception and actual height [$\chi^2(4, n = 572) = 184.40$, $P < 0.001$]. Particularly, children with a higher (>75th percentile) or lower (<25th) weight and height than the majority of the same age group tend to perceive their physical characteristics as closer to the mean ones, respectively, underestimating or overestimating their weight or height. Indeed, children with a higher weight perceived themselves as thinner than how they actually were, and shorter children perceived themselves as taller than how they actually were (Table 3).

Taking into consideration the relationship between accuracy in weight and height perception and BMI (Table 2), chi-square analyses show some significant differences in weight perception by BMI, $\chi^2(6, n = 572) = 54.57$, $P < 0.001$, but no differences are shown in height perception, $\chi^2(6, n = 572) = 4.70$, $P = 0.583$. In particular, the overestimation error is committed by a greater percentage of underweight children: about a quarter of them

Table 2. Cross-tabulations of adequacy of weight and height perception by BMI categories

BMI (OTF categories)	Accuracy of weight perception (%)			χ^2
	Underestimation	Accurate	Overestimation	
Underweight	0 (-3.0)	77 (1.4)	23 (2.2)	54.57*
Healthy weight	19 (-4.0)	67 (1.2)	14 (3.9)	
Overweight	42 (5.2)	56 (-2.5)	2 (-3.5)	
Obese	32 (1.2)	68 (0.7)	0 (-2.8)	
Accuracy of height perception (%)				
	Underestimation	Accurate	Overestimation	
Underweight	15 (0.7)	54 (-1.6)	31 (1.2)	4.70
Healthy weight	11 (-0.2)	69 (0.7)	20 (-0.7)	
Overweight	12 (0.4)	64 (-1.0)	24 (0.8)	
Obese	8 (-0.7)	75 (1.3)	17 (-0.9)	

Note. Adjusted standardized residuals appear in parentheses below row frequencies. In bold residuals > |1.98|.

*indicate significance at $P < 0.001$.

BMI, body mass index; OTF, Obesity Task Force.

		Accuracy of weight perception (%)			χ^2
		Underestimation	Accurate	Overestimation	
Actual weight	<25th percentile	0 (-7.1)	60 (-1.2)	40 (12.1)	247.15*
	25th–75th percentile	18 (-3.9)	78 (6.8)	4 (-5.0)	
	>75th percentile	55 (10.7)	45 (-6.03)	0 (-5.3)	
		Accuracy of height perception (%)			
		Underestimation	Accurate	Overestimation	
Actual height	<25th percentile	0 (-4.1)	43 (-6.2)	57 (10.2)	184.40*
	25th–75th percentile	5 (-4.8)	74 (3.2)	21 (0.0)	
	>75th percentile	27 (8.5)	72 (1.8)	0 (-8.5)	

Note. Adjusted standardized residuals appear in parentheses below row frequencies. In bold residuals > |1.98|.

*indicate significance at $P < 0.001$.

(23%) selected a higher weight than the actual one. A greater tendency to underestimate weight is instead present in overweight children who made this type of error more than normal weight and obese children: in particular, 42% of overweight children underestimated their weight compared with 32% of obese children and 19% of normal weight children.

Discussion

The results of this study indicate a high number of overweight and obese children in line with what has been shown by other studies in recent years (Gualdi-Russo *et al.* 2008; ISTAT 2011b). These findings are consistent with the present observed prevalence of childhood obesity in Italy (Spinelli *et al.* 2012) that represents a worrisome public health issue.

With regard to weight and height self-perception, about one-third of the children do not show accurate perception.

Only with regard to weight perception there are some differences in gender and age, but a better accuracy in self-perception for girls shown in other studies is not confirmed (Saxton *et al.* 2009). The self-perception errors mainly involve younger boys who tend to underestimate their weight more. In our opinion, this indicates a possible role of peer comparison processes in weight perception. Body perception depends in part on the comparison with peers' characteristic (Kay 2000; Maximova *et al.* 2008); it is hence likely that weight underestimation in the youngest can be partly due to an erroneous comparison with older children who are physically bigger.

Moreover, similarly to what was found by Saxton and colleagues (2009), a higher tendency for girls to overestimate their weight was not shown, while it happens at older ages. This suggests that overestimation is more likely to appear in girls during pre-adolescence in relation to the pubertal physical changes resulting in an increase in body fat.

Table 3. Cross-tabulations of adequacy of weight and height perception by, respectively, actual weight and height

With regard to the type of error made on physical self-perception, results show that children tend to overestimate their height and to underestimate their weight, probably to conform to an ideal model of height and thinness. This higher frequency of errors of height overestimation and of weight underestimation is consistent with what other studies show (Gardner *et al.* 1999) and it is probably linked to aesthetic models. As a matter of fact, while tall height is perceived positively, heavy weight is on the contrary not appreciated in most Western cultures (Mulasi-Pokhriyal & Smith 2010).

By relating the accuracy of self-perception with actual weight and height, a higher inaccuracy emerged for children who have weight and height that differ most from the average and who probably feel the need to be similar to the majority of their peers and classmates.

Although a misperception of height does not seem to have negative consequences for health, a misperception of weight could interfere with the adoption of behaviours deemed to modify health risk situations such as underweight, overweight and obesity (Gesell *et al.* 2010). The analysis of the relation between BMI and the accuracy in the perception of weight shows that as early as primary school age, there is a tendency for overweight and obese individuals to underestimate their weight. In addition, however, our results identify overweight children as the group most at risk of health problems because they have fewer probabilities to perceive the deviation of their weight from the average. In other words, the tendency to underestimate their weight could cause overweight children to not fully understand the possible negative health consequences of maintaining their actual weight and might represent an obstacle to enacting healthy weight control practices.

On the other hand, we found a non-negligible percentage of underweight children (about one-fifth) who tend to overestimate. This condition may constitute a risk particularly for girls

on the threshold of pre-adolescence in relation to the possible development of eating disorders or restrictive feeding practices, which could be detrimental to health (Cho *et al.* 2012).

Conclusions

Many studies in various disciplines (medicine, psychology, sociology and economics) have highlighted how overweight and obesity are a significant issue not only in terms of physical and mental health but also with regard to their huge economic and social impact. For this reason, different governments and the WHO promote overweight and obesity prevention programmes during childhood and adolescence, when it is easier to modify lifestyles compared with adulthood. Such programmes usually suggest strategies to favour a correct diet and adequate exercise (Kropski *et al.* 2008; Erdol *et al.* 2014). Generally, these programmes aimed at children do not have a more correct body perception among their aims. Our study highlights how the perception of one's own physical characteristics is important in particular in overweight children who tend to perceive themselves as less heavy. This incorrect weight perception might make intervention strategies to limit overweight less effective, as children themselves may not understand the meaning of their commitment in a less pleasant but healthier lifestyle (eating a lot of fruits and vegetables, doing constant exercise and spending less time in front of television and videogames).

Health education programmes need to take into consideration body size perception and, in particular, the tendency to underestimation (Gesell *et al.* 2010), and they could not limit themselves to give information on healthy nutrition and physical activity. Moreover, these interventions should not neglect the social importance attributed to physical characteristics and, in particular, to weight, especially in relation to the development of feelings of dissatisfaction with their bodies that at older ages prove to be not only related to the presence of eating disorders but also to a negative perception of the self and to various forms of psychological distress (Wallander *et al.* 2009; Cho *et al.* 2012). Finally, because the perception of children is often related to that of the adults closer to them, it would be appropriate to take into account the influence from adults, parents and teachers in particular, on body size perception (Gualdi-Russo *et al.* 2008; Mulasi-Pokhriyal & Smith 2010). Besides, adults should be encouraged to realistically assess their children's body mass, so that they do not neglect or mistakenly perceive the existence of problems related to weight. Children's lifestyles depend largely on the adults' choices made at home and at school.

Key messages

- Body perception in children could be socially influenced as shown by the tendency to underestimate weight and overestimate height.
- Inaccurate body perception was related to a tendency to perceive one's body characteristics as close as possible to the mean.
- Obese and overweight children underestimate their weight.
- The incorrect weight perception could frustrate the understanding of the need to modify weight in situations of underweight, overweight and obesity.
- Health education programmes need to take into consideration body size perception and in particular the underestimation of weight.

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