



Weight status and perceived body size image in overweight and obese children 8–12 years old

Doaa K. Hussin, Ibrahim H. Mohammad, Hamad A. Al-Hamad, Gamal Makboul & Medhat Elshazly

To cite this article: Doaa K. Hussin, Ibrahim H. Mohammad, Hamad A. Al-Hamad, Gamal Makboul & Medhat Elshazly (2011) Weight status and perceived body size image in overweight and obese children 8–12 years old, Alexandria Journal of Medicine, 47:4, 365-371, DOI: [10.1016/j.ajme.2011.07.013](https://doi.org/10.1016/j.ajme.2011.07.013)

To link to this article: <https://doi.org/10.1016/j.ajme.2011.07.013>



© 2011 Alexandria University Faculty of Medicine. Production and hosting by Elsevier B.V. All rights reserved.



Published online: 17 May 2019.



Submit your article to this journal [↗](#)



Article views: 112



View related articles [↗](#)



Citing articles: 1 View citing articles [↗](#)



ORIGINAL ARTICLE

Weight status and perceived body size image in overweight and obese children 8–12 years old

Doaa K. Hussin, Ibrahim H. Mohammad, Hamad A. Al-Hamad, Gamal Makboul, Medhat Elshazly *

Medical Research Institute Alexandria University, Community Medicine, Horeya Street, Ibrahimia, Alexandria, Egypt

Received 7 June 2011; accepted 17 July 2011

KEYWORDS

Children;
Obesity;
Body image

Abstract *Background:* Young people's perception of their weight status attracted much interest. With a better understanding of childhood body image problems, investigating prevention programs within schools is an important next step.

Objective: The aim of the study was to investigate body size perception in school children using verbal descriptor and BMI-calibrated visual-matching methods to examine associations between perceived and actual body size.

Methods: The subjects of this study were 106 school students (8–12 years old) from Khaldia region in Kuwait. Cross-sectional data on height, weight, and body image were collected in the classroom. Only overweight and obese children were assigned to participant with BMI percentile values for age and sex of >85 to <95 and BMI >95, respectively. Students selected a figure to represent their current images. Body image was measured using a body image tool with a sequence of seven body silhouettes progressing from very thin to overweight.

Results: The results revealed that both verbal and visual scales overestimate overweight and underestimate obese ones. There is a predominance of underestimation rather than overestimation, especially in girls. Visual-matching could be considered a more precise measure of body size perception than verbal, which could explain the greater sensitivity to sex differences. Parents in general and of girls specific underestimate the size of their children than boy's parents. The perception of friends of body size was underestimated. The majority of obese and overweight attributed their conditions to eating more foods. Those trying to lose weight did this through both reduction of amount of food.

* Corresponding author. Tel.: +20 123256276.
E-mail address: medhat_shazly@hotmail.com (M. Elshazly).



Conclusions: These results indicated that children can estimate their body size with visual-matching and verbal-rating methods, but the degree of precision was more accurate by visual one. The verbal scale showed a tendency for children of all sizes to perceive themselves as normal or overweight.

© 2011 Alexandria University Faculty of Medicine. Production and hosting by Elsevier B.V. All rights reserved.

1. Introduction

Childhood overweight and obesity is an international problem, with 10% of school age children estimated to be overweight.^{1,2} In the United Kingdom, obesity in children increased from 9.9% in 1995 to 13.7% in 2003.³ Although the UK government has set an ambitious target of stopping this escalating trend by 2010, a recent publication forecasts that there could be further increases, with 19% of boys and 24% of girls aged under 10 predicted to be obese by 2010.⁴

Obese children are more likely to become obese adolescents, and obese adolescents are more likely to become obese adults.⁵ Obesity has numerous health-related sequelae, as well as social consequences, such as lower wages, less likelihood of marriage, less education, and stigma.^{6,7} In addition, social forces, such as gender and socioeconomic status, have been associated with an increased likelihood of obesity among youth.^{8–10}

Maloney and O'Dea in their study focused on the idea that body image distortion is prevalent in the schools. They addressed the idea of Health Promoting Schools. This is based on the concept that education and health are inter-related. This means that without health, it becomes difficult to successfully learn. On the other hand, it also means that learning is an essential factor for one to be healthy. With a better understanding of childhood body image problems, investigating prevention programs within schools is an important next step.¹¹

Young people's perception of their weight status attracted much interest during peak concern about eating disorders, but is now being revisited in light of the obesity epidemic.¹² Two studies observed the adult pattern of overestimation in young women and underestimation in young men using verbal scales,^{13,14} but a recent study on overweight adolescents showed that they underestimated their weight, with no sex differences.¹⁵ Another study using verbal and visual scales found almost half the boys and one-third of girls underestimated their size.¹⁶

Several studies have shown clearly that obese adolescents become targets of early and systematic discrimination, and they are ranked lowest as those with whom their peers would like to be friends. Furthermore, they are more prone to develop a negative self-image, which appears to persist into adulthood, and low self-esteem.¹⁷ Obese adolescents with decreasing levels of self-esteem demonstrated significantly higher rates of sadness, loneliness and nervousness, and were more likely to engage in high-risk behaviors such as smoking or consuming alcohol.¹⁸

Evidence seems to suggest that in the 20th century, high-fat food intake has increased and that at the same time, energy expenditure has declined due to increasingly sedentary lifestyles.¹⁹ It is known that obesity is environmentally influenced in part and that a sedentary lifestyle and sustained physical inactivity may be risk factors for obesity in youth.

The present study investigated body size perception in a group of school children 8–12 years old using verbal descriptor and BMI-calibrated visual-matching methods to examine asso-

ciation between perceived and actual body size in Khaldia region, Kuwait.

2. Methods

2.1. Design and setting

The present work is a cross-sectional survey that was conducted from October to December 2010 in the Khaldia region in Kuwait. Three schools were randomly selected from the official national list of public schools in the region, stratified by gender, in each grade. After selecting two classes in different grades in each school, all children 8–12 years old and classified as overweight or obese according to age and gender specific cut-offs of BMI for children were invited to participate in the study.

Baseline evaluation occurred if the child was documented or reported to be greater than the 90th percentile weight for height relative to his or her age. Children were recruited using letters sent to parents of children identified as overweight by chart reviews. Recruitment effort yield 106 children out of 120 children, 46 girls and 60 boys, provided data for this analysis with 88.3% response rate.

All families provided written informed consent to participate. Parents and the child attended separate interview at their preferred choice of location.

2.2. Study questionnaires

The questionnaire was derived from other published studies dealing with the same topic as well as from our own experience. The questionnaire consisted of two parts. The first one includes personal and demographic characteristics (age and gender of the child, family income, and parental education). In the second part included the child and parental measurements (height and weight), perceived body image (verbal and visual) by child him/herself, parents and friends, and questions about trials and methods of losing weight if any.

2.3. Measurements

Anthropometric measurements were taken by trained researchers using standard protocols. The height of each parent and child was measured to the nearest millimeter without shoes using a Harpenden stadiometer. Each child was weighed to the nearest tenth of a kilogram in light clothing without shoes using Tanita Digital Medical scales.

Body mass index (weight in kg/height in m²) was calculated for the children and parents. Body mass index (BMI) for parents was calculated based on self-reported weight and height. While these for children according to their measurements. Child BMI values were then converted into age and sex appropriate BMI-for-age percentile for each subject using CDC/NCHS BMI-for-age percentile growth chart for children

(2–20 years).²⁰ According to American Medical Association we classified children with a BMI at ≥ 95 th percentile as “obese” and those with a BMI between the 85th and 95th percentiles as “overweight.”²¹

2.4. Children's body image scale

The children's body image scale (CBIS)²² consists of seven gender-specific figures posed in the anatomical position. Each figure is a modified photograph of an anonymised, pre-pubescent boy or girl with a BMI within the specified range for one of seven National Center for Health Statistics (NCHS) percentiles (3rd–97th) for 10 year olds.²³ Figures are horizontally arranged in ascending order of adiposity and labelled from ‘A’ to ‘G’ (alphabetical labels were converted into numbers from ‘1’ to ‘7’, respectively, for analysis). “Perceived body size” is assessed by asking the child to identify the figure most similar in size to him. Because CBIS figures denote gender and age-specific BMI ranges, each child's BMI, unadjusted for age/gender, was used to determine the figure closest to his size (“actual body size”).

The accuracy of perceived size was calculated by subtracting the “actual” figure number from the “perceived” (score range –6 to +6). Negative scores indicate underestimation, zero accurate selection and positive scores overestimation of size.

We also administered a verbal descriptor scale for perceived body size, with one item: “do you think your body is: thin, normal, overweight, or obese”.

2.5. Data management and statistical analysis

Although the body image measures produce ordinal data, they were treated as interval in line with previous research using the CBIS^{22,24} and other widely used verbal and visual body image scales to enable comparability of findings.^{25–27} The Statistical Package for Social Sciences (SPSS-9) was used for data pro-

cessing. Simple descriptive statistics were used (mean \pm standard deviation for quantitative variables, and frequency with percentage distribution for categorized variables). Bivariate associations were examined using Chi-square tests for categorical variables and student *t* test for quantitative variables.

3. Results

Among 106 children in the study boys outnumbered girls (56.6% versus 43.4%, respectively), their age ranges from 8 to 12 years with a mean = 10.0 ± 1.4 years. The majority of the study sample were obese children (94.3%) and the remaining were overweight (5.7%) according to their BMI for age percentiles. There were no statistically significant differences between boys and girls regarding the mean BMI of the child, father or mother. Also, no statistical difference was detected regarding the family income. Parental education (father and mothers) was higher among boys than girls (Table 1).

3.1. Verbal perception of body size

When the child was asked about how he/she identifies his/her body size, 42.4% of all children mentioned that they are thin or normal, 39.6% reported that they are overweight, and only 17.9% considered themselves as obese. Regarding gender difference higher percentages of girls considered their body size thin or normal than boys, while higher proportions of boys perceived their body size as overweight and obese than girls, a difference was statistically significant ($P = 0.010$) (Table 2).

As regards parental perception of child's body size, about one third of parents considered the body size of their children normal (29.2%), 42.5% considered them overweight and 28.3% obese. Parents of girls underestimated the size of their children than boy's parents, whereas 50% of girls' parents perceived that the body size of their child normal compared to only 13.3% of boys' parents. The reverse was observed regarding parental perception of overweight and obese children. The

Table 1 Sample demographic and anthropometric characteristics.

Variables	Male (<i>n</i> = 60)		Female (<i>n</i> = 46)		Total (<i>n</i> = 106)		Significance	
	Mean \pm SD		Mean \pm SD		Mean \pm SD		Test	<i>P</i>
Age	10.5 \pm 1.4		9.2 \pm 1.1		10.0 \pm 1.4		<i>t</i> = 5.22	< 0.001
Child BMI	25.7 \pm 4.3		26.6 \pm 4.6		26.1 \pm 4.4		<i>t</i> = 1.14	0.26
Father BMI	28.3 \pm 2.5		28.1 \pm 2.0		28.2 \pm 2.3		<i>t</i> = 0.52	0.60
Mother BMI	27.3 \pm 3.2		28.1 \pm 2.1		27.6 \pm 2.8		<i>t</i> = 1.53	0.13
Percentile	95.7 \pm 1.8		96.4 \pm 1.6		96.0 \pm 1.7		<i>t</i> = 2.07	0.04
	No.	%	No.	%	No.	%		
<i>Father education</i>								
Less than university	9	15.0	8	17.4	17	16.0	$\chi^2 = 19.26$	< 0.001
University	31	51.7	38	82.6	69	65.1		
Higher	20	33.3	0	0.0	20	18.9		
<i>Mother education</i>								
Less than university	9	15.0	9	19.6	18	17.0	$\chi^2 = 10.59$	0.005
University	36	60.0	36	78.3	72	67.9		
Higher	15	25.0	1	2.2	16	15.1		
<i>Family income</i>								
700–1500	4	6.7	4	8.7	8	7.5	Fischer exact	0.73
> 1500	56	93.3	42	91.3	98	92.5		

Table 2 Verbal perception of body size by the participating children, parents and friends.

Variables	Male (<i>n</i> = 60)		Female (<i>n</i> = 46)		Total (<i>n</i> = 106)		Significance
	No.	%	No.	%	No.	%	
<i>Child perception</i>							
Normal or thin	18	30.0	27	58.6	45	42.4	$X^2 = 9.04$
Over weight	28	46.7	14	30.4	42	39.6	$P = 0.01$
Obese	14	23.3	5	10.9	19	17.9	
<i>Parental perception</i>							
Normal or thin	8	13.3	23	50.0	31	29.2	$X^2 = 17.24$
Over weight	30	50.0	15	32.6	45	42.5	$P = 0.001$
Obese	22	36.7	8	17.4	30	28.3	
<i>Friends perception</i>							
Normal or thin	25	41.7	31	67.4	56	52.8	$X^2 = 6.93$
Over weight	17	28.3	7	15.2	24	22.6	$P = 0.03$
Obese	18	30	8	17.4	26	24.5	

difference was statistically significant ($P = 0.001$). Moreover, perception of friends of body's size was underestimated. More than a half of children reported that their friends perceived their body size as thin or normal (52.8%), friends of the participating girls underestimated the size in a higher proportion than boys (67.4% compared to 41.7%, respectively ($P = 0.03$) (Table 2).

3.2. Visual perception of body size

When the children were asked to identify the figure most similar in size to them, 2.8% chose the very thin one, 0.9% chose thin, 10.4% chose the normal size figure, 42.4% chose the overweight figures and 46% chose the obese figures. The differences in visual perception between boys and girls were statistically insignificant as shown by the difference in P values shown in Table 3.

Table 4 reveals the different perceptions of body size by the study children. Despite that there was no actual thin or normal body size among the study sample of children, 42.4% of children perceived their body size either thin or normal when they asked verbally, while only 14.1% perceived the same when they identify their sizes from the figures, the difference between verbal and visual perception was statistically significant ($P < 0.001$).

The overall actual overweight among the study sample was 5.7%, according to verbal and visual perception, the children overestimate also the proportion of overweight when they

asked or saw the figures of body size, 39.6% considered themselves overweight verbally compared to 42.5% of visual perception, the differences between verbal and visual perception and between boys and girls were statistically insignificant as shown by the different P values.

Actual obesity in our study was 94.3%, boys as well as girls underestimate their body sizes regarding obesity. The actual proportion of obese boys in the study sample was 93.3%, only 13.3% perceived themselves as obese when they asked verbally, while 40.0% perceived the same when they chose their body sizes visually from the figures. Similarly, the verbal and visual perception for girls was 10.9% and 47.8%, respectively compared to the actual proportion of obesity among girls 95.7%. The underestimation of obesity is higher for both verbal and visual perception of children. However, under estimation was higher for verbal than visual perception.

Table 5 showed that among 61 children considered themselves obese or overweight, when the child was asked why he or she think that they are obese, the majority of them attributed this for eating more foods (42.6%), 18.0% related this to genetic factors and only 3.3% reported that the cause is lack of exercise performing. On the other hand, 93.4% of the same group of children answered yes when they were asked about their trials of losing weight. Among those answered yes, 33.3% tried to lose weight through reducing the amount of food they eat, 21.1% through escaping one or more meals per day, 12.3% through performing exercise only and a third through both reduction of amount of food and exercise (33.3%).

Table 3 Visual perception of body size by participating children using children body image scale (CBIS) figures.

CBIS	Male (<i>n</i> = 60)		Female (<i>n</i> = 46)		Total (<i>n</i> = 106)		Significance (P)
	No.	%	No.	%	No.	%	
A	1	1.7	2	4.3	3	2.8	0.83
B	0	0.0	1	2.2	1	0.9	0.88
C	6	10.0	5	10.9	11	10.4	0.87
D	12	20.0	9	19.6	21	19.8	0.85
E	17	28.3	7	15.2	24	22.6	0.17
F	13	21.7	16	34.8	29	27.4	0.20
G	11	18.3	6	13.0	17	16.0	0.64

Table 4 Comparison between actual body size with verbal and visual perceived size.

Type of perception	Actual body image		Verbal perception		Visual perception		Significance <i>P</i>
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
<i>Normal or thin</i>							
Male	0	0	18	30.0	7	11.7	0.03
Female	0	0	27	58.6	8	17.4	<0.001
Total	0	0	45	42.4	15	14.1	<0.001
<i>Overweight</i>							
Male	4	6.7	28	46.7	29	48.3	0.99
Female	2	4.3	14	30.4	16	34.8	0.82
Total	6	5.7	42	39.6	45	42.5	0.77
<i>Obese</i>							
Male	56	93.3	14	13.3	24	40.0	0.002
Female	44	95.7	5	10.9	22	47.8	0.003
Total	100	94.3	19	17.9	46	43.4	<0.001

Table 5 Obesity causes perceived by the children and trials for losing weight.

Causes and trials	Male		Female		Total		Significance <i>P</i>
	No.	%	No.	%	No.	%	
<i>Perception causes of obesity and overweight</i>							
Genetic	8	19.0	3	15.8	11	18.0	0.95
Eating more food	15	35.7	11	57.9	26	42.6	0.18
Lack of exercise	1	2.4	1	5.3	2	3.3	0.85
All of the above	18	42.9	4	21.1	22	36.1	0.18
Total	42	100.0	19	100.0	61	100.0	
<i>Trials for losing weight</i>							
Yes	38	90.5	19	100.0	57	93.4	0.41
No	4	9.5	0	0.0	4	6.6	0.41
Total	42	100.0	19	100.0	61	100.0	
<i>Trial methods for reducing weight</i>							
Reduce the amount of food	9	23.7	10	52.6	19	33.3	0.06
Escape one or more meal	12	31.6	0	0.0	12	21.1	0.02
Exercise only	4	10.5	3	15.8	7	12.3	0.88
Reducing the amount of food and exercise	13	34.2	6	31.6	19	33.3	0.92
Total	38	100.0	19	100.0	57	100.0	

4. Discussion

The current study attempted to investigate the accuracy of body size perception in 8–12 year old preadolescent children using verbal and visual scale methods. Recent studies have been working toward the development of a pictorial scale that is a more accurate measure of body image in young children. Paxton and Truby, in their study, concluded that the CBIS was a reliable instrument for children of both genders, and that these results have offered the CBIS as a tool in the use of future body image studies.²⁸

The current study revealed that both verbal and visual scales overestimate overweight and underestimate obese ones. The accuracy of body size perception using visual matching varied with weight status. Obese children were more likely to identify a figure smaller than their own, but the majority of the obese children showed a striking tendency towards underestimation of size, particularly obese girls. This results of both

verbal and visual perception of body size suggested general unawareness of body size in boys and girls.

The differences between verbal and visual perception could be explained by the fewer response options available with the verbal scale compared with the visual one, although few children chose the extreme figures on the visual scale.^{4,7} Girls may be more reluctant than boys to use these terms of themselves. Both thin and fat images are described more negatively in similar studies than mid-range figures by children around this age, and children may choose not to self-identify with stigmatized body sizes.^{29,30} However, using the visual task, the most frequently chosen figures represented the thin, normal, and overweight centiles. This suggested a genuine underestimation of size, whether the judgment is absolute or relative. These results also indicated that visual-matching task can be considered a more precise measure of body size perception than verbal, which could explain the greater sensitivity to sex differences. The predominance of underestimation rather than

overestimation, especially in girls, is surprising given the wide spread assumption that most girls feel normal or overweight, regardless of their true size. Our results are similar to the findings of other studies indicating widespread underestimation of body size, which is more pronounced in overweight/obese individuals.^{13,31,32}

Many parents of overweight or obese children did not perceive their children to be obese.^{33–37} The results of the current study revealed that parents in general, and of girls specific, underestimate the size of their children. This is consistent with Baughcum et al. who found that a high percentage of parents failed to view their children as they are.³⁸

Body size misperception could influence the perceived relevance of health recommendations and the efficacy of weight management interventions.²⁵ In children of this age, parents are the main gatekeepers of lifestyle change, and they also underestimate their children's weights.³⁹ However, weight-status misperception may make prevention efforts more difficult. Parents are unlikely to initiate action to prevent overweight or obesity if the weight status of a child is not perceived as problematic or if parents do not consider the link between obesity and the possibility of current or future adverse health outcomes for their children.^{35,40} These findings suggest that excess weight is not only a major health problem in Kuwaiti families but one that is not recognized within the families as a problem, possibly because of misperception of what constitutes an obese status. Thus, public health education should focus on providing Kuwaiti parents with information about weight guidelines for themselves and their children.

The literature has also noted that peer influence may play a role in child body perception. Teasing and joking can be hurtful in any situation, especially when dealing with body image. In their study on children perceived and ideal body image, Friedman et al. reported findings that may seem contradictory to this.⁴¹ However, the results of the present study indicated that perception of friends of body size was underestimated, more than one half of children reported that their friends perceived their body size as normal. Moreover, friends of the participating girls underestimated the size in a higher proportion than boys. Studies have shown an increase in peer influences on eating and exercise behavior with increasing age among children and adolescents, thus potentially diminishing the parental influences.^{42,43}

The current study revealed that among those considered themselves obese or overweight, the majority of them attributed this to eating more foods, and 36.1% related this to multiple causes as genetic factors and lack of exercise performing. The majority of those trying to lose weight did this through both reduction of amount of food and exercises others through reducing the amount of food they eat and through escaping one or more meals per day.^{42,6}

Children own perceptions ought to be considered if weight management practices are to be taken forward into later childhood. Whereas young children do not consider their weight and associated management in the same way as older children or adults, the inclusion of sensitive weight feedback has been shown to be beneficial to weight management in a similar age group and could be adapted for specialists of health education.⁴⁴ Understanding of the magnitude of body size misperception using the CBIS could be a useful adjunct to delivering the most appropriate and individualized feedback strategy.

As described by other authors, a vast number of associations between overweight/obesity and psychosocial factors was found.^{45,46} Therefore, factors that underlie the misperception and the cultural context in which they develop need to be examined.

Since most obese children remain obese as adults, this age group is a very important group to reach through preventive programs addressing issues of health promotion, including body satisfaction, sociability, diet and sedentary lifestyles. One of the implications of these results is the need for early identification, assessment and management of adolescents who exceed a healthy weight for height, gender and age, which would enable us to start prevention and management of child overweight and obesity earlier, thus decreasing the potential for associated medical and psychosocial problems.

5. Conclusion

Children can estimate their body size with visual-matching and verbal-rating methods, but the degree of precision is more accurate with visual one. Findings from the verbal scale showed a tendency for children of all sizes to perceive themselves as "just right". With the visual task it was clear that most children, especially in the heavier groups, saw themselves as thinner than they were.

References

1. Lobstein T, Baur L, Uauy R. Obesity in children and young people: a crisis in public health. *Obes Rev* 2004;**5**:4–85.
2. World Health Organization. Global strategy on diet, physical activity and health: obesity and overweight. Geneva: WHO; 2006.
3. Jotangia D, Moody A, Stamatakis E, Wardle H. *Obesity among children under 11*. London: National Centre for Social Research; 2005.
4. Zaninotto P, Wardle H, Stamatakis E, Mindell J, Head J. *Forecasting obesity to 2010*. London: National Centre for Social Research/Department of Health; 2006.
5. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med* 1997;**337**:869–73.
6. Gortmaker SL, Must A, Perrien JM, Sobol AM, Dietz W. Social and economic consequences of overweight in adolescence and young adulthood. *N Engl J Med* 1993;**329**:1008–12.
7. Sargent JD, Blanchflower DG. Obesity and stature in adolescence and earnings in young adulthood. *Arch Pediatr Adolesc Med* 1994;**148**:681–7.
8. Goodman E. The role of socioeconomic status gradients in explaining differences in US adolescents' health. *Am J Public Health* 1999;**89**:1522–8.
9. Sobal J, Strunkard AJ. Socioeconomic status and obesity: a review of the literature. *Psychol Bull* 1989;**105**:260–75.
10. Troiano RP, Flegal KM. Overweight children and adolescents: description, epidemiology, and demographics. *Pediatrics* 1998;**101**:497–505.
11. Maloney D, O'Dea J. Preventing eating and body image problems in children and adolescents using the health promoting schools framework. *J Sch Health* 2000;**70**:18–21.
12. Farrell C, Lee M, Shafran R. Assessment of body size estimation: a review. *Eur Eat Disord Rev* 2005;**13**:75–88.
13. Brener ND, Eaton DK, Lowry R. The association between weight perception and BMI among high school students. *Obes Res* 2004;**12**:1866–74.

14. Xie B, Chih-Ping C, Spruijt-Metz D. Weight perception and weight-related sociocultural and behavioral factors in Chinese adolescents. *Prev Med* 2006;**42**:229–34.
15. Edwards N, Pettingell S, Borowsky I. Where perception meets reality: self perception of weight and weight-related behaviours in a nationally representative sample of overweight adolescents. *Pediatrics*, in press.
16. Chaimovitz R, Issenman R, Moffat T. Body perception: do parents, their children, and their children's physicians perceive body image differently? *J Pediatr Gastroenterol Nutr* 2008;**47**: 76–80.
17. Stunkard A, Burt V. Obesity and the body image. Age at onset of disturbances in the body image. *Am J Psychiatry* 1967;**123**:1443–7.
18. Strauss RS. Childhood obesity and self-esteem. *Pediatrics* 2000;**105**:1–5.
19. Martinez-Gonzales MA, Martinez JA, Hu FB. Physical inactivity, sedentary lifestyle and obesity in the European Union. *Int J Obes Rel Metab Disord* 1999;**23**:1192–201.
20. CDC. National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion. 2 to 20 years: Body mass index-for-age percentiles; 2000.
21. Barlow SE. Expert committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics* 2007;**120**:S164–92.
22. Truby H, Paxton SJ. Development of the children's body image scale. *Br J Clin Psychol* 2002;**41**:185–203.
23. Hamill PV, Drizd TA, Johnson CL. Physical growth: National Center for Health Statistics percentiles. *Am J Clin Nutr* 1979;**32**: 607–29.
24. Truby H, Paxton SJ. The children's body image scale: reliability and use with international standards for body mass index. *Br J Clin Psychol* 2008;**47**:119–24.
25. Maximova K, McGrath JJ, Barnett T. Do you see what I see? Weight status misperception and exposure to obesity among children and adolescents. *Int J Obes* 2008;**32**:1008–15.
26. Wardle J, Marsland L. Adolescent concerns about weight and eating; a social-development perspective. *J Psychosom Res* 1990;**34**:377–91.
27. Collins ME. Body figure perceptions and preferences among preadolescent children. *Int J Eat Disord* 1991;**10**:199–208.
28. Paxton S, Truby H. Development of the children's body image scale. *Br J Clin Psychol* 2002;**41**:185–203.
29. Wardle J, Volz C, Golding C. Social variation in attitudes to obesity in children. *Int J Obes* 1995;**19**:562–9.
30. Margulies AS, Floyd RG, Hojniski RL. Body size stigmatization: an examination of attitudes of African American preschool-age children attending Head Start. *J Pediatr Psychol* 2008;**33**: 487–96.
31. Johnson-Taylor WL, Fisher RA, Hubbard VS. The change in weight perception of weight status among the overweight: comparison of NHANES III (1988–1994) and 1999–2004 NHANES. *Int J Behav Nutr Phys Activity* 2008;**5**:9–14.
32. Inoue M, Toyokawa S, Miyoshi Y. Degree of agreement between weight perception and body mass index of Japanese workers: MY health up study. *J Occup Health* 2007;**49**:376–81.
33. Maynard LM, Galuska DA, Blanck HM, Serdula MK. Maternal perceptions of weight status of children. *Pediatrics* 2003;**111**(5 pt 2): 1226–31.
34. Adams AK, Quinn RA, Prince RJ. Low recognition of childhood overweight and disease risk among Native-American caregivers. *Obes Res* 2005;**13**:146–52.
35. Young-Hyman D, Herman LJ, Scott DL, Schlundt DG. Care giver perception of children's obesity related health risk: a study of African American families. *Obes Res* 2000;**8**:241–8.
36. May AL, Donohue M, Scanlon KS. Child-feeding strategies are associated with maternal concern about children becoming overweight, but not children's weight status. *J Am Diet Assoc* 2007;**107**: 1167–75.
37. Watkins MG, Clark KM, Foster CM, Welch KB, Kasa-Vubu JZ. Relationships among body mass index, parental perceptions, birth weight and parental weight after referral to a weight clinic. *J Natl Med Assoc* 2007;**99**:908–13.
38. Baughcum AE, Chamberlin LA, Deeks CM, Powers SW, Whitaker RC. Maternal perceptions of overweight preschool children. *Pediatrics* 2000;**106**:1380–6.
39. Miller JC, Grant AM, Drummond BF. DXA measurements confirm that parental perceptions of elevated adiposity in young children are poor. *Obesity* 2007;**15**:165–71.
40. Levine M, Schermer F, Smolak L. Parental input and weight concerns among elementary school children. *Int J Eat Disord* 1999; **25**:263–71.
41. Friedman B, Gardner R, Jackson K. Hispanic and White children's judgments of perceived and ideal body size in self and others. *Psychol Rec* 1999;**49**:555–64.
42. Adams K, Sargent R, Thompson S, Richter D, Corwin S, Rogan T. A study of body weight concerns and weight control practices of 4th and 7th grade adolescents. *Ethn Health* 2000;**5**:79–94.
43. Gifford-Smith M, Dodge K, Dishion T, McCord J. Peer influence in children and adolescent: crossing the bridge from developmental to intervention science. *J Abnorm Child Psychol* 2005;**33**:255–65.
44. Bibeau WS, Moore JB, Caudill P. Case study of a transtheoretical case management approach to addressing childhood obesity. *J Pediatr Nurs* 2008;**23**:92–100.
45. Dietz WH. Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatrics* 1998;**518**–25.
46. Jonides L, Buschbacher V, Barlow S. Management of child and adolescent obesity: psychological, emotional, and behavioural assessment. *Pediatrics* 2002;**110**:215–21.