Infant and Child Development
Inf. Child. Dev. **24**: 365–378 (2015)
Published online 8 November 2014 in Wiley Online Library
(wileyonlinelibrary.com). DOI: 10.1002/icd.1894

Obesity Bias in Children: The Role of Actual and Perceived Body Size

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The aim of this study was to examine how children perceive their body size and whether their actual or perceived body size can explain their anti-fat views. Four hundred and fourteen 5–6, 7–8 and 9–10-year-old children were read short vignettes depicting two characters, one possessing a positive and the other a negative quality. Following each vignette, participants were asked to pick the story characters among thin, average and obese figures. Obesity bias was defined as the attribution of the positive quality to the thin or average figure and the corresponding negative one to the obese. Body mass index determined children's actual body size. Perceived body size was determined with the use of Collins' (1991) figures of increasing size. The results showed that actual body size affected the accuracy of perceived body size. While the majority of average children were accurate at identifying their body size, most overweight and obese children tended to underestimate it. The accuracy of body size perception improved with age. Obesity bias did not relate to children's actual but to their perceived body size: Those who perceived themselves as heavier exhibited less bias. The implications of the findings are discussed in relation to children's developing identity, and suggestions are made for future research. Copyright © 2014 John Wiley & Sons, Ltd.

Key words: body-weight stereotypes; obese children; obesity bias; perceived body size

Obesity has been described as 'one of the most stigmatizing and least socially acceptable conditions in childhood' (Schwimmer, Burwinkle, & Varni, 2003, p. 1818). Obese figures are the least liked among those with physical differences and disabilities, and children evaluate them negatively for their personality and behavioural characteristics (Latner, Simmonds, Rosewall, & Stunkard, 2007; Latner & Stunkard, 2003; Sigelman, Miller, & Whitworth, 1986). Heavy figures, when compared with average or thin, are assigned negative social and interpersonal

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attributes: Children consider them to be lazy, sad, mean, weak, less intelligent and academically competent, and more teased by others (Brylinsky & Moore, 1994; Powlishta, Serbin, Doyle, & White, 1994). Besides, they are perceived as being unhealthy, unfit and with poor eating habits (Hill & Silver, 1995).

Several factors have been associated with children's anti-fat views. Between them, age, gender and body size are the most extensively studied (see Puhl & Latner, 2007, for a review). There is no doubt that the onset of obesity bias is located in the preschool years (Cramer & Steinwert, 1998; Spiel, Paxton & Yager, 2012) and that anti-fat views are well established during school years (Brylinsky & Moore, 1994; Klaczynski, Daniel, & Keller, 2009). Weight stereotyping has been reported both in boys and girls, but some studies have found that there are stronger anti-fat views among girls (Holub, 2008; Koroni, Garagouni-Areou, Roussi-Vergou, Zafiropoulou, & Piperakis, 2009; Latner & Stunkard, 2003).

Body size is, surprisingly, a factor that does not appear to be associated to children's anti-fat views. Studies examining how their participants' body size related to the liking of obese targets either did not report any association (Counts, Jones, Frame, Jarvie, & Strauss, 1986; Cramer & Steinwert, 1998; Davison & Birch, 2004; Holub, 2008; Kraig & Keel, 2001; Latner et al., 2007; Lerner & Korn, 1972) or reported a limited one (Hill & Silver, 1995). Overweight and obese children were as likely to endorse weight stereotypes as their average peers. This recurring finding is rather unexpected for at least two reasons. First, it goes against the central tenet of the Social Identity Theory (SIT) that posits that people are more positive towards their 'in-group' members as they are perceived to be more similar (Tajfel & Turner, 1979, 1986). Hence, obese children are expected to show favouritism towards their in-group members or at least to exhibit less anti-fat views than the thin or average weight children. Second, this finding contradicts a growing body of research with obese adults. A large scale study of 4238 adults across a wide range of body weights found that the amount of explicit and implicit weight bias decreased as body weight increased (Schwartz, Vartanian, Nosek, & Brownell, 2006). A subsequent study verified this finding and showed that young adults with high body mass index (BMI) displayed lower levels of implicit anti-fat attitudes (O'Brien, Hunter, Halberstadt & Anderson, 2007). Thus, it was considered worth investigating why obese children do not defend their 'in-group' identity as obese adults do.

The aim of this study is to examine the influence of a relatively understudied factor, perceived body size, on children's anti-fat views. It is possible that obese children underestimate their body size and thus do not perceive themselves as being obese. Subsequently, as the SIT postulates, they identify with the thin or average-sized groups who do not favour excess weight. Therefore, it is critical to examine children's anti-fat views not only in relation to their actual, but also in relation to their perceived, body size.

A number of studies suggest that children, and especially those with excess weight, systematically underestimate their body size when asked to identify themselves among figures of increasing size (see Dunphy-Lelii, Hooley, McGivern, Guha, & Skouteris, 2014, for a review). Cramer and Steinwert (1998) found that obese preschool children were the most inaccurate and were more likely to classify themselves as thin than as chubby. In a recent study by Saxton, Hill, Chadwick, and Wardle (2009), over 90% of the overweight and obese children picked as their perceived self a figure with a BMI that was substantially smaller than their own.

Body size recognition is gradually developing with age. Several studies reported a weak or no association between BMI and perceived body size at

DOI: 10.1002/icd

preschool age (Ambrosi-Randić, 2000; Holub, 2008; Musher-Eizenman, Holub, Edwards-Leeper, Persson, & Goldstein, 2003). This association becomes increasingly stronger in middle childhood, as children become more accurate in their body size judgments (Collins, 1991; Truby & Paxton, 2002). Children's gender has also been pointed out as a factor influencing children's body size perception, but research has yielded mixed findings. Some studies have shown that girls are more accurate than boys (Collins, 1991; Truby & Paxton, 2002); others have found the reverse pattern (Ambrosi-Randić, 2000; Holub, 2008) or have reported no gender effect (Williamson & Delin, 2001).

Some support for the idea that perceived and not actual body size might relate to children's weight-related attitudes is provided by a few studies with preschool children. Holub (2008) found that children who perceived themselves as larger assigned less negative characteristics to overweight figures. However, Spiel et al. (2012) failed to replicate this finding and reported instead that perceived body size did not affect the assignment of negative characteristics but the assignment of the positive ones (children who perceived themselves as heavier attributed more positive qualities to larger figures). These findings direct our attention to the role of perceived body size and call for further exploration. Most importantly, the aforementioned studies failed to examine how overweight or obese children perceived their body size and how their self-perception related to their anti-fat views. In fact, the overweight/obese children were underrepresented in Spiel et al.'s (2012) study (there were only three), while in Holub's (2008) study, their number is not reported.

Thus, the aims of this study were as follows: (i) To investigate how children of various body builds perceive their body size, and (ii) examine whether children's actual or perceived body size relates to their anti-fat views. (iii) In addition, we were particularly interested in how the overweight and obese children perceived themselves and whether their body size perception related to their anti-fat attitudes.

Based on the findings of earlier research, it was anticipated as follows: (i) Children would tend to underestimate their body size. Underestimation was expected to be particularly evident among the overweight and obese children. (ii) Perceived body size, and not actual body size, was expected to relate to children's anti-fat views: The heavier the children perceived themselves, the less obesity bias they were expected to hold. (iii) Obesity bias was expected to be less only among the overweight and obese children who perceived their excess weight.

The study had a developmental perspective, and thus, it examined the associations between obesity bias, and actual and perceived body size in three age groups of children aged 5–6, 7–8 and 9–10 years, respectively. Earlier studies investigating body size identification have shown that body size recognition improves with age. Based on this evidence, it was hypothesized that with older age, there would be a closer match between perceived and actual body size.

METHOD

Participants

Four hundred and fourteen children attending state schools took part in the study. There were 131 5- to 6-year olds (68 boys and 63 girls) with a mean age of 68 months (age range 60 to 75 months) attending nursery school, 152 7- to 8-year olds (76 boys and 76 girls) with a mean age of 94 months (age range 88 to

DOI: 10.1002/icd

101 months) attending Year 2 and 131 9- to 10-year olds (56 girls and 75 boys) with a mean age of 119 months (age range 113 to 125 months) attending Year 4. The children attended schools serving families from a wide range of socioeconomic backgrounds in Heraklion, Crete, Greece. All the children were Caucasian. Eighty-nine per cent of the participants were Greek, and 11% originated from the Balkans and East European countries. The ethnic composition of the sample was typical of schools in the province of Heraklion. All children were fluent in Greek.

Written consent for participation in the study was obtained from children's parents, and permission was granted from the School Boards. The data presented here are part of a larger study on the psychosocial consequences of obesity in children. In the context of this study, each child's social status at school was measured. Teachers were also asked to rate children's behaviour with peers at school.

Measures

Actual body size (body mass index)

To assess participants' body size, the height and the weight of each child were measured. BMI was calculated as the ratio of the weight (in kilogrammes) to the square of the height (in metres). The cut-off points to classify children's BMI as underweight, average, overweight and obese were defined following Cole, Bellizi, Flegal, and Dietz's (2000) and Cole, Flegal, Nicholls, and Jackson's (2007) classification. These are age-specific and sex-specific BMI cut-off points based on international data.

Perceived body size

Children's perceived body size was assessed using Collins' (1991) pictorial scale. This scale contains seven child-body pictures of increasing size ranging from very thin to very heavy. This instrument has one row of pictures for girls and one for boys. Each participant was presented with the row of pictures corresponding to his or her own sex and was asked to point to the child that mostly looked like him or her. This scale has been widely used to assess children's perceived and ideal self and has a satisfactory test–retest reliability for perceived self ($r = .71$) among first to third grade (Collins, 1991) and among third to fifth grade children ($r = .73$) (Vander Wal & Thelen, 2000).

The figures in Collins' (1991) scale do not correspond to a specific BMI. However, previous research (Holub, 2008; Maximova et al., 2008) has considered that the third, fourth and fifth figures represent average body sizes, while the first two and the last two represent the thin and the heavy body builds, respectively.

Obesity bias task

The storyline method developed by Cramer and Steinwert (1998) was adopted to assess obesity bias because it is considered as the most appropriate for the age population for this study. A wide range of qualities/characteristics tapping different aspects of a child's life (social, academic, athletic, artistic and self-qualities) was embedded within a story context, building on Penny and Haddock's (2007) assessment of anti-fat bias.

A series of 13 short vignettes was developed. Each vignette had two same sex characters who were diametrically different in one specific quality/characteristic. The qualities/characteristics differentiating the story characters were as follows: has friends/does not have friends, shares/does not share, cooperates/does not

DOI: 10.1002/icd

cooperate, has good writing skills/has poor writing skills, does well in maths/does poorly in maths, is a fast/slow runner, is a fast/slow swimmer, is talented/untalented in drawing, is good/bad in singing, is happy/unhappy, is an achiever/looser, is diligent/lazy or is brave/not brave.

An example of the friendship vignette is as follows: 'The bell rang and all the kids ran into the school yard to play. Nick rushed out with his friends and played football. Greg does not enjoy break time because he does not have a friend to play with. He usually sits on the bench and watches the other kids play'. At the end of each scenario, the experimenter presented each participant with two sets with three child figures each (Figure 1). The figures within each set were identical in facial features, attire and hair, and had the same neutral expression. The figures varied only in terms of their body size: One was thin, one was average and one was obese. The experimenter presented the first set (Set A) and asked the child, 'Which of these three figures is Nick who has friends at school?' Following the child's response, the experimenter presented the second set (Set B) and asked, 'Which of these three figures is Greg who does not have friends at school?'

An advantage of the obesity bias task was that it avoided the pitfalls of forced-choice answers (choose between an average and an obese figure) in more than one way. By presenting the children with two sets of figures, they had the option to

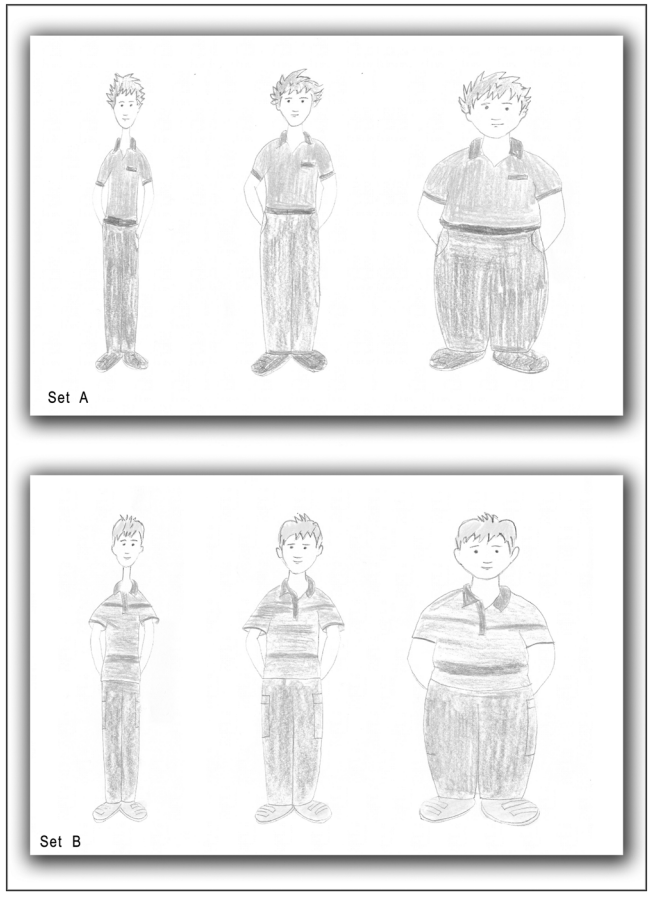

Figure 1. Sample of drawn figures

DOI: 10.1002/icd

attribute the positive and the negative characteristics to figures of any, even the same, body size. The inclusion of a thin figure was deliberate, as there were two figures that deviated from average. If negative characteristics were attributed to the obese figure, it could be argued that stereotyping is specific to obesity.

Male participants were read vignettes with male characters, and female participants were read the same vignettes with female characters. A total of 52 sets of figures were drawn for the 13 vignettes, 26 sets with male figures and 26 sets with female figures. The characters of each vignette had different names. Across the sets, characters were visually distinct, as they differed in their outfit and hair style. In that manner, each story character was unique, and children's attention was retained throughout the procedure.

Procedure

Children's parents were contacted via a letter distributed through schools containing detailed information about the purpose of the study and the procedures asking for consent to their children's participation. Ninety-two per cent of the parents contacted gave their consent.

Data regarding children's perceived body size and anthropometry were provided by their physical education teacher with the help of trained research assistants. Each child was asked to look carefully at the images of Collins' scale (1991) and point to the one that looked mostly like him or her. The weight of each child was measured with a SECA digital scale with an accuracy of ±100 g. The height was measured with a freestanding stadiometer to the nearest 0.5 cm. Perceived body size was always tested prior to the anthropometric measures.

For the assessment of obesity bias, children were interviewed individually in a quiet area at their school. Testing took place by a different person (the author) about 2 weeks after the assessment of actual and perceived body size to prevent children from associating the two processes. Children were told that they were going to hear vignettes about different characters. Each vignette was read aloud. The children were reassured that there was no right or wrong answer.

The vignettes were presented in a random order across participants. The drawn sets of figures were also randomized. In half of the vignettes, the positive qualities were possessed by character A and in the other half by character B. Testing lasted approximately 15 min.

Statistical Analysis

Obesity bias was defined as the condition where a child assigns the positive quality to the thin or average figure and the corresponding negative one to the obese figure. For each child, a new binary variable was created that indicated whether his or her pattern of assigning the positive and negative characteristic constituted bias or not. To test whether the observed obesity bias differed significantly from chance assignment to the figure choices, chi-square tests were employed. A composite measure of general obesity bias [obesity bias index (OBI)] was generated, by adding all 13 specific bias-indicating binary variables. OBI scores could range from 0 (total absence of bias) to 13 (bias in each and every characteristic). Higher OBI scores designated more anti-fat bias. The internal consistency of the OBI was satisfactory (Cronbach coefficient $a = .80$).

Summary descriptive statistics are presented as mean and standard deviations for continuous variables and as frequencies and percentages for categorical

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variables. Associations between categorical variables were assessed with chi-square or Fisher exact tests, as appropriate. Regression analysis was employed to assess the effect of age, gender, and actual and perceived body types on obesity bias. All statistical tests were carried out at the two-sided 5% level of significance. IBM-SPSS was used for all analyses.

RESULTS

The Actual Body Size of the Participants

According to their BMI, participants were classified as underweight, average, overweight and obese. As shown in Table 1, the majority (60.1%) of children fell within the average range, while there were 15 (3.6%) underweight, 99 (23.9%) overweight and 51 (12.3%) obese children. Body-type distribution was similar for both sexes but fluctuated across the three age groups (Fisher's exact $p < .001$). More specifically, the percentage of overweight and obese children increased from 28.2% at the age of 5–6 years to 42.8% by the age of 7–8 years and then dropped slightly to 36.7% by the age of 9–10 years. Conversely, the proportion of underweight children decreased from 6.9% at the age of 5–6 years to less than 1% by the age of 9–10 years.

The Perceived Body Size of the Participants

The mean perceived body size on Collins' (1991) 7-figure scale was $M = 3.7$ ($SD = 1.22$). One-way ANOVA showed a significant age effect, $F(2, 411) = 6.93$, $p = .001$. Post-hoc Tukey HSD tests revealed that the mean perceived body size for the 9–10-year olds ($M = 4.01$) was significantly higher than the mean perceived body size of the 5–6 ($M = 3.48$, $p = .001$) and the 7–8-year olds ($M = 3.61$, $p = .01$). To examine whether body size perception was affected by children's sex, a *t*-test was performed. A significant difference between boys and girls was found, $t(412) = 2.15$, $p = .03$, with girls identifying themselves more often with lighter figures ($M = 3.56$, $SD = 1.19$) than boys ($M = 3.82$, $SD = 1.23$).

To examine whether children could identify their body size, we checked whether there was a match between actual and perceived body size. The choice of the first two figures of Collins' (1991) scale indicated the perception of a thin body type, the choice of the third, fourth and fifth figures the perception of an average body type and the choice of the last two the perception of a heavy body type. As can be seen in Table 2, the vast majority of children (73.4%) perceived themselves as average, regardless of their actual body size. Sixteen per cent

Table 1. Body size frequency distribution by age

	Age			
Body size	5–6 years	7–8 years	9–10 years	Total
Underweight	9 (6.9%)	5 (3.3%)	1 (0.8%)	15 (3.6%)
Average	85 (64.9%)	82 (53.9%)	82 (62.5%)	249 (60.1%)
Overweight	17 (13%)	49 (32.3%)	33 (25.2%)	99 (23.9%)
Obese	20 (15.2%)	16 (10.5%)	15 (11.5%)	51 (12.3%)
Total	131 (100%)	152 (100%)	131 (100%)	414 (100%)

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Table 2. Frequencies (and percentages) of participants' actual by perceived body size

Actual body size	Perceived body size						Total	
	Thin		Average		Heavy			
Underweight	2	(13.1%)	13	(86.7%)	–	–	15	(100%)
Average	55	(22.1%)	188	(75.5%)	6	(2.4%)	249	(100%)
Overweight	9	(13.6%)	77	(56.9%)	13	(29.5%)	99	(100%)
Obese	–	–	26	(51%)	25	(49%)	51	(100%)
Total	66	16%	304	(73.4%)	44	(10.6%)	414	(100%)

classified themselves as thin, and only 10.6% identified with the heavier figures of the scale.

Actual body size was found to affect the accuracy of children's perceived body size, $\chi^2(3) = 123.7$, $p < .0001$. The majority of the average weights (75.5%) picked up figures representing average size bodies, exhibiting a good match between actual and perceived body size. However, only two underweight children classified themselves as thin, whereas the majority (86.7%) considered themselves as average. The vast majority of the overweight children perceived themselves as average (77.8%) or even thin (9.1%) with only 13.1% identifying with the heaviest figures. More than half of obese children (51%) perceived themselves as average with the rest identifying with the heavy figures. There was no difference between boys and girls in matching actual and perceived body size, $\chi^2(1) = .75$, $p < .38$.

Children's ability to correctly identify their body size improved significantly with age, $\chi^2(2) = 17.83$, $p < .001$. While at 5–6 years, 52% of the children were accurate; by the age of 9–10 years, accuracy increased to 69.5%. Average children's accuracy improved from 68.2% at the age of 5–6 years to 86.8% at the age of 9–10 years, $\chi^2(2) = 10.14$, $p = .006$. Overweight children's accuracy increased from 11.8% at the age of 5–6 years to 24.2% at the age of 9–10 years, $\chi^2(2) = 5.8$, $p = .05$. Forty per cent of the obese children identified with the heavy figures at the age of 5–6 years and 73.3% at the age of 9–10 years, $\chi^2(2) = 7.18$, $p = .03$.

Obesity Bias and Its Predictors

The binary data that were created to designate the quality-specific obesity bias were directly compared with what one might expect from chance responding to the figure choices. Had the children responded randomly to the figure choices, the expected frequency of obesity bias would be 22%, as two out of the nine possible response combinations were defined as constituting obesity bias. Chi-square goodness of fit tests showed that in all of the characteristics examined, the null hypothesis of chance assignment was rejected (all $p < .001$).

The mean OBI score was $M = 8.2$ ($SD = 3.3$). A linear regression was performed with OBI as the dependent variable, and children's BMI (kg/m^2), perceived body size as indicated on Collins' (1991) 7-point scale, age in months and sex as independent variables. The overall model was significant, $R^2 = .21$, $F(4, 334) = 3.89$, $p = .004$. Children's perceived body size had a significant contribution: The larger the perceived body size, the lower the amount of obesity bias ($B = -.36$, $p = .03$). Also, age had a significant contribution showing that obesity bias increased with age ($B = .025$, $p = .01$). However, BMI and sex did not significantly contribute to the model (Table 3).

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Table 3. Summary of regression analyses predicting children's obesity bias index scores

	B	*SE B*	*β*	*p*
Child's age	.025	.01	.14	.01
Child's gender	.039	.35	.06	.26
Child's actual body size (body mass index)	−.10	.06	−.09	.13
Child's perceived body size	−.36	.16	−.12	.03

Obesity Bias among the Overweight/Obese: The Effect of Perceived Body Size

In order to get an insight into how the overweight and obese children differed on OBI score depending on how they perceived themselves, they were divided into two groups: (i) those perceiving themselves average or thin, and (b) those perceiving themselves as heavy. A *t*-test showed that those children who perceived themselves as heavy exhibited less bias ($M = 6.89$) than those perceiving themselves as normal/thin ($M = 8.04$), $t(148) = 2$, $p = .04$). The first group did not differ significantly on OBI score from the average weight children who perceived themselves as such ($M = 8.27$), $t(298) = 0.61$, $p = .53$).

DISCUSSION

The main aim of this study was to investigate how children of various body builds perceived their body size and examine whether their actual or perceived body size could explain their anti-fat views. It was hypothesized that children and especially those who are overweight and obese would tend to underestimate their body size. Perceived rather than actual body size was expected to relate to children's anti-fat views.

Overall, children tended to identify with the low average figures of Collins' (1991) scale, irrespective of their own body size, with girls identifying with lighter figures significantly more often than boys. This finding indicates that there is a pro-thin bias in children, reflecting the internalization of the societal ideals about thinness (Dunphy-Lelii et al., 2014). Accuracy of body size perception improved with age. This finding corroborates previous research showing that, as children grow older, they are better at conceptualizing their own body and have developed a more accurate idea of their body size (Truby & Paxton, 2002; Williamson & Delin, 2001). The fast physical growth experienced during the preschool years has been blamed to inhibit children's ability to update their self-representation (see Dunphy-Lelii et al., 2014, for a review). In this study, there was no difference between boys and girls in the accuracy of body size perception. Research on the role of gender is inconsistent, with some studies reporting higher accuracy in girls (Chung, Perrin, & Skinner, 2013; Truby & Paxton, 2002) and other studies reporting higher accuracy in boys (Ambrosi-Randić, 2000).

As hypothesized, weight status affected the accuracy of body size perception. Average weight children were more accurate in body size identification than the thin or those with excess weight. Whereas the overweight and obese children underestimated their weight status, the underweight overestimated it. As a result, most underweight and overweight children tended to view themselves as average, as well as about half of the obese. This finding is consistent with several previous studies involving preschoolers (Cramer & Steinwert, 1998), school children and adolescents (Edwards, Pettingell, & Borowsky, 2010; Fredrickson, Kremer, Swinburn, Silva-Sanigorski, & McCabe, 2013; Maximova et al., 2008; Saxton et al., 2009) that

DOI: 10.1002/icd

reported high levels of weight underestimation among the overweight and obese. It seems that children tend to classify themselves within or closer to the socially accepted category of the average shape. Underweight children, similarly to the obese, are often viewed as weak, fearful, less healthy and more teased (Brylinsky & Moore, 1994; DeJong & Kleck, 1986; Staffieri, 1967). It is possible that children refuse any deviation from what it is generally accepted as normal and are reluctant to identify with stigmatized weight categories in order to sustain a positive self-esteem (Crocker & Major, 1989). This interpretation is further supported by the finding that chubby 5-year olds could correctly identify the body size of their chubby peers but were less accurate identifying their own body build (Lerner & Gellert, 1969).

The present study applied a stringent criterion for an operational definition of obesity bias, which depended on the pattern of assigning the positive and negative quality within each vignette assessing a variety of competencies and qualities. Our findings showed that two of the explored parameters, age and perceived body size, were predictors of obesity bias.

As regards age, this is not the first study to indicate that obesity bias is strengthened with age possibly because of children's greater exposure to the socio-cultural messages that promote thinness (Brylinsky & Moore, 1994; Klaczynski, et al., 2009). The study also showed that perceived and not actual body size relates to children's anti-fat views. As hypothesized, the heavier the children perceived themselves, the less obesity bias they held. Children's misperceptions about their body size (overestimation among the underweight and underestimation among the overweight and the obese) justify why previous studies did not find any association between obesity bias and children's actual body size. Moreover, focusing on the overweight and obese individuals, it was found that the perceived body size related to the strength of obesity bias held. Only the overweight and obese that identified with the heavy figures of Collins' (1991) scale had lower obesity bias scores.

Our finding that perceived body size relates to the strength of obesity bias is in line with the postulations of the SIT and suggests that children's anti-fat views are affected, not by their actual, but by their perceived in-group identity. It is believed that identification with a particular group results in increased liking of that group or, as in our study, in less stigmatization of that group, which serves as a means to protect individual ego and self-worth (Nesdale, 2000; Tajfel, 1981). This more positive group identity can be used as a protective shield towards negative stigmatizing experiences. Research with obese adults suggests that those with less anti-fat beliefs had higher self-esteem (Crandall & Biernat, 1990). Relatedly, Friedman et al. (2005) have shown that the consequences of weight stigmatizing experiences among the obese were mediated by the adoption of anti-fat attitudes: Those with strong anti-fat beliefs had higher levels of depression, lower self-esteem, body image disturbance and mental health symptoms.

However, it should be noted that although obesity bias was less, it was still present, among those who perceived themselves as heavy. To some extent, this finding reflects the pervasiveness of obesity stigma and the position of the overweight/obese within the society (Hogg & Turner, 1987), as negative self-stereotyping has been reported mainly within members of low-status groups (Glick & Fiske, 2001; Jost & Banaji, 1994).

Limitations of the Study and Future Research

Several limitations frame the interpretation of the current findings and suggest directions for future research. A potential limitation of the study lies in the use

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of Collins' (1991) pictorial instrument. Although the scale has good psychometric properties for self-recognition (Collins, 1991; Vander Wal & Thelen, 2000), there are no data available for the appropriateness of the scale for children below the age of 7 years. Thus, the discrepancy observed in this study between the actual and the perceived body size in the youngest age group might be due to the poor performance of the scale. There is need for future studies to develop instruments assessing how preschool children perceive their own body size, because perceptions have implications in the development of body dissatisfactions and disordered eating.

An additional limitation derives from how Collins' (1991) scale was used in this study. Although the figures do not correspond to specific BMIs, in this study, the figures were used as representing specific body types. Thus, our findings on the inaccuracy of children's body size perception have to be interpreted with caution because the absolute accuracy could not be assessed.

It could also be claimed that asking children to identify story characters among figures that differed considerably in their body size implied, indeed, that the characters had different body types. However, we believe that the effect of this experimental bias was minimal. Had children expected that body size was important to the character assignment, then we would have observed none or very few concomitant choices for the positive and negative attributes. This, however, was not the case. For most attributes, about 14% of the children assigned the positive and negative qualities to same sized figures. This, in our view, suggests that the children's choices were in large dictated by their personal attitudes.

The findings of this study can be considered as the starting point for future studies, as they raise some interesting issues. It could be claimed that body size underestimation is not a bad thing. Children should feel that they have a normal body size, as this protects them from experiencing body dissatisfaction. However, there is evidence showing that accurate self-perception of being overweight or obese is strongly associated with healthy weight-loss behaviours (Chung et al., 2013; Edwards et al., 2010). Our finding that fewer overweight than obese children identified with heavy figures suggests that children are more likely to realize their extra weight when they are well within the obese status. By that time, trying to return to a normal weight range would be harder. The design of this study cannot provide an insight into the causes of body size underestimation. Future studies should examine which factors affect body size misperception to enhance the effectiveness of obesity intervention programmes, as the individuals who recognize their unhealthy weight are more likely to engage in healthy weight-loss behaviours (Chung et al., 2013; Edwards et al., 2010).

The study indicated that obesity bias is less among those who perceive themselves as heavier, but we do not know if this reduced bias helps them handle weight stigmatization more effectively. Research with obese adults suggests that those who hold less anti-fat views are better able to deal with stigmatizing experiences (Friedman et al., 2005), but to our knowledge, there is no such evidence for obese children.

Although the children who perceived themselves with excess weight exhibited less obesity bias, there is evidence that people can simultaneously hold dual attitudes for the same thing: explicit attitudes that are accessible, controllable and consciously acknowledged, and implicit attitudes that can only be detected with reaction-time measures of cognitive associations (Greenwald & Banaji, 1995). Future research should investigate children's explicit versus implicit anti-fat bias and, most importantly, their differential associations with the psychological functioning of those with excess weight.

DOI: 10.1002/icd

The design of the study does not allow determining the direction of the causation. Does accuracy in body size identification as overweight or obese result in holding less obesity bias due to 'in-group' effects or does holding less obesity bias facilitate the recognition of someone's excess weight? This is a research field for prospective studies.

In summary, the findings of the study underline the importance of an understudied factor, that of perceived body size, in the attribution of anti-fat views. The heavier the children perceived themselves, the less obesity bias they held. In line with the postulations of the SIT among overweight and obese children, accurate perception of one's body size as heavy was associated with less obesity bias. The challenge for future studies would be to examine whether this contributes to the development of a more positive self-identify among the overweight and obese and operates as a defensive barrier towards stigmatizing experiences.

ACKNOWLEDGEMENTS

Many thanks to the children who participated in the study. I am grateful to Dr Kostas Christidis for drawing the figures used in the study. Further, I would like to thank the anonymous reviewers for their insightful comments on earlier versions of this manuscript. I am also thankful to Dr Plousia Misailidi and Dr Sophia Wellbeloved for their constructive comments and suggestions. The study was funded by the University of Crete (ELKE, K.A.2760).

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DOI: 10.1002/icd