

# Parental misperception of child's weight and related factors within family norms

Seo Ah Hong<sup>1,2</sup>  · Karl Peltzer<sup>1,3,4</sup> · Chutima Jalayondeja<sup>5</sup>

Received: 1 June 2016 / Accepted: 4 May 2017 / Published online: 22 May 2017  
© Springer International Publishing Switzerland 2017

## Abstract

**Purpose** Parental perception of their child's weight may be a crucial factor in parental ability for action with regard to their child's weight problem. This aim of this study was to investigate parental perception of their child's weight status and dietary healthiness, amount of food consumed and physical activity level and its related factors.

**Methods** A cross-sectional survey was conducted among children (Grades 4–6) selected by cluster sampling in two schools. Children were invited to participate in the measurements of anthropometry and their parents were asked to classify their child's weight and health behaviors.

**Results** In total, 41.8% of parents misperceived their child's weight, of which 82% underestimated their child's weight, in particular regarding overweight or obesity. As parents of overweight or obese children underestimated their child's weight, around 65% were not concerned with their child's current weight and about becoming overweight in the future. Factor associated with underestimation of overweight children was not having a sibling, while

among children with normal weight, the underestimation was associated with boys, lower body mass index (BMI), maternal employment and low household income. Furthermore, parents underestimating their child's weight were more likely to be optimistic about their child's dietary healthiness, food amount taken, and physical activity level than those with correct child's weight estimates.

**Conclusions** Findings show a high proportion of parental misperception of their child's weight status. Family-based weight control interventions will need to incorporate parental misperceptions of the body weight and health behaviors of their children.

**Keywords** Parental perception · Related factors · Child's weight · Health behaviors

## Introduction

Most of the Asian countries are fast catching up with the West on obesity [1]. Thailand showed one of the highest rates of obesity in Asia [1]. The prevalence of obesity ( $\geq$ BMI 25 kg/m<sup>2</sup>) in adults doubled from 18.2% in 1991 [2] to 34% in 2008–2009 in Thailand [3]. A similar increase has been observed in children, with childhood obesity becoming a big public health concern in Thailand. According to the National Health Examination Survey (2008–2009), the prevalence of overweight or obesity was 14.9% in children aged 10–14 years [4]. A recent study of children aged 6–12 years in Bangkok showed a higher prevalence of obesity (19.3%) [5]. Thus, research attention has increasingly focused on efforts to reduce childhood obesity.

Parental involvement and support has been found to be a promising strategy for the prevention and treatment of

---

✉ Seo Ah Hong  
seoah.hon@mahidol.ac.th

<sup>1</sup> ASEAN Institute for Health Development, Mahidol University, Salaya, Phutthamonthon, Nakhon Pathom 73170, Thailand

<sup>2</sup> Institute for Health and Society, Hanyang University, Seoul, Republic of Korea

<sup>3</sup> Department of Research and Innovation, University of Limpopo, Polokwane, South Africa

<sup>4</sup> HIV/STIs and TB Research Programme, Human Sciences Research Council, Pretoria, South Africa

<sup>5</sup> Faculty of Physical Therapy, Mahidol University, Nakhon Pathom, Thailand

childhood obesity [6, 7]. Parents' ability to take action with regard to their child's weight problems is dependent on the awareness of their child's weight [8, 9], which is used in explaining the relationship between weight status and weight control behavior [10]. Parents who underestimated their child's weight were less likely to report concerns [11, 12], which may lead to a lack of motivation to help children to reduce weight and to foster healthy behaviors. According to a recent systematic review [13], the magnitude of misperception, particularly underestimation of their child's weight differed in various studies [11, 13–19], probably due to various methodological limitations [18] and different cultural backgrounds. To our knowledge, there has been a lack of studies on parental perceptions of child's weight and its relation to perception of child's health behaviors in Southeast Asian countries facing a rising burden of obesity. Therefore, the present study aimed to assess parental perceptions of their child's weight and health behaviors and to identify socio-demographic characteristics affecting discordance between parental perception and actual child's weight status within family norms. By doing so, this study may provide evidence for parental misperceptions in future interventions aiming at tackling childhood obesity.

## Methods

### Study design and participants

In a cross-sectional study, all students in 4th–6th Grade classes (Mean age = 10.6, SD = 0.93) were randomly selected by cluster sampling in two primary schools in Nakhon Pathom province, a suburban area in Thailand. The approval from the director of each school was obtained after the study design and purpose had been explained. Parents were invited by letter to respond to a self-administered questionnaire. The students were requested to complete a self-administered questionnaire under the supervision of trained researchers, who also conducted anthropometric measurements with the children. The response rates of children and their parents were 100 and 88%, respectively. Of 609 parent–child dyads, only 525 dyads were included in the analysis due to missing values on parental information.

### Materials and methods

For anthropometric data, students were weighed and measured by trained researchers using standardized protocols [20]. Children were asked to wear light indoor clothing and without shoes during the measurements.

Child's weight was measured to the nearest 100 g, using a digital weight scale, and height was measured at standing without shoes to the nearest 0.1 cm using a wall-mounted wooden stadiometer.

As the prevalence of overweight or obesity was greater when using the WHO criteria (37.2%) compared to Thai Growth Reference (TGR, 23.1%) and the International Obesity Task Force (IOTF, 30.9%), the World Health Organization (WHO) reference may be recommended to identify school children at risk of overweight or obesity at the population level in our previous study (data not shown). This supports the WHO reference as a better predictor to estimate school-aged children at risk. Yet, as a recent review revealed that the IOTF definition of obesity is highly conservative [21], the IOTF criterion seems to be more accurate to define obesity and overweight in confirmation of a disease in clinical context. The use of IOTF showed the better agreement with the TGR in estimation of the prevalence of combined overweight and obesity (data not shown). In addition, many studies reported that the IOTF criterion seems to be a more suitable one to guarantee the multi-ethnic and cultural application [22, 23]. Therefore, we used age- and gender-specific BMI values using the extended IOTF BMI cutoffs reformulated by Cole et al. in 2012 [24], which used underlying LMS (Least mean Square) curves. The cut-off for weight status for Asian children was <16 for severely underweight, 16–16.9 for underweight, 17–24.9 for normal weight, 25–29.9 for overweight, and  $\geq 30$  for obesity.

The questionnaire for a parent or caregiver included items on parental concern (2 items), perception of their child's weight (1 item) and health behaviors (3 items) that were adapted from previous studies [25, 26]. Parental concern questions included, "I am worried my child is overweight right now" and "I am worried my child will become overweight", with response options ranging from 1 = "disagree a lot" to 5 = "agree a lot". The responses were dichotomized to agree or disagree (including the neutral answer) for parental concern. For parental perception of their child's weight, parents were asked to rate their child in comparison with other (his/her age) children's weight (much thinner, thinner, similar, overweight, or much more overweight). Health behaviors regarding their child's diet, activity level and amount of food had the response options ranging from 'much less healthy' to 'much more healthy' healthiness of diet, from 'eats much less' to 'eats much more' for amount of food eaten and from 'much less active' to 'much more active' for activity level. The responses were grouped to 'less', 'about the same' or 'more' for parental perception.

## Data analysis

The child's weight status was compared with parental perception of their child's weight on 5-point scales from 'much thinner' to 'much more overweight'. Cohen's Kappa test was used to assess the inter-rater agreement between the percentages of parent's perception of their child's weight in each of child weight categories. We further assessed the concordance using the Kappa value and it can be interpreted by the strength of agreement: 0 to 0.20 (poor); 0.21 to 0.40 (fair); 0.41 to 0.60 (moderate); 0.61 to 0.80 (good); 0.81 to 1.00 (very good).

For further analyses, parental perceptions were classified as concordant, underestimation and overestimation compared to child's actual weight. Since the prevalence of the overestimation was much lower than the underestimation of the weight status, and underestimation particularly among overweight/obese children may result in low motivation to reduce excess weight [27], comparison between parents who accurately perceived and those who underestimated their child's weight were estimated using student *t* test for continuous variables or Chi-square tests for categorical variables. Separate analyses were conducted for normal weight and overweight/obese children. Statistical analyses were conducted with SAS for Windows (version 9.3).

## Ethical considerations

All procedures were conducted after ethics approval from the Human Research Ethics Committee of Mahidol University, Thailand (Approval No.: 2015/033.2701). Informed assents from children and informed consents from their parents were obtained after explanation of the study objectives and assurance of the confidentiality of their identity.

## Results

The prevalence of thinness, overweight and obesity among children when estimated by the IOTF cut-off points was 5.7, 19.1, and 10.7%, respectively. The percentage of the total agreement between parental weight estimate and measured weight status of the child was 59.2% ( $\kappa = 0.49$ ). Parental perceptions of their child's weight according to their children's weight status are presented in Fig. 1. About 42% of parents misperceived their child's weight, while 6.9% of parents overestimated and 33.9% underestimated their child's weight status. Weight underestimation was greater in parents of overweight or obese children (42.3%).

Table 1 shows parental responses regarding concern about their child's weight and perceptions of their child's

health behaviors compared to their peers. Among parents underestimating their child's overweight or obese status only 35% responded that they were concerned that their child was currently overweight and 34% of becoming overweight in future. In the total sample, parents who were underestimating their child's weight status were more likely to report that their child's diet was less healthy (57.7%) and they ate less (66.3%) and were also more active (50%) compared to their peers. When stratifying with normal and overweight children, compared to parents who correctly estimated the measured normal weight status of their child, parents who underestimated the measured normal weight of their child were more likely to report their child's diet was less healthy (71.4%), ate less (67.1%) and were also less active (42.6%). Moreover, compared to parents who correctly estimated the measured overweight or obesity status of their child, parents who underestimated the measured overweight or obesity status were more likely to report their child's diet was more healthy (52.3%), and ate less or similar (57%) and were more active (59.3%).

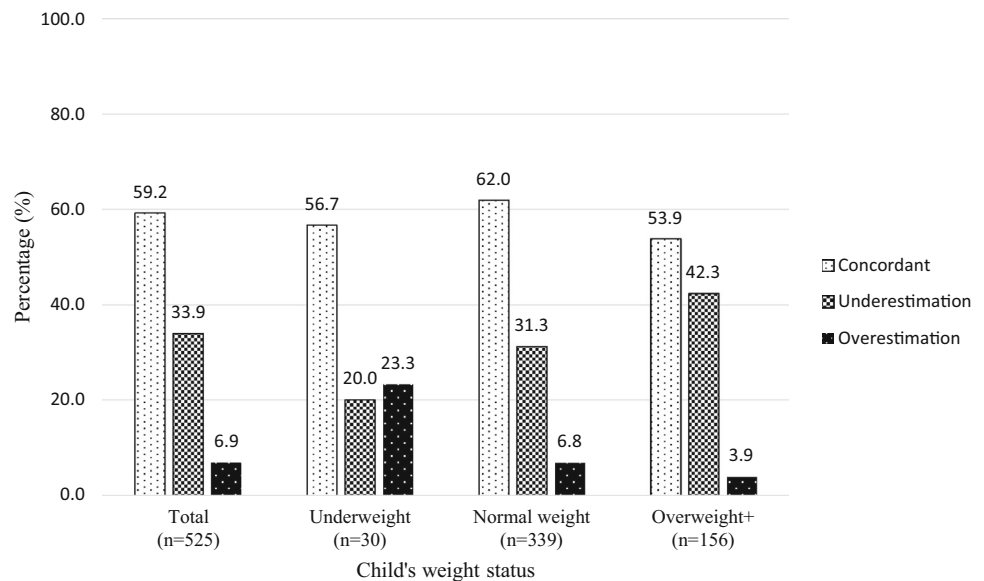
The proportion of underestimation was significantly higher in boys (44.8%) than in girls (30.9%) and in employed mothers (38.1%) than in unemployed mothers (13.3%) (Table 2). Among children with measured normal weight, factors associated with parental underestimation were boys and children with lower BMI, higher household income, and mother's working status, while in children with higher measured BMI, parents with only one child showed a higher proportion of underestimation than those with more than one child.

## Discussion

The percentage of the total agreement between parental perception of their child's weight and child's measured weight status was only 59.2%. Among the parents who misperceived their child's weight, 82% underestimated. The underestimation may lead to a lesser concern about their child's weight and greater optimism about their child's health behaviors. Furthermore, the child's gender, the existence of siblings and maternal employment status may distort the parental perception of the child weight status. These findings may call for an urgent need of family-based childhood obesity interventions in increasing more accurate estimation of child's weight.

To our knowledge, this is one of the first studies on the accuracy of parental perception of their child's weight in Southeast Asian countries, which makes it difficult to compare our study findings. Our results showed a high proportion of parental misperception of child's weight. Moreover, the parental misperception was greater in children overweight or obese. In agreement with previous

**Fig. 1** Distribution of accuracy of parental weight perception according to measured child weight status. Child weight status was categorized using the new IOTF cutoff points



studies [11, 12], our study showed approximately 70% of parents of overweight or obese children reported that they were concerned about their child being overweight now and in future. Furthermore, among those parents underestimating their child's overweight status, the proportion reporting concern was very low (only 35%). The lower concern seemed to be related to the mismatch between parental perceptions and their child's actual weight. In a society where parental misperception of their child's weight is common [13, 14], overweight may be normalized increasing the risk of obesity [28]. This finding is supported by a recent study where showing a generational shift in social norms related to body weight, in which the threshold BMI z-score of children for being parentally perceived as overweight increased significantly from 0.96 in 1988–1994 survey to 1.35 in 2005–2010 survey. This resulted in lower probability of overweight or obese children being correctly perceived by parents [14]. As regular weight screening may help parents to identify their child's weight status accurately [29], schools and health care providers should provide an opportunity to screen children's BMI status on a regular basis [8, 17, 29], and give feedback on the weight status and the health consequences of obesity to the parents as well as the children [8, 17, 18, 29].

The parental weight misperception could be related to impaired healthy development of their children [15]. Our study showed parental optimal perception on health behaviors of overweight children. For example, parents of overweight or obese children were likely to report their child's diet was more healthy, ate less or similar and were more active. This parental misperception of child's health behaviors can be explained partly by a tendency to underestimate one's personal risk [30, 31]. For example, if parents had an incorrect norm [32], they were more likely

to lower perceived risk [31]. On the other hand, they may cope by denying that their child's overweight or obese weight status [30], partly because they may perceive that little can be done to solve it [16]. Meanwhile, parents who perceived their child's overweight correctly were more likely to view their child's health behavior patterns, such as diet and physical activity and to consider childhood obesity as a health threat [16]. These parents may more likely monitor and regulate child's health behaviors and to encourage participating in programs addressing childhood obesity [7, 8, 16]. In addition, parents who are more likely to see health behavior of the family as well as their child [16], which may benefit the entire family as well as the children at risk [11]. Another study found that parents who expressed concern about their child's weight were more likely to attempt to limit their child's screen time [8] and to improve the family's diet [8, 11].

Greater underestimation by parents was observed in boys, consistent with other studies [17, 33], despite of no significant gender difference in overweight or obese children. This finding may be attributed to the parent's view on being fat as a positive feature representing affluence in Asian societies [34], particularly towards boys compared to girls that are placing more value on thinness [8]. In addition, different from previous studies [13] showing parents were likely to misperceive their child's weight in younger age, our study did not show a difference in ages due to the limited target age group (Grades 4–6). However, it may suggest that public health actions to tackle obesity should start at an early age. Besides gender and age, other familial characteristics, such as maternal employment, household income, and number of children in the household were associated with BMI misclassification in our study. Regarding familial characteristics, mothers who were

**Table 1** Distribution of concordant versus underestimation of parental weight perception by parental concern and perception of child's health behaviors according to child's weight status

	Total <sup>a</sup> (n = 466)		Normal weight (n = 316)		Overweight or obesity (n = 150)		p value
	Concordant	Underestimation	Concordant	Underestimation	Concordant	Underestimation	
Parental concern							
Concerned that child is overweight now							
Disagree	60.2	39.8	65.3	34.7	35.6	64.4	0.0007 <sup>***</sup>
Agree	67.9	32.1	70.7	29.4	65.4	34.6	
Concerned that child will become overweight							
Disagree	61.7	38.3	66.8	33.2	32.6	67.4	0.0002 <sup>***</sup>
Agree	66.5	33.5	67.2	32.8	66.0	34.0	
Perception of child's health behaviors compared with peers							
Healthiness of diet							
Less healthy	42.3	57.7	28.6	71.4	77.3	22.7	0.0543
Similar	70.9	29.1	76.5	23.5	55.7	44.3	
More healthy	61.9	38.1	72.2	27.8	47.7	52.3	
Amount of food eaten							
Eat less	33.7	66.3	32.9	67.1	42.9	57.1	0.0188 <sup>*</sup>
Similar	72.4	27.6	81.5	18.5	42.6	57.4	
Eat more	67.9	32.1	71.2	28.9	65.9	34.1	
Activity level							
Less active	61.6	38.4	57.4	42.6	68.3	31.8	0.0264 <sup>*</sup>
Similar	68.9	31.1	75.9	24.1	50.0	50.0	
More active	50.0	50.0	54.9	45.1	40.7	59.3	

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

<sup>a</sup> Analysis was done in the sample of children with normal weight or overweight or higher

**Table 2** Distribution of child and familial characteristics by accuracy of parental perception of children's weight status

	Total <sup>a</sup> (n = 466)		Normal weight (n = 316)		Overweight or obesity (n = 150)		p value
	Concordant	Underestimation	Concordant	Underestimation	Concordant	Underestimation	
<b>Child factors</b>							
BMI (kg/m <sup>2</sup> ) (mean ± SD)	19.3 ± 4.05	19.0 ± 4.88	17.2 ± 1.74	15.5 ± 1.24	24.5 ± 3.45	24.5 ± 3.16	0.9740
Child's age (year) (mean ± SD)	10.7 ± 0.93	10.5 ± 0.96	10.7 ± 0.90	10.5 ± 0.97	10.6 ± 0.98	10.5 ± 0.97	0.6716
<b>Child's sex</b>							
Boys	55.2	44.8	58.6	41.4	50.6	49.4	0.1268
Girls	69.1	30.9	71.0	29.0	63.1	36.9	
<b>Number of children</b>							
Two or more	62.8	37.2	63.7	36.3	61.0	39.1	0.0620
One	64.8	35.3	74.7	25.3	43.6	56.4	
<b>Parental factors</b>							
<b>Parent with high BMI (≥25)</b>							
None	64.3	35.7	65.8	34.2	58.8	41.2	0.4808
One	55.5	44.5	59.3	40.7	47.4	52.6	
Both	63.6	36.4	66.7	33.3	60.7	39.3	
<b>Father's education</b>							
Primary school or lower	60.9	39.1	62.2	37.8	58.7	41.3	0.3650
Secondary school	65.7	34.3	67.0	33.0	62.2	37.8	
College or higher	61.4	38.6	68.3	31.7	48.1	51.9	
<b>Mother's education</b>							
Primary school or lower	61.2	38.8	63.1	36.9	57.9	42.1	0.8230
Secondary school	64.1	35.9	67.3	32.7	57.1	42.9	
College or higher	63.6	36.4	68.7	31.3	52.0	48.0	
<b>Mother's employment<sup>b</sup></b>							
Unemployed	86.7	13.3	88.0	12.0	80.0	20.0	0.3728
Employed	61.9	38.1	65.6	34.4	53.2	46.8	
<b>Monthly household income</b>							
1st tertile	61.9	38.1	65.7	34.3	53.3	46.7	0.8515
2nd tertile	68.0	32.0	75.5	24.6	55.4	44.6	
3rd tertile	58.8	41.2	58.6	41.4	59.3	40.7	

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ <sup>a</sup> Analysis was done in the sample of children with normal weight or overweight or higher<sup>b</sup> Fisher's exact test

working or had a higher household income tended to underestimate the measured normal weight of their children in our study, although a study of Chinese mothers showed that working mothers underestimated their overweight children's weight [34]. Meanwhile, our study showed that parents of overweight or obese children misperceived and underestimated their child's weight when they have only one child in their household. The existence of siblings in a household may be related to the socialization of body prescribing standards and expectations related to body perceptions [35, 36] within the family system [37] by providing significant social comparison standards for body image attitudes [38] and satisfaction [39] in adulthood. This finding highlights the need of interventions, which should be directed towards the whole family to improve parental weight perception [15] at an early age of their children in order to prevent childhood obesity.

This study has several limitations. Firstly, because the study population is limited to children studying in two schools, the results may not be generalizable to the total population. In addition, of 605 parents of children only 88% of parents (60% mothers and 40% fathers) completed information on the perception on their child's weight. Despite of no significant differences in children's measured BMI, there may be differences in the parent's view in the child's weight between parents who completed the survey and those who did not, and between fathers and mothers. Next, while the weight and height were measured in children, those of the parents were assessed by self-report. However, as a high correlation between self-reported body size and BMI was observed [40], it may indicate good internal validity. Finally, this study is cross-sectional in nature, and thus no causal relationships can be drawn from these findings. Despite these limitations, this study provides useful information for future obesity interventions in South East Asia. These findings may lead to a need of development of effective strategies that increase more accurate estimation of child's weight in the prevention and treatment of child obesity.

## Conclusion

The study found an underestimation of the child's weight status by their parents and an incorrect estimation of their child's health behavior. Family-based weight control interventions will need to incorporate parental misperceptions of the body weight and health behaviors of their children.

**Acknowledgements** This research was supported by Thai Physical Activity Research Center–PARC, Thai Health Promotion Foundation.

## Compliance with ethical standards

**Conflict of interest** The authors had no conflict of interest and nothing to disclose.

**Ethical approval** Before commencement of the study, ethical approval was granted from the Human Research Ethics Committee (HREC), Mahidol University. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

## References

- Ramachandran A, Snehalatha C (2010) Rising burden of obesity in Asia. *J Obes*. doi:[10.1155/2010/868573](https://doi.org/10.1155/2010/868573)
- Aekplakorn W, Hogan MC, Chongsuvivatwong V, Tatsanavivat P, Chariyalertsak S, Boonthum A et al (2007) Trends in obesity and associations with education and urban or rural residence in Thailand. *Obesity (Silver Spring)* 15:3113–3121. doi:[10.1038/oby.2007.371](https://doi.org/10.1038/oby.2007.371)
- Pitayatiennan P, Butchon R, Yothasamut J, Aekplakorn W, Teerawattananon Y, Suksomboon N et al (2014) Economic costs of obesity in Thailand: a retrospective cost-of-illness study. *BMC Health Serv Res* 14:146. doi:[10.1186/1472-6963-14-146](https://doi.org/10.1186/1472-6963-14-146)
- Yamborisut U, Mo-Suwan L (2014) Prevalence of childhood and adolescent obesity in Thailand: a review. *J Med Assoc Thai* 97:44–51
- Sirikulchayanonta C, Pavadhgul P, Chongsuwat R, Klaewkla J (2011) Participatory action project in reducing childhood obesity in Thai primary schools. *Asia Pac J Public Health* 23:917–927. doi:[10.1177/1010539510361965](https://doi.org/10.1177/1010539510361965)
- Golan M (2006) Parents as agents of change in childhood obesity—from research to practice. *Int J Pediatr Obes* 1:66–76
- Summerbell CD, Waters E, Edmunds LD, Kelly S, Brown T, Campbell KJ (2005) Interventions for preventing obesity in children. *Cochrane Database Syst Rev* 20(3):CD001871. doi:[10.1002/14651858.CD001871.pub2](https://doi.org/10.1002/14651858.CD001871.pub2)
- Moore LC, Harris CV, Bradlyn AS (2012) Exploring the relationship between parental concern and the management of childhood obesity. *Matern Child Health J* 16:902–908. doi:[10.1007/s10995-011-0813-x](https://doi.org/10.1007/s10995-011-0813-x)
- Jeffery AN, Voss LD, Metcalf BS, Alba S, Wilkin TJ (2005) Parents' awareness of overweight in themselves and their children: cross sectional study within a cohort (EarlyBird 21). *BMJ* 330:23–24. doi:[10.1136/bmj.38315.451539.F7](https://doi.org/10.1136/bmj.38315.451539.F7)
- Kim KH (2007) Religion, weight perception, and weight control behavior. *Eat Behav* 8:121–131
- Lampard AM, Byrne SM, Zubrick SR, Davis EA (2008) Parents' concern about their children's weight. *Int J Pediatr Obes* 3:84–92. doi:[10.1080/17477160701832552](https://doi.org/10.1080/17477160701832552)
- Tschamler JM, Conn KM, Cook SR, Halterman JS (2010) Underestimation of children's weight status: views of parents in an urban community. *Clin Pediatr (Phila)* 49:470–476. doi:[10.1177/0009922809336071](https://doi.org/10.1177/0009922809336071)
- Rietmeijer-Mentink M, Paulis WD, van Middelkoop M, Bindels PJ, van der Wouden JC (2013) Difference between parental perception and actual weight status of children: a systematic review. *Matern Child Nutr* 9:3–22. doi:[10.1111/j.1740-8709.2012.00462.x](https://doi.org/10.1111/j.1740-8709.2012.00462.x)

14. Hansen AR, Duncan DT, Tarasenko YN, Yan F, Zhang J (2014) Generational shift in parental perceptions of overweight among school-aged children. *Pediatrics* 134:481–488. doi:[10.1542/peds.2014-0012](https://doi.org/10.1542/peds.2014-0012)
15. Sand L, Lask B, Hysing M, Stormark KM (2014) In the parents' view: weight perception accuracy, disturbed eating patterns and mental health problems among young adolescents. *J Eat Disord* 2:9. doi:[10.1186/2050-2974-2-9](https://doi.org/10.1186/2050-2974-2-9)
16. Sylvetsky-Meni AC, Gillepsie SE, Hardy T, Welsh JA (2015) The impact of parents' categorization of their own weight and their child's weight on healthy lifestyle promoting beliefs and practices. *J Obes* 2015:307381. doi:[10.1155/2015/307381](https://doi.org/10.1155/2015/307381)
17. De La OA, Jordan KC, Ortiz K, Moyer-Mileur LJ, Stoddard G, Friedrichs M et al (2009) Do parents accurately perceive their child's weight status? *J Pediatr Health Care* 23:216–221. doi:[10.1016/j.pedhc.2007.12.014](https://doi.org/10.1016/j.pedhc.2007.12.014)
18. Lopes L, Santos R, Pereira B, Lopes V (2013) Maternal perceptions of children's weight status. *Child Care Health Dev* 39:728–736. doi:[10.1111/j.1365-2214.2012.01380.x](https://doi.org/10.1111/j.1365-2214.2012.01380.x)
19. Mathieu ME, Drapeau V, Tremblay A (2010) Parental misperception of their child's body weight status impedes the assessment of the child's lifestyle behaviors. *Int J Pediatr*. doi:[10.1155/2010/306703](https://doi.org/10.1155/2010/306703)
20. Lee RD, Nieman DC (1993) *Nutritional assessment*. Brown & Benchmark, Oxford
21. Reilly JJ, Kelly J, Wilson DC (2010) Accuracy of simple clinical and epidemiological definitions of childhood obesity: systematic review and evidence appraisal. *Obes Rev* 11:645–655. doi:[10.1111/j.1467-789X.2009.00709.x](https://doi.org/10.1111/j.1467-789X.2009.00709.x)
22. Navder KP, He Q, Zhang X, He S, Gong L, Sun Y et al (2009) Relationship between body mass index and adiposity in prepubertal children: ethnic and geographic comparisons between New York City and Jinan City (China). *J Appl Physiol* 107:488–493. doi:[10.1152/jappphysiol.00086.2009](https://doi.org/10.1152/jappphysiol.00086.2009)
23. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH (2000) Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 320:1240–1243. doi:[10.1136/bmj.320.7244.1240](https://doi.org/10.1136/bmj.320.7244.1240)
24. Cole TJ, Lobstein T (2012) Extended international (IOTF) body mass index cut-offs for thinness, overweight and obesity. *Pediatr Obes* 7:284–294. doi:[10.1111/j.2047-6310.2012.00064.x](https://doi.org/10.1111/j.2047-6310.2012.00064.x)
25. Campbell MW, Williams J, Hampton A, Wake M (2006) Maternal concern and perceptions of overweight in Australian preschool-aged children. *Med J Aust* 184:274–277
26. Baughcum AE, Powers SW, Johnson SB, Chamberlin LA, Deeks CM, Jain A et al (2001) Maternal feeding practices and beliefs and their relationships to overweight in early childhood. *J Dev Behav Pediatr* 22:391–408
27. Brug J, Wammes B, Kremers S, Giskes K, Oenema A (2006) Underestimation and overestimation of personal weight status: associations with socio-demographic characteristics and weight maintenance intentions. *J Hum Nutr Diet* 19:253–262. doi:[10.1111/j.1365-277X.2006.00707.x](https://doi.org/10.1111/j.1365-277X.2006.00707.x)
28. Spargo M, Mellis C (2014) Childhood obesity and parental perceptions in a rural Australian population: a pilot study. *J Paediatr Child Health* 50:131–134. doi:[10.1111/jpc.12417](https://doi.org/10.1111/jpc.12417)
29. Nihiser AJ, Lee SM, Wechsler H, McKenna M, Odom E, Reinold C et al (2009) BMI measurement in schools. *Pediatrics* 124(Suppl 1):S89–S97. doi:[10.1542/peds.2008-3586L](https://doi.org/10.1542/peds.2008-3586L)
30. Weinstein ND (1982) Unrealistic optimism about susceptibility to health problems. *J Behav Med* 5:441–460
31. Jay M, Stepney C, Wijetunga NA, Akinrinade G, Dorsey K, Bruzzese JM (2013) Accuracy of weight perception among urban early adolescents with uncontrolled asthma and their caregivers. *Ann Behav Med* 45:239–248. doi:[10.1007/s12160-012-9452-8](https://doi.org/10.1007/s12160-012-9452-8)
32. Weinstein ND (1989) Effects of personal experience on self-protective behavior. *Psychol Bull* 105:31–50. doi:[10.1037/0033-2909.105.1.31](https://doi.org/10.1037/0033-2909.105.1.31)
33. Wald ER, Ewing LJ, Cluss P, Goldstrohm S, Cipriani L, Colborn DK et al (2007) Parental perception of children's weight in a paediatric primary care setting. *Child Care Health Dev* 33:738–743. doi:[10.1111/j.1365-2214.2007.00753.x](https://doi.org/10.1111/j.1365-2214.2007.00753.x)
34. Chen S, Binns CW, Maycock B, Zhao Y, Liu Y (2014) Chinese mothers' perceptions of their child's weight and obesity status. *Asia Pac J Clin Nutr* 23:452–458. doi:[10.6133/apjcn.2014.23.3.14](https://doi.org/10.6133/apjcn.2014.23.3.14)
35. Tantleff-Dunn S, Gokee JL (2002) Body image: A handbook of theory, research, and clinical practice. In: Cash TF, Pruzinsky T (eds) *Interpersonal influences on body image development*. Guilford Press, New York
36. Smolak L (2002) Body image: A handbook of theory, research, and clinical practice. In: Cash TF, Pruzinsky T (eds) *Body image development in children*. Guilford Press, New York
37. Whitchurch G, Constantine L (1993) Sourcebook of family theories and methods: a contextual approach. In: Boss P, Doherty WJ, LaRossa R, Schumm WR, Steinmetz SK (eds) *Systems theory*. Plenum Press, New York
38. Rieves L, Cash TF (1996) Social developmental factors and women's body image attitudes. *J Soc Behav Pers* 11:63–78
39. Coomber K, King RM (2008) The role of sisters in body image dissatisfaction and disordered eating. *Sex Roles* 59:81–93. doi:[10.1007/s1199-008-9413-7](https://doi.org/10.1007/s1199-008-9413-7)
40. Sutcliffe CG, Schultz K, Brannock JM, Giardiello FM, Platz EA (2015) Do people know whether they are overweight? Concordance of self-reported, interviewer-observed, and measured body size. *Cancer Causes Control* 26:91–98. doi:[10.1007/s10552-014-0487-y](https://doi.org/10.1007/s10552-014-0487-y)



Reproduced with permission of copyright owner. Further reproduction prohibited without permission.