



Review Article

Understanding Parental Misclassification of Child Weight Status

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Abstract

Understanding the reasons for continued overweight and obesity in childhood has been identified as a crucial health problem. Effect from overweight and obesity in childhood extends into adolescents and adulthood. Weight problems in the early childhood period are linked to worsened health and increased overweight/obesity problems later. Studies have explored many factors affecting weight in childhood, though parental ability to discriminate weight has gained much attention. If parents cannot discriminate weight status, then they are less likely to intervene to correct or prevent weight issues. Despite emphasis on parental perception and misclassification of weight, this issue is underexplored in the preschool age group. This paper examined current research regarding parental perception and childhood obesity. Eight-point criteria including primary assessment of weight and parental perception was applied to articles found in Onesearch, a database that simultaneously looks at the entire library catalogue. From 1,399 articles, results were narrowed to a total of N=18 papers that met criteria and were included in the full review here. The articles had one common finding: parental perception of overweight and obesity in their child is poor. This review does show that perception research is expanding beyond the effects of basic demographic influences to include effects from items like health literacy, parental efficacy, concern over future weight status in children, and overall concern with the societal shift in weight gain.

Keywords: Parental misclassification; Parental perception; Child; Weight; Obesity

Introduction

Obesity is a pervasive problem that is not limited to one country or any single age group. This multifaceted problem involves a myriad of factors, including genetic, environmental, cultural, and psychosocial components. Lack of adequate treatment and intervention has led to obesity rates reaching epidemic proportions. The rate of childhood obesity has tripled since the 1980s, and now almost one-third of American children are obese [1]. Worldwide, the number of overweight children under age 5 has increased from 32 million in 2000 to 41 million in 2014 [2].

Weight status in childhood can start an unhealthy trajectory where children are at an increased likelihood and risk for being overweight and obese as adolescents and adults. Overweight children also face increased chance of health problems like type 2 diabetes, high blood pressure, and increased cholesterol and triglycerides [3,4]. If a child is overweight in ages from birth through age 5, they are five times more likely than their normal-weight peers to be overweight at age 12 [4].

Parents are moderators of child weight not just because they can serve as role models, but also because they are gatekeepers for a child's behavior and choices [5]. However, it is well-documented that parents are poor discriminators of their children's weight [4,5]. This is alarming as misperception of weight has been identified as a strong predictor of childhood obesity [5].

Despite research showing health consequences and risk to children, obesity continues to be a problem. It is theorized that part of the impediment of progress to decrease childhood obesity rates lies in the fact that parents do not correctly perceive their child's weight status and therefore do not act to correct or prevent weight problems. This comprehensive literature review aims to include a global perspective on

moderators of parental misclassification that could delineate continued issues in weight perception research and outline what needs further exploration to not just understand misperception, but also to frame appropriate intervention and preventative strategies. This review also aims to understand the evolution of perception research that has expanded past basic demographic influences and onto more comprehensive perspectives on influence that includes concern about weight, health literacy, and parental efficacy. Research on a parent's ability to classify and perceive the correct child weight has been expanded internationally and is changing how perception is evaluated.

It is imperative to examine this issue on a global level to help frame future research regarding childhood obesity and how to address parent (mis)perceptions.

Methods

Methodology to perform literature included a search on current classification studies done not just in the United States, but internationally. Systematic reviews have focused on Western or American research, but it fails to show the larger picture. This review was structured to be inclusive of relevant misclassification research regarding any age group of children and to include studies from any country.

Data sources and search strategies

A search was conducted to identify studies that describe parental misclassification of child weight. Misclassification is defined as when the parent view of child weight is inconsistent with actual child weight. The literature search included articles between 2007 and May 2017. Papers

were identified from Onesearch using these terms: “Parental misclassification” or “parental perception,” childhood, obesity, and weight. The Onesearch tool allows simultaneous access to the entire library catalogue and many scholarly e-resources with results that are ranked by relevance. This was chosen for its comprehensiveness (Figure 1).

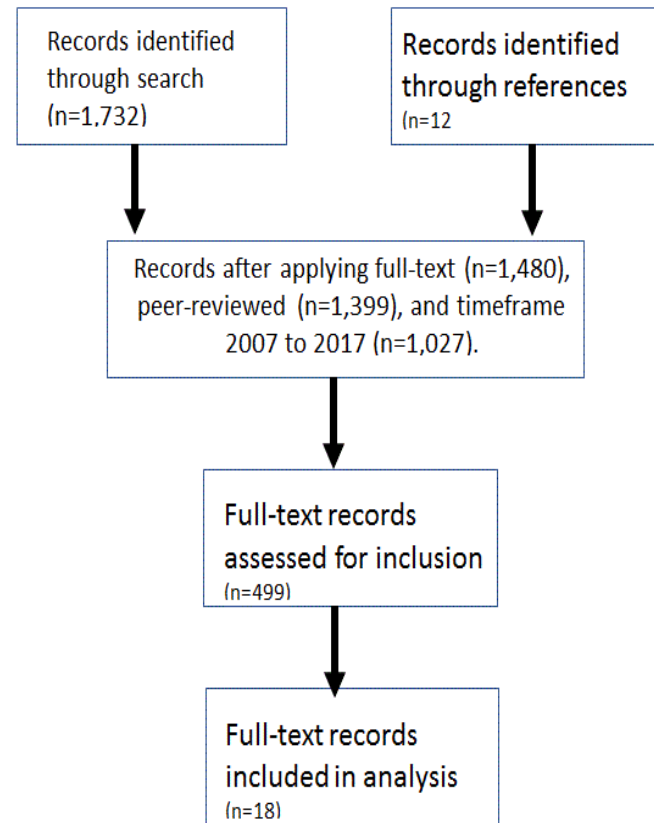


Figure 1: Process of paper selection.

To be considered for full review, articles needed to meet the following criteria: (i) Be primary research, not a review, (ii) The weight of the child had to be assessed by the investigator or proxy person and not obtained by parent report, (iii) Needed to evaluate parental perception and compare it to investigator measurement, (iv) Be published in a peer-reviewed journal, (v) Have full text availability, (vi) Have subjects of any age or ethnicity, (vii) Be published in the last 10 years, and (viii) Origination in any country as long as publication was available in English. Papers that did not (i) Include actual measured child weight, (ii) Those that were reviews or meta-analyses and (iii) Those that were not available in English were excluded.

Identifying relevant studies and data extraction

The database was searched during a three-week period from the end of April through May 2017 to find relevant articles. These papers were screened by looking at the title and

abstract first. Articles that met the search criteria were reviewed for full consideration.

Included and excluded papers

This search protocol yielded 12,631 articles with just the search terms of misclassification, perception, parental, and childhood. By adding weight, this was reduced to 1,732. Results were refined to include research that was full-text (n=1,480) and peer-reviewed (n=1,399). This was then narrowed from articles written from 2007 to 2017 (n=1,027).

Of the 1,027 articles, these were further narrowed as only articles dealing with misperception and misclassification directly as an outcome were included (n=499) based on abstracts. Articles that measured weight perception in the context of a different issue, such as feeding or activity patterns, were not included. Of the initial 499, only 12 of these articles examined investigator-assessed child weight and compared to parental perception as a primary research objective. The main reason for exclusion of articles at the full text stage was due to the researcher relying on reports of weight instead of direct measurement. References and citations were looked at to find other articles that involved original research and either preschool or adolescents. An additional 6 articles were identified through reference searches of applicable articles.

Results

The studies reviewed examined parental ability to discriminate child weight status, and they either called this phenomenon misclassification or misperception. These terms appear to be used interchangeably in the literature. Whether perception or misclassification is used, the criteria to determine this are the same. Actual weight measurements are compared to perceived parental views of the child weight; if actual weight and perceived weight do not match, it is deemed misclassification or misperception [6-23]. Due to the interchangeability found in the terms, misclassification is being used in this article. Misclassification has been demonstrated as a global problem as parents cannot accurately discriminate weight [4,6-23]. Even though international studies have larger samples of children [6-13,20] than some of the identified American-based studies [14-16], the results show the same trend of parents misclassifying their child’s weight in large proportions.

Height and weight information on each participating child was obtained using standard methods [6-13,15-23] or medical records [14]. Some studies added additional measurements to examine and classify weight. This included use of waist circumference and waist for height ratio because they have more sensitivity to metabolic syndromes and heart disease [13]. Most studies [7-13,14-23] gauged parental perception by asking the parent to select the description most like their child. These descriptions mostly involved a 5-point Likert scale with options such as very underweight to very overweight and with about the right weight as the middle

choice. There were some variations including asking if the child is “fine” for their age [6]. Only one study [16] asked parents to evaluate their child using a pictorial method that included 7 contours of children depicting underweight to obese children in both male and female likeness.

Perception of child weight has mostly been evaluated from the maternal perspective. Even though 12 of the 18 surveyed articles [6-8,10,14-21,23] allowed either parent to participate, most respondents were mothers. Father participation was as low as 0.01% [9] and as high as 20% [15] with most studies having very little father participation.

Rate of misperception/misclassification?

The percentage of parental misclassification occurring overall and within the child’s actual weight categories of overweight and obese is portrayed in Table 1. The overall perception rate cited in the reviewed literature shows that it is remaining anywhere from 20% to 29% in the most recent studies published in 2015 [19] and 2016 [12,16,18,20].

When looking at these same studies for the rate of misperception within those children who are clinically classified as obese, the rate of the identified parent misclassifying their child is 17% [18] to 81.4% [12] with a mean of 51.5%.

Location	Sample size (N)	Age range or grade* (mean)	Overall Percentage	Obese/Overweight Percentage	Year, Source
Greece	2287	2-5	38.6	55.4	2008 [4]
Finland	606	5, 11 (5, 11.6)	-	83, 52	2010 [10]
United States	120	2-5	30	76.1	2011 [11]
United States	358	14	31	58	2011 [12]
New Zealand	1,098	4-8 (6.5)	48.9	69.3	2011 [6]
Norway	3,770	2-19	-	70	2011 [5]
United Kingdom	531	6-8	-	-	2011 [18]
Croatia	1,068	6-8	23.7	97.8	2012 [8]
Ireland	1,037	Any (11.7)	-	-	2012 [3]
European Countries (8)	16,220	2-9 (6)	-	-	2012 [7]
Puerto Rico	250	1-6* (9.5)	37.6	48.6	2012 [20]
United Arab Emirates	945	1-12* (10.7)	33.8	63.5	2013 [14]
United Kingdom	237	7, 16 (6.9, 15.8)	56, 26	46.5, 26.3	2014 [19]
Poland	230	6	20	60.9	2015 [16]
England	361	6-8	21	17	2016 [15]
New Zealand	1,093	4-8 (6.5)	21.1	58	2016 [17]
Australia	3,557	4-5	29.7	81.4	2016 [9]
United States	453	Any (10.2)	-	-	2016 [13]
Overall and percentage of misclassification in obese/overweight category is either replicated from publication or calculated based on presented numbers in study. Some authors did not present this or information that could be extrapolated to configure this as denoted by – above					

Table 1: Misclassification of weight overall and within obese/overweight categories by study year.

Factors evaluating in relationship to misperception?

Common factors assessed for their effect on parental child weight perception include some form of socioeconomic status measurement [6,12,14,16-18,20-22], a child’s age/sex/weight [6-8,15,16,18,20-22] and parent BMI [6-8,15-22] and education [6-10,14,17-20,22,23]. No one variable was deemed to have a significant (p<0.05) effect across all studies. For instance, parents who misperceived their children were more likely to be overweight or obese than a healthy weight (p=0.002) [18]. However, this finding is not universal. Parent BMI was deemed a significant factor in weight perception (p<0.05) in six studies [7,8,16-18,21] while six others

[6,9,15,19-20,22] reported it did not significantly affect perception of child weight. Likewise, child gender had mixed results. It was not a significant factor in correct parental perception [18,20], but other studies found significance. In those studies that found it was a significant factor, whether a child’s gender played a role appeared to depend on the age group studied in three of the 18. Parents of adolescent boys at ages 14 [15], 11.7 [6], 16 [22] were better able to recognize overweight status and thus have a more accurate perception of their child’s weight.

Parental age was not consistently considered in the perception research. In the four studies that discussed it, three did not find to influence their ability to evaluate child weight status [6,16,22]. Another study discussed parental age as a

factor, but the final effect of weight perception was not presented or discussed [9]. Other studies focused on the differences of parental weight perception accuracy through the lens of child age.

A study [22] of 7 and 16 year old youth showed that parent's perception of child weight improved as the child aged. The accuracy improved from 44% to 74%. On a similar subject, a study [7] looking at 2 to 5 year-old children found contradictory results. The researchers divided this period into three age segments for the research: 24-36 months, 37-48 months, and 49-60 months [7]. This study confirmed that the rate of misperception increases within each age division: 34%, 38% and 42% ($p=0.03$). It is difficult to compare the results of these studies, though. Studying varied age groups versus one specific group could alter perception results.

A unique feature that is emerging in research regarding how parents perceive their child's weight is other mechanisms, besides just basic demographic characteristics, that can influence how they see their child. These new factors include future concern about the child's weight [10,14,18,21], concern about the weight of the overall country [15], health literacy [14], the effect of positive health conditions like obesity, diabetes, and cardiovascular disease [11] in parents/grandparents and obesity-related diseases like high blood pressure, coronary artery disease, and type 2 diabetes in parents [13].

Concern over child weight

Concern over the child's future weight yielded inconsistent results. For instance, concern was found to be a moderator of perception, allowing more accurate weight perceptions when parents were concerned for the child's future weight [10]. Overall, this concern was observed in 29.9% of parents [10]. This was not consistent with all studies measuring concern, though. Others found that parental concern for future weight was minimal and it was a non-significant factor in a parent's perception of their child's weight [14]. Still, a third study found that parents who misperceived their child's weight had more concern over a child's future weight status ($p<0.001$) [18]. This study also examined concern about the country's overall weight shift. Their result for concern over the national rise in weight was not significant factor ($p=0.126$) affecting weight perception [18]. These results were mused as being related to parent's recognizing overweight status, but failing to distinguish between overweight and obesity [18].

Effect of health conditions

The study looking at obesity-related diseases found no effect between illness and parental perception ($p=0.415$) [13]. There was no indication of how this question was asked, so it is difficult to determine how valid the insignificance is. The idea of relating health to perception was only observed in three of the 18 studies. The second study that addressed illness found that 65.4% of children studied had a positive

family history including obesity, diabetes, and/or cardiovascular disease [11]. Also, this was observed more frequently in overweight or obese children and parents with positive family history [11]. However, the results of whether this was an impact on perception were mixed. The number of illnesses in the family history was correlated with parent's misclassification of weight ($p=0.004$) [11]. This did not hold in adjusted model. The final model only showed that the odds for misclassification are higher if there is a family history of diabetes ($p=0.019$) [11]. The third health-related study examined the effect of health literacy levels, results show that parents with higher health literacy are more accurate at predicting weight and even the severity of illness for the child [14].

Other components being examined

Other studies used unique components to examine how different variables can affect the parent's ability to correctly perceive a child's weight status. Items like the child's gestational age, birth weight, breastfeeding, as well as the child's number of siblings and position in the family were added to typical considerations like BMI to determine what affected parental perception [18]. However, in this study, only the child's BMI percentile and age as well as maternal education were found statistically significant.

Discussion

Although a recent meta-analysis [4] evaluated perception research prior to 2013, many of the articles reviewed did not address moderators of parental perception, and new research has identified moderating factors that need further exploration. This review attempted to add current research to evaluate changes in moderating factors that can help us better understand parental misclassification. This aim is crucial as a proper understanding is the foundation for prevention and intervention with childhood obesity.

This review validated past findings and identified new moderators that need explored further. Key review findings include the validation of consistent ways to evaluate weight misclassification by comparing investigator-assessed weight to parental perception of weight [6-23] and reaffirmation of the consistent misclassification of child weight by parents as other reviews [4] and studies [6-23] have shown. Misperception of child weight is a continued problem across multiple countries, though it is not fully understood. This review shows that misclassification rates vary widely from 17% [18] to 81.4% [12]. This range could be due to the variable and inconsistent moderating factors used to evaluate perception.

Most studies evaluated some form of SES, including parent education, as well as child age/weight/sex. However, newer studies have added more depth to moderating factors by including parent concern about a child's weight [10,14,18], concern over shifts in overall population weight [18], parental health literacy [14], and family history of obesity-related

diseases [11]. Concern over child weight was found to be an important target for public health interventions, yet it is only explored in three of the 18 articles. Furthermore, health literacy and experience with obesity-related diseases can help us understand if the parents' perceived consequence of obesity and knowledge of health risks affect perception. While these issues were partially explored individually in a single study each, they were not evaluated in conjunction with other known moderators for parental perception. For instance, concern for becoming overweight was looked at with known moderators such as parental BMI, parental education, child gender, and child age [10], while another study [14] only looked at concern with factors like health literacy and parental efficacy. The idea of exposure to obesity-related issues and knowledge of health risks are important and should be explored in connection to known moderating effects like child gender [6,7,10,21,22], age [4,6,8,10,15,22] and BMI [4,21] as well as parental BMI [7,8,16-18,21] and education [7,17,23]. Parent's knowledge of health consequence and risk related to obesity could be an important moderating factor in perception and a foundation piece for future intervention and preventative efforts.

This review also highlights the finding that younger children's weight is misperceived by their parents [7,14,18,19,22]. Implications for prevention and even treatment show that younger youth should be the target for intervention/prevention, and that it is crucial for parents to recognize problems so they are ready to make the needed lifestyle changes [10]. Children in younger age groups are more reliant on parents [4,24]. Researchers have also identified that early periods are critical for child development and nutrition [4], and there are modifiable risk factors that can change the negative trajectory in weight, health, and habits [24]. The best time for obesity intervention and prevention are shown to be in infancy and early childhood when children are modifiable in their behavior and their physiological characteristics are plastic [5].

With the connection between early childhood and its risk for future problems as well as its desirability for modifiable behaviors, research needs to target this age. The future research needs to move past traditional sociodemographic connections and delve into more complex areas, such as knowledge of health risks and consequences as well as concern over the individual child weight and the population shifts in weight.

With its roots in social and psychological issues, it is theorized that part of the perception problem could be associated with fear of stigmatizing the youth and guilt from parents who may feel failure for their child's size due to the responsibility component involved [10]. However, other researchers have postulated that a lack of health knowledge can contribute to misunderstanding [11]. Further, the increasing obesogenic environment may change how people view weight. The increasing and more obvious weight deviations can make it harder to discriminate healthy versus unhealthy weights, and most parents may perceive their child as healthy regardless of weight [10]. This points to a lack of

connection between weight and health, which is an area that could be explored to further understand of parental perceptions.

Furthermore, perception research has largely focused on mothers. Even studies that do not exclude fathers have extremely low participation for rates fathers. Is there a difference between how mothers and fathers perceive weight status in their children? Are mothers the most influential caregiver in our modern society? These are questions that have not been answered in present research; especially considering the finding that father's do not perceive their own weight correctly [4].

Though much research has looked at this area, it is clear that it is not enough. More clarity is needed to understand the complex issues that affect how parents perceive their children's weight.

Limitations

This review was rigorous in examining articles in the Onesearch database, plus looking at references of identified articles to find a comprehensive selection of studies. However, there are still limitations. Onesearch allows simultaneous searching of all databases, but there is a chance that some articles may be missed and thus not be included in the review. This database was chosen because of its ability to search multiple databases simultaneously. To check this limitation, the researcher did run the same search terms through CINHALL. Only five items were identified in this search, and none met the inclusion criteria for this review. Despite this finding, the use of only Onesearch is still a limitation. Also, this review only included articles available in English, so any article that was not available in translated form was excluded. This means some relevant research could be missed unintentionally. Another limitation is the low number of articles that were found that fit the criteria. Although they do provide insight into this issue, the low number limits generalizability.

Conclusions

Parental perception of weight continues to be an important component of the obesity problem. Perception research has consistently evaluated demographical features for children and parents, including age, sex, education, and SES, but the field is just beginning to explore how additional factors can affect perception. Recent studies have expanded perception research, but more is needed. There could be factors that have not been fully explored or understood that account for the reason misperception and overweight/obesity levels continue to remain high, especially in the preschool age group.

Parents must correctly perceive their child's weight if we hope to form successful intervention and/or prevention strategies to combat the persistent weight problem. The end goal is to engage parents to introduce or engage in healthy behavior changes with a focus on healthy habits to make an

impact, but the first step is to ensure parents recognize unhealthy weight levels. If parents do not recognize increased weight or risk for increased weight before it is an obvious problem, they are unlikely to implement changes in diet and lifestyle [6].

Conflicts of Interest Statement

The authors have no conflicts of interest to reports.

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