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The Relationship of Obesity and Weight Gain to Childhood Teasing

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This article examines the relationship between weight gain and childhood teasing in children. Anthropometric data and self-reported teasing experiences were collected on a sample of second and third graders at a local elementary school in a disadvantaged suburban community. The study model uses bio-ecological development theory in which child development is understood in context: the child's physical characteristics influence the social environment, which interact and influence the behaviors that result in physical development and characteristics such as weight gain. Results suggest that teasing influences BMI change and that the relationship is more complex than simply stating that obese children are teased.

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WITH THE GROWING concern about the obesity epidemic and its related consequences, there is a growing interest in the interplay of multiple biological and psychosocial factors that are associated with overweight children's development. Although more is known about antecedents such as genetics, nutrition and exercise, less is known about the behavioral determinants of conditions that produce overweight or the consequential social effects on children who are overweight such as teasing or bullying. With the most recent Centers for Disease Control (CDC) report on obesity finding that more than two thirds of adults are overweight or obese (CDC, 2014), we need to focus on the origins in childhood.

Obesity is a major health problem today affecting one third of adults and 17% of U.S. children who are obese (Ogden, Carroll, Kit, & Flegal, 2012). Minorities disproportionately exhibit high rates of overweight and obesity with 37 and 36% for Hispanic and non-Hispanic Black females respectively, and

35% of all non-Hispanic Black children ages 2–19 years. Specifically among school children 6–11 years, 18% are obese (>95th percentile) with 26 and 22% non-Hispanic Black males and females respectively; with 27 and 23% Hispanic males and females respectively (Ogden, Carroll, Kit, & Flegal, 2014). Although there is recent evidence that the rates appear to have leveled off (Ogden et al., 2012), these epidemic rates place our youth in danger of developing a myriad of diseases as well as a shortened life span. It is well understood that a diet high in fat and calories and limited physical activity are predecessors to gaining weight. However, little research to date has focused primarily on negative outcomes related to weight-based teasing and its bi-directional relationship with BMI change, particularly among racially diverse children. To understand this in a social context, the child's developmental change needs to be examined. This study examines the possible interactive relationships between childhood teasing and obesity starting in second grade students followed to third grade.

The purpose of the study is to describe the characteristics of overweight children and the influence of their BMI and BMI change on their self-reported teasing. The study also seeks to answer the extent to which children's reported peer teasing bothers them and is associated with weight gain. The

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children in this study were part of a community-based project in a charter school. School students (grades K-4) were primarily from racially and ethnically diverse backgrounds and were culturally disadvantaged. The population of this community, including the children, is statistically more overweight than neighboring communities at 41% compared to 38% (Nassau County National Behavioral Risk Factor Surveillance Survey [BRFSS], 2007).

Conceptual Model

Bronfenbrenner's human ecology model defines development occurring within complex "layers" of environment, each having an effect on a child's development bi-directionally (Bronfenbrenner, 1977, 2001, 2005). The model emphasizes that a child's own biology and physical systems interact with the environment, which fuels development (Bronfenbrenner, 2005). Thus the systems and environments interact bi-directionally "making humans human." This "bio-ecological systems theory" yields a developmental model that can be used to understand change over time such as weight gain.

The study is conceptualized on this developmental model that describes four systems of human development or human ecology. These are as follows: (1) the microsystem at the center including the biology and physical characteristics of the child within the family, school, peer group, neighborhood; (2) the mesosystem comprising connections between immediate environments such as the child's home, classroom; (3) the exosystem or external environmental settings which indirectly affect the systems within such as the school system or media, and (4) the macrosystem, or larger cultural context such as cultural values. Within the interactionism of these systems, there is recognition that causes for continuity and change in the person are dependent on the dynamic interaction between the persons, environment and situations (Reynolds et al., 2010). Understanding development or individual change in context is central to Bronfenbrenner's model and suggests a framework to study how a child's physical characteristics such as obesity influence the social environment which includes classmates, and how the response of the social environment such as teasing reciprocally influences the child's behavior that lead to physical changes such as weight gain. These interactions are all within the context of family and community that play a role in the child's development (Figure 1).

Obesity in childhood should be understood within this model. With development at the center, children's family and community values of what constitutes overweight are central to how children are nurtured and fed, both physically and psychologically. Parenting and obesity literature is extensive with parenting efficacy affected by various factors (Grossklau & Marvicsin, 2014; Towns & D'Auria, 2009). Parents of some children may not see them being overweight as a problem. For example, Hackie and Bowles (2007) studied parents of

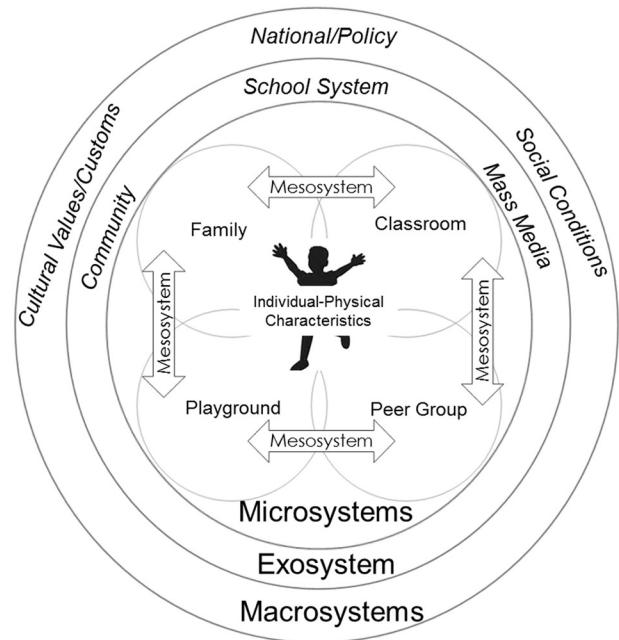


Figure 1 Bio-ecological development theory.

overweight children who did not see their child as overweight. Garrett-Wright (2010) found that parents reported little or no concern even when their child was overweight or obese and cautioned that low levels of concern about child weight were frequently found in samples where high levels of overweight and obesity exist in children. Misperception of obesity exists because parents fail to accept the idea that their child is fat (Myers & Vargas, 2000).

As important, the school environment also plays a significant role in the child's cognitive, social and emotional development. Schools are the communities in which young children interact with peers throughout their day. Obese children are reported to suffer from weight-based teasing at schools (McCormack et al., 2011). Recognizing the context of overweight children's social interactions is critical to any efforts to prevent obesity. What precipitates teasing and bullying in school, and what are the results of these negative social interactions that are not congruent with home and family?

Such interaction between the teaser and individual being teased can lead to the transformation and emergence of self-categorization of identity that can produce a lifelong tainted self-view. According to Reynolds et al. (2010), social norms, shared values, influence and persuasion, shared emotions and shared goals are collective products, which shape social system and culture. Therefore, it can be said that group culture and behavior can influence one's sense of self as an individual. Obese youth are more likely to be found at the periphery of social networks, suggesting that the obese youth are more likely to be socially marginalized by peers (Strauss & Pollack, 2003). In addition to be at greater risk for social marginalization, children who are obese are also at an increased risk for peer victimization (Gray, Kahhan, &

Janicke, 2009). These social influences from the environment may affect the child's mental health. Psychological factors such as depression, self-esteem and body dissatisfaction are implicated in obesity and weight gain. For example, O'Dea (2005) identified a linear relationship between body dissatisfaction and increasing BMI for girls. Taken together, Russell-Mayhew, McVey, Bardick, and Ireland (2012) propose a psychological model that suggests physical consequences. Bronfenbrenner's human ecology model can be simplified to take into account these supported interactions to suggest that children's weight gain as a developmental issue must be understood in the context of other considerations besides nutrition and exercise.

The simplification of the model for this study (Figure 2) depicts a circular pathway that shows a cycle of overweight in a social environment that leads to increased eating which results in gaining weight. Thus the cycle left uninterrupted may be more detrimental in the health-related consequences that public health professionals are trying to prevent in obesity reduction programs. While the model suggests a singular feedback loop, the prediction characteristics and potential points of intervention are more complicated. We need to gain more insight on the interrelationships among the child's characteristics that are antecedent to a teasing response in the classroom, and the consequences of teasing on the child's weight gain.

Identifying individual as well as group risk factors in the school age population of youths in communities that are disadvantaged in particular can lead to a better understanding of behavioral and psychosocial outcomes in relation to weight-based teasing. Early identification of weight related teasing could allow for better planning of interventions that couple traditional activity and nutritional programs with affective

objectives to boost self-esteem and a better understanding of the negative consequences of teasing.

Literature Review

As obesity rates among children continue to rise there is an increasing need to refine our understanding of the consequences of weight-based teasing and its influence on BMI and BMI change. There is ample evidence in the literature that the epidemic of childhood obesity continues with children from disadvantaged neighborhoods being over-represented (Jensen & Steele, 2010; Taylor, 2011). The conclusions are drawn from limited foci related to nutrition and exercise interventions and do not consider alternative potential interventions that may be influential in mediating the benefits—or at worst, counteracting the benefits of otherwise useful interventions. This may be due, in part, to a lack of understanding of the behavioral and social impact of teasing.

The prevalence of overweight children that suffer emotional consequences has been widely documented (Russell-Mayhew et al., 2012). Studies show that overweight children who are teased by peers are at a greater risk for developing low self-esteem and negative body image, which are correlated with depressive symptoms and suicidal ideation (Russell-Mayhew et al., 2012; Taylor, 2011). According to Jensen and Steele (2010), teasing is a specific type of peer victimization that is characterized by a range of verbal taunts about personal or social factors including appearance, performance, social behavior, academic achievement, or family background. Hayden-Wade et al. (2005) reported that 78% of a sample of overweight youth experienced teasing compared to 37.2% of a non-overweight sample. Teasing and bullying are closely related: the differences often primarily lying in the recipients' interpretation of behaviors directed towards them. Researchers have also found that bullied children have significantly more health problems, poorer school adjustment and poorer emotional adjustment than children who have not been bullied (Haraldstad, Christophersen, Eide, Natvig, & Helseth, 2011). Approximately half of obese boys and girls report experiencing significant problems with their peers (Warschburger, 2005). Estimates of victimization among obese youth are twice as high as rates reported among non-obese populations (Hayden-Wade et al., 2005).

The prevalence of weight-based teasing and its influence on BMI have been examined with focus on the effectiveness of the development of an integrative approach in school-based programs aimed at decreasing obesity rates among children (Puhl & Luedicke, 2012). Researchers in the field of obesity have proposed using an integrative approach to the prevention of the spectrum of problems related to eating and weight, including eating disorders, obesity, and unhealthy weight control behaviors. Many weight management programs in schools center around physical activity and healthy eating practices, but the social aspects of these focused activities may

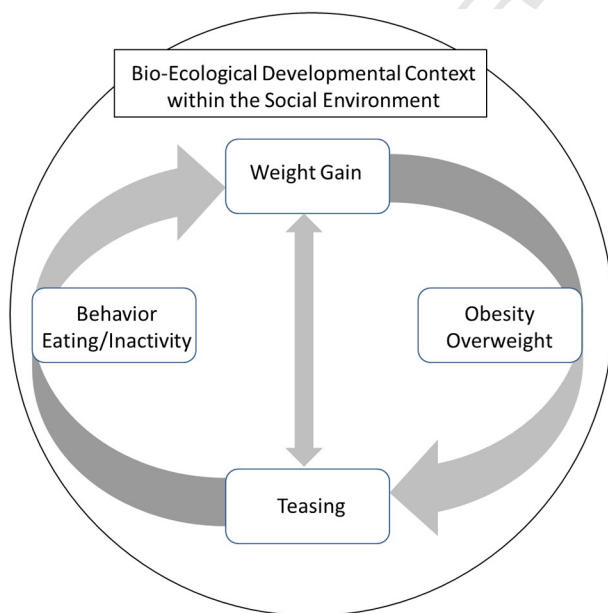


Figure 2 Cycle of weight gain, obesity, teasing, and eating/inactivity behaviors.

consequently call attention to some children and precipitate their behavioral responses of self-isolation and withdrawal (Puhl, Luedicke, & Heuer, 2011). For example, a physical education program that separates high performers and low performers into groups by virtue of physicality may be detrimental to some children's self-esteem and willingness to engage in challenging physical activities. Children are well aware of their classmates' physical differences and the environment may be ripe for teasing. We know less about these unintended consequences of well-intended obesity prevention programs.

In order to guide the development of such programs, it is essential to examine the underlying factors of the physical and emotional effects of teasing. There is growing concern that children who experience weight-based teasing may be driven into an emotional state prompting increased over-eating and continued weight gain. Womble et al. (2001) determined that the psychosocial model of binge eating was influenced by a history of weight-based teasing and has recommended that the construct of teasing be considered in the development of prevention programs. A 2002 study reported that shape and weight gain concerns increase risk for excessive weight gain, likely through associations with unhealthy eating patterns such as binge eating and emotional eating which may lead to reduced participation in physical activity due to appearance related discomfort (Neumark-Sztainer, Falkner, Story, Perry, & Hannan, 2002). A decrease in physical activity could also be considered an antecedent to future weight gain.

The concept of loneliness among teased adolescents leading to disordered eating behaviors, including becoming overweight, has also been documented. The experience of teasing may lead adolescents to experience a feeling of loneliness, which can also be examined in relation to BMI change. For example, Hayden-Wade et al. (2005) noted a correlation between weight based teasing and loneliness in adolescents and, more specifically between weight-based teasing and binge eating among overweight youth in their study sample. Loneliness may be a function of social isolation when physical performance is revered and children feel inadequate. Social isolation may be self-imposed by children who are teased.

Adolescents are particularly vulnerable developmentally to the effects of weight-based teasing and mistreatment. In adolescence, youths are particularly sensitive to peer interactions and the results may impact their emotional well-being (Eisenberg, Neumark-Sztainer, & Story, 2003). For example, in a study of 1071 public school students by Krukowski et al. (2009), school performance was significantly associated with weight-based teasing. With research findings that weight based teasing has a detrimental effect on school age populations, it is important to understand the social context of obesity attention while understanding the impact of teasing on the child. It can lead to a myriad of emotional and physical symptoms that need to be prevented if associated with the best obesity prevention programs.

This study was aimed at generating a greater understanding of the effects of weight related teasing on BMI, BMI change,

and potential gender differences in pre-adolescent school aged children from a disadvantaged population between ages 7 and 9 whose rapid growth spurts and body changes have not yet been triggered. This age may be particularly susceptible to internalizing social taunts and learning unhealthy coping behaviors such as over eating (Womble et al., 2001), which may reciprocally result in weight gain. A bio-ecological developmental systems approach will aid to our understanding of the complexity of weight reduction efforts in treating obesity as an epidemic in the population.

Purpose

This project was initiated from an invitation by the elementary school principal of a suburban charter school located in a socioeconomically disadvantaged community in metropolitan New York. According to the county health statistics, this community has significant health problems including obesity (28%), hypertension (24%) and diabetes (9%) (Nassau County National Behavioral Risk Factor Surveillance Survey [BRFSS], 2007). The principal requested that researchers, faculty and nursing students assist school personnel in identifying areas of support that they could provide as they grew combining health-related activities with research potential. The partnership was established following two focus group sessions with faculty, food service workers, social workers, physical education instructor, and the principal, as well as two meetings with parents. The problems to be addressed were health-related issues in general and obesity specifically, but included the community concern about the social and aggressive behaviors of the children related to teasing and bullying. The focus group transcripts were used to carve out areas to address and brought back to the school personnel and parents for discussion about potential plans. The new charter school opened with kindergarten, first and second grades (total = 150), with 2 classes at each grade ($n = 25$ per class). The plan was to grow annually with a new grade to open each year until the capacity (K–5th) was reached. The study was initiated with the second grade students. Data collection would follow them from Spring to Fall over 6 months into the new third grade. The researchers would measure heights and weights, calculate their BMI and BMI change, and obtain the third graders' self-reported teasing by other children.

On the basis of a bio-ecological systems model, the following questions could be asked to assess developmental change:

1. Is teasing associated with BMI (at third grade) or BMI change (from second grade)?
2. Are teasing scores affected by BMI change scores for children whose BMI changes indicated weight gained versus weight lost ("gained" BMI vs "lost" BMI) over 6 months?
3. Does gender and BMI change predict teasing related to (a) personality and behavior; (b) family and environment; (c) school; and (d) my body.

Study Methods

Sample

The target population was drawn from the charter school students enrolled via parent applications from within the public school system. More than half of the students in the school are Spanish speaking. Fewer than 2% are White or Asian and 41% are Black Non-Hispanic. Ninety-two percent of the children in the school are eligible for free lunch. Over the study period, all 50 children from the second grade were measured ($n = 28$ boys; $n = 22$ girls); in the third grade, 41 of the same children were measured ($n = 25$ boys; $n = 16$ girls); and the final sample to complete the questionnaires during the third grade yielded 37 complete sets of data ($n = 24$ boys; $n = 13$ girls).

Measures

The variables in the study of the target population included their second grade heights, weights and calculated BMIs (BMI2) using the CDC online calculator (CDC.gov); their third grade heights, weights, and calculated BMIs (BMI3); and computed BMI change (BMI3 minus BMI2). To capture change, BMIs were used to identify relative positive or negative values indicating whether the child “gained” weight (i.e. body mass) over normal growth from BMI2 to BMI3, “lost” weight (i.e. body mass) over the period, or maintained their BMIs (near zero). Since most of the children gained weight not associated with normal growth in the 5 month period, particularly boys, a mid-point of BMI change for the sample was computed ($+ .1$) and used as the cut point to determine if children “gained” versus “lost” body mass.

The Child Assessment of Teasing Scale (CATS©) (Vessey, Horowitz, Carlson, & Duffy, 2008) was used to measure self-reported teasing. This paper-and-pencil questionnaire was translated and back translated into Spanish to provide language choices for the students, but only 1 child chose to use the Spanish version. It was dropped from the analysis. The scale is divided into two sets of questions around how the child reports being teased: “how much are you teased about ...?” “How much does the teasing bother you...?” The responses range from “not at all” to “very much.” The items can be analyzed separately or used to compute “weighted” scores by multiplying the amount of teasing by how much it is bothersome. The items are then grouped into 4 factors that include (1) my body; (2) personal; (3) family; and (4) behaviors. The factors yielded two separate measures for analysis that are un-weighted and weighted: (a) weighted scores were calculated for each factor and analyzed separately; unweighted mean teasing scores for “how much you are teased” and “how much it bothers you” were calculated separately by gender. The CATS has been used in numerous studies with reported acceptable reliability

(Cronbach alpha = .94), validity and a Fleish–Kinkaid reading level of grade 3.9 (Vessey, DiFazio, & Strout, 2012; Vessey et al., 2008). Total teasing score was calculated as the average of all four weighted factors.

Procedures

The researchers obtained approval to conduct the study from the Institutional Review Board and parental consent was obtained for all children in the study. Baseline BMIs were recorded on all second grade students in two classes just prior to summer vacation. When they returned in the fall, the same children, now in the new third grade of the school had their heights and weights recorded and new BMIs calculated.

Over the next 6 months, the CATS (Child Assessment of Teasing Scale) questionnaire was distributed by the teachers and collected by the researchers. To capture the developmental change over time, approximately 1 year separated the first BMI calculations and self-reported questionnaires about the children’s teasing, which were completed approximately 6 months after the second BMI calculations.

Results

The heights, weights and BMIs for children in the second grade who were re-measured in the third grade demonstrated that the rates of obesity and overweight in this community exceeds the generally reported population data in the U.S. (Table 1). Almost 50% of third grade children in this community (48% boys and 56% girls) are above the 85th percentile of the population and almost one third are obese (Figure 3). From second to third grade, the percentages of children in both genders in the obese and overweight categories increased suggesting that in the months between measures, which included summer when children are at

Table 1 Summary of children’s BMI-for-age.

	Grade 2			Grade 3			
	Boys	Girls	Total	Boys	Girls	Total	
Number of children assessed:	28	22	50	25	16	41	
Underweight (<5th percentile)	0%	5%	2%	4%	6%	5%	
Normal BMI (5th–85th percentile)	54%	45%	50%	48%	38%	44%	
Overweight or obese (>85th percentile) ^a	46%	50%	48%	48%	56%	51%	
Obese (>95th percentile)	25%	36%	30%	32%	38%	34%	

^a Terminology based on: Barlow SE and the Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. Pediatrics. 2007;120 (suppl4):s164-92.

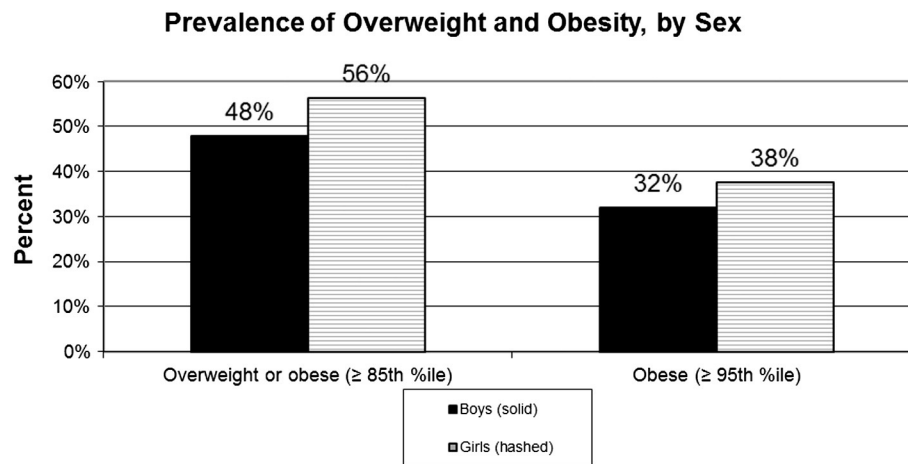


Figure 3 Overweight and obese summary statistics for third grade children.

home and not school, many gained weight disproportionately to their heights moving from normal to overweight and from overweight to obese.

A paired t-test on the small sample of children who had complete measures demonstrated that the BMI change from second to third grade was non-significant for girls but noteworthy ($p = .08$) for boys (Table 2), probably due to normal change in heights for some males beginning at this age (7–9) and continuing through adolescence. Although not significant at the .05 level possibly due to the small sample, the BMI change for boys should not be overlooked. It was therefore important to assess BMI change in this period of time sorted by gender to answer the research questions. It also validated the mid-point of BMI change that was not 0.

To address the question of BMI and teasing, the total teasing scores were computed and split at the median (total teasing [TT] high vs low) and used to assess total teasing by BMI (second grade, third grade) BMI change (“gained” versus “lost”) and analyzed by gender. Using a non-parametric correlation (Kendel’s tau), TT and BMI (second grade $n = 40$) $r = .027$, $p = \text{NS}$; BMI (third grade $n = 37$) $r = .099$, $p = \text{NS}$, were not significant. However, an independent t-test on TT by BMI change (lost vs gained) sorted by gender revealed that there was a significant difference in teasing

(higher vs lower) for females ($t = 2.55$, $p = .04$) but not for males ($t = 0.581$, $p = \text{NS}$). These findings suggest that teasing was not related to second or third grade children’s BMIs if taken in total; sorted by gender, teasing was not reported as a result of BMI, but rather, BMI change was related to the child’s report of teasing. Given the 6-month time interval between BMI measurements, this finding gives some support to the interactive nature of teasing and weight gain. Because the sample was small for complete data, subsequent analyses were bootstrapped to test the more complex questions.

Following the completion of the preliminary analyses, bootstrapping was used to assess the effects of teasing on the children’s change in BMI from second to third grade. Bootstrapping allows for a more precise estimate of the indirect effects particularly when a sample is limited (Calmetes, Drummond, & Vowler, 2012). The concept is that after a random sample has been taken, the values in this sample are repeatedly, randomly “resampled” to generate a large series of new sets of values that are called “pseudosamples” that can be used to recalculate values that characterize the source population. “The bootstrap samples are to the original sample, as the original sample was to the population...and is likely to give more accurate estimates of population parameters than if these values had been calculated on the basis of an initial incorrect assumption of a specific distribution” (p. 235). With bootstrapping, multiple linear regression was used to analyze the combination of weighted teasing factors on BMI change. When separated by gender, the four CATS factors (*my body, family, personal/behavioral, and school*) predicted BMI change for girls ($F = 6.94$, $p < .001$) but not for boys ($F = 1.12$, $p = \text{NS}$). For boys, only 9% of the variance can be explained by teasing, but for girls, 57% of the variance can be explained by teasing.

A closer look at the data separated by gender suggests clear associations of teasing and BMI change. Analysis of variance of the unweighted total teasing scores on the children sorted by BMI gained and BMI lost yielded

Table 2 Paired samples test on BMIs for second and third grade children with complete data (6 months interval).

Gender			Paired differences		t	p
			Mean	SD		
Females	Paired	BMI2 to BMI3	−0.31	1.67	−0.74	NS
		$n = 16$				
Males	Paired	BMI2 to BMI3	−0.60	1.64	−1.82	.08 *
		$n = 25$				

* Although not significant at $p < .05$, the paired difference value should be interpreted cautiously due to small sample size. More boys at third grade gained weight not commensurate with their heights.

Table 3 Analysis of variance of unweighted teasing scores by BMI gained vs lost.

Gender	Teasing scores—unweighted total		Sum of squares	<i>F</i>	<i>p</i>
Male <i>n</i> = 25	“I am teased”	Between groups	0.69	0.07	NS
		Within groups	220.299		
		Total	220.989		
	“Teasing bothers me”	Between groups	0.34	1.05	NS
		Within groups	196.21		
		Total	196.56		
Female <i>n</i> = 13	“I am teased”	Between groups	13.77	2.96	NS
		Within groups	51.18		
		Total	64.95		
	“Teasing bothers me”	Between groups	26.18	7.48	.02
		Within groups	38.53		
		Total	64.70		

significant differences (Table 3). For boys and girls, the unweighted “I am teased” score was not significant. However, for girls the unweighted “I am bothered by the teasing” score was statistically significant ($F = 7.47$, $p < .05$) but not for boys. When BMI-gained and BMI-lost were analyzed by each of the four factors, difference

emerged with both genders for individual factor scores (Table 4). The factor related to being teased about school was significant ($t = -2.09, p < .05$) as was the factor teasing about my personality or behavior bothers me was significant ($t = -2.67, p < .05$). In both groups, those who had gained body mass (BMI-gained) in the 6 month interval had

Table 4 T-tests for unweighted teasing factors for combined genders.

		<i>n</i>	Mean	SD	<i>t</i>	<i>p</i>
Factor 1 Personality/behavioral	BMI lost	13	1.539	0.64	−1.395	NS
	BMI gained	25	1.890	0.78		
“I am teased about personality & behavior...”						
Factor 2 Family and environment	BMI lost	13	1.571	0.79	0.011	NS
	BMI gained	25	1.569	0.77		
“I am teased about my family and environment...”						
Factor 3 School related	BMI lost	13	1.509	0.51	−2.086	.04
	BMI gained	25	1.996	0.75		
“I am teased about school related...”						
Factor 4 My body	BMI lost	13	1.615	1.02	0.36	NS
	BMI gained	25	1.500	0.89		
“I am teased about my body...”						
Factor 1 Personality/behavioral	BMI lost	12	1.304	0.49	−2.672	.01
	BMI gained	25	1.871	0.79		
“Teasing about personality & behavior bothers me...”						
Factor 2 Family and environment	BMI lost	12	1.333	0.69	−0.539	NS
	BMI gained	25	1.474	0.77		
“Teasing about my family and environment bothers me...”						
FACTOR 3 School Related	BMI lost	12	1.583	0.78	−1.169	NS
	BMI gained	25	1.893	0.74		
“Teasing about school concerns bothers me...”						
Factor 4 My body	BMI lost	12	1.229	0.67	−0.747	NS
	BMI gained	25	1.440	0.86		
“Teasing about my body bothers me...”						

reported higher teasing scores than those who had lost or stayed the same.

Finally, *t*-tests of the weighted teasing scores by factors were calculated, sorted by gender, to test differences between the groups of children with BMI lost and BMI gained. For all children, the weighted teasing factor related to personality/behavior was statistically significant ($t = -2.16$, $p < .05$), but only girls with BMI gained versus those with BMI lost analyzed separately yielded a statistically significant weighted factor on personality/behavior ($t = -3.00$, $p < .05$) and the weighted factor on teasing related to school ($t = -2.38$, $p < .05$) (Table 5).

Discussion

This study explored the reciprocal relationship between self-reported teasing, BMI, and BMI change with a short-term longitudinal measurement approach in a multi-cultural disadvantaged group of elementary school children. Data revealed a significant difference in weight related teasing when analyzed by gender. Girls who gained body mass in the study period reported more about “being teased” and boys who gained body mass reported more that “teasing bothered them.” Knowing that some children are teased who are not overweight as reported by Hayden-Wade et al. (2005), there are other factors that may be in play such as low self-esteem,

school failure or chronic conditions. While there was no evidence for any clear association between overweight, obesity and teasing in general unless sorted by gender, there were clear associations between self-reported teasing and BMI change over time, although not with the “my body” factor in the tool. This suggests a developmental influence of teasing and weight gain, which can be described within the bio-ecological systems models described by Bronfenbrenner (2005). All four factors in the self-reports of teasing accounted for the variance in BMI change for girls but not for boys.

The individual characteristics of the child including the physical system (height, weight) and psychosocial system (how the child reports feelings) must be viewed in the context of the social environments of family, playground, and specifically peer groups. These microsystems exist within the exosystems that include the child’s community and school, and are most likely influenced by the constant media hyping the problem of obesity. The child’s development, which includes biological and physical changes over time, is a function of the health and relationships between and among these systems. When the system imposes a psychosocial threat such as teasing, the child’s behavior and development can be affected.

The children in this multicultural charter school highlight the significant prevalence of overweight and obesity associated with disadvantaged groups. The finding that approximately half of the children (48% boys and 56% girls) were overweight is troubling; but the results which show that 32% of boys and 38% of girls fell into the obese category in this sample are outside the national comparison for all children (ages 10–17) who are non-Hispanic Black (23%) or Hispanics (22%) (National Survey of Children’s Health, 2014). These children live in a suburban poor community where the principal and teachers were justifiably concerned enough to seek help with regard to the health and well-being of the children in their school. From the focus group interviews, the researchers also learned that the neighborhoods are particularly violent. Teaching about nutrition alone or exercise to intervene in the children’s health is an overly simplistic approach.

The simpler model that predicts that weight gain and subsequent overweight or obesity also exists within the social context of interactions between the growing child and the social group that interacts with him or her. Whether weight change that indicates gaining body mass triggers the social response of teasing or that teasing fosters the child’s behavior that leads to weight gain remains unclear. However what is evident in this study is that BMI alone was not associated with teasing unless sorted by gender, but BMI change was clearly associated with a variety of reports of being teased and/or being bothered by the teasing. The feedback loop leads us to the prediction that the relationship between teasing and weight gain is complex supporting the developmental explanation that there is a bidirectional relationship between the social environment and physical development.

Table 5 Mean score comparisons of weighted factor teasing scores by gender and BMI change (lower = <.10 higher = >.10).

Factors	BMI lost Mean/SD	BMI gain Mean/SD	<i>t</i>	<i>p</i>
Weighted factor 1				
Personality and behavioral teasing				
Girls	1.26/0.6	4.37/2.5	-3.000	.02
Boys	3.18/2.1	3.99/3.9	-0.482	NS
Both	2.22/1.8	4.09/3.5	-2.163	.04
Weighted factor 2				
Family and environmental teasing				
Girls	1.29/0.6	3.11/2.9	-1.486	NS
Boys	3.86/3.5	2.71/3.34	0.718	NS
Both	2.58/2.8	2.83/3.2	-0.233	NS
Weighted factor 3				
School related teasing				
Girls	1.33/0.5	5.50/4.2	-2.381	.04
Boys	4.01/2.2	3.81/2.9	0.152	NS
Both	2.67/3.1	4.29/3.3	-1.809	NS
Weighted factor 4				
My body teasing				
Girls	1.25/0.8	1.43/0.6	-0.436	NS
Boys	3.79/4.1	3.36/4.7	0.199	NS
Both	2.52/3.1	2.82/4.1	-0.224	NS

The study was limited geographically and the sample was small from a charter school, but the results give support for this as pilot work in developing a larger, more inclusive study over a longer period of time. The findings can also be interpreted in the context of the geography. New York State data suggest that gender, personality and behavior are slightly inconsistent with the BMI findings in this study: in New York, more grade school boys are obese (>95th percentile) (20.3%), than their female counterparts (13.8%) compared to the third grade children in this study (32 and 38% respectively). More Hispanic children in New York were classified as obese (22.5%) than non-Hispanic Black children (19.5%) or White, non-Hispanic children (15%). In addition, in New York, 22.7 and 28.5% of children with one or more identified emotional or behavioral issues have been classified in the overweight category of BMI greater than the 85th percentile ([National Survey of Children's Health, 2007; 2010/11: Table for Indicator 1.4](#)). Similar data exist for children residing in communities containing poorly kept housing and in households of total low income as identified by Federal Poverty Levels. Greater numbers of parents with children in New York State reported that their neighborhoods were "never safe" or "sometimes safe" (20%) than the national level (14%) ([National Survey of Children's Health, 2007; 2010/11: Table for Indicator 7.2, 2010/2011](#)). In this study, prior to data collection, the principal reported that the community environment of the school was unsafe and that precautions should be taken to maintain security at all times.

The findings related to weight related teasing are consistent with other studies. Weight-based victimization toward overweight youth and weight related teasing in racially diverse children have been widely reported ([Gray et al., 2009; McCormack et al., 2011; Puhl & Luedicke, 2012; Puhl et al., 2011](#)), as has mental health problems such as depression, body dissatisfaction, eating disorders, and emotional issues associated with childhood overweight and obesity. However the connections are not necessarily clear and the cycle ought to be further understood.

Gender accounts for how teasing affects the children who experience a weight change. Girls were more likely to report being bothered by teasing. They also reported more school related teasing with BMI change and both boys and girls reported more personality and behavioral teasing when they had gained body mass from second to third grade. Neither boys nor girls whose BMI changed reported "my body teasing" as a problem; however, both boys and girls reported more being bothered by "teasing about my personality and behavior." Some of these distinct gender differences suggest a need for more tailored interventions to be designed to address the weight gains that could be connected to summer time away from school in children from second to third grades.

These findings also suggest the potential for normal weight children to gain weight as a result of peer teasing as well as concerns for overweight children to continue to gain weight while being teased. With our rates of obesity among U.S. children at the center of attention, we as health

professionals need to better understand the antecedents and consequences, and the feedback loop suggested by the model to provide timely interventions that break the cycle. The CATS© scale was created for use as a tool to help school personnel with information about those students likely to be at risk for difficulties related to harmful teasing. Prevention of escalation to bullying is critical for the safety of children. Specific interventions can be tailored to increase resilience towards teasing and educate students and teachers on how to cope with behavioral issues related to teasing before the repetitive cycle with teasing leading to weight gain and vice versa. According to [Vessey et al. \(2008\)](#), the CATS© scale may be used to address the critical need for reliable and valuable outcome measures to detect desired changes in students participating in school based-bullying and violence prevention programs. Further utilization of the scale could prove successful to recognize students at risk and aid in the creation of new programs.

Children within the social environment grow and develop as a function of numerous influences. The interrelationship of weight change with teasing should be viewed as a complex bio-ecological model and the cycle of teasing, weight, and weight gain should be understood together with any health interventions developed in the schools, lest they do more harm than good. Raising community and parent awareness to engage them to be involved with their children's social peers and healthy eating behaviors go hand in hand with public health interventions. According to [Reynolds et al. \(2010\)](#), "there are complex issues that emerge...and there is no suggestion that change is simple. There is, however, an acceptance that systems...are now being shown to be open to the interdependences between the person and the situation... shaping the person. Social psychology emphasizes the role that the group and social processes play in shaping the mind and focuses more on the impact of 'group-states' on the person,...most importantly, discussion of...the genuine impact of the environment and its interpretation, on the 'real' person. This shift is radical in its implications for personality psychology and psychology more generally." (p. 477).

Obesity in childhood has been associated with many negative health outcomes including diabetes, hypertension, and poor health that emerge in later life, making it a major public health problem today ([Gray et al., 2009](#)). To test the influence of teasing in future research, participants should ideally be studied over a longer period of time. Considering results from this small participant sample, future research should be expanded to include other populations of school-aged children in similar as well as diverse settings. Although new reports suggest that the obesity rate for young children has fallen 43% in the decade ([Tavernise, 2014, February 25](#)), there is still work to do. Ethnicity can be the strongest predictor of being overweight or obese ([Moreno, Johnson-Shelton, & Boles, 2013](#)). Children of color who often live in disadvantaged communities remain disproportionately overweight and obese, needing our concern and efforts. However, this study suggests that teasing that affects all

children and its relationship to weight gain should be central to future research.

Q4 Uncited references

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