Published in final edited form as:

Pediatr Obes. 2019 October ; 14(10): e12538. doi:10.1111/ijpo.12538.

Weight-Based Teasing is Associated with Gain in BMI and Fat Mass Among Children and Adolescents At-Risk for Obesity: A Longitudinal Study

Natasha A. Schvey, PhD^{a,b}, Shannon E. Marwitz, BS^b, Sarah J. Mi, BS^b, Ovidiu A. Galescu, MD^b, Miranda M. Broadney, MD, MPH^b, Deborah Young-Hyman, PhD^b, Sheila M. Brady, MSN, CRNP^b, James C. Reynolds, MD^b, Marian Tanofsky-Kraff, PhD^{a,b}, Susan Z. Yanovski, MD^b, Jack A. Yanovski, MD^b

^aUniformed Services University of the Health Sciences (USUHS), 4301 Jones Bridge Road Bethesda, MD 20814, USA

^bSection on Growth and Obesity, Program in Developmental Endocrinology and Genetics, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health, DHHS, 10 Center Drive, Building 10, Room 1-3330, MSC 1103, Bethesda, MD 20892-1103, USA

Abstract

Background: Youths with overweight and obesity report frequent instances of weight-based teasing. However, little is known about the prospective associations between weight-based teasing and changes in body composition among youth.

Objectives: To assess associations between weight-based teasing and changes in BMI and fat mass in a longitudinal study of youths with, or at-risk for, overweight and obesity.

Methods: One hundred ten youths with, or at-risk for, overweight participated in a longitudinal observational study. The Perception of Teasing Scale was administered at baseline. Height, weight, and body composition were obtained at baseline and at follow-ups (range: 1–15 years).

Results: Mean age at baseline was 11.8y; 53% had overweight/obesity; 36% were Non-Hispanic Black; 55% were female; mean follow-up from baseline: 8.5y. Adjusting for covariates and repeated measures of BMI or fat mass, linear mixed models revealed that weight-based teasing was associated with greater gain of BMI and fat mass across the follow-up period ($p < .007$). Adjusting for covariates, youths reporting high weight-based teasing (two standard deviations above the mean) are predicted to gain an additional .20 kg/m² in BMI and .65 kg of fat mass per year compared to peers who report no weight-based teasing.

Conclusions: Among youths with, and at-risk for, overweight and obesity, weight-based teasing was associated with greater weight and fat gain.

Keywords

Adolescents; weight-based teasing; BMI; adiposity

Overweight and obesity in youth are associated with a host of negative outcomes, including type 2 diabetes, hypertension, dyslipidemia, sleep apnea, and orthopedic complications (1,2). In addition to the medical sequelae of obesity, youths with excess weight also report frequent instances of weight-related victimization and stigmatizing experiences across multiple domains. In fact, weight-based teasing (WBT) is consistently one of the most common reasons cited for bullying among youth; over 90% of high school students have witnessed peers with overweight/obesity being teased due to their weight (3). Among youths with overweight/obesity, up to 60% report WBT by peers and family members (4,5). Others who engage in WBT include teachers, coaches, and healthcare providers (6). Although some propose that weight stigma might be beneficial in that it ostensibly could motivate healthy behavioral changes (7), an extensive body of research indicates that the experience of weight stigma is associated with adverse psychological consequences among both children and adults, including low self-esteem, social isolation, truancy, and suicidal thoughts and behaviors (8–11). Importantly, WBT is also associated with a host of behaviors and psychological constructs that may contribute to and exacerbate excess weight, including body dissatisfaction, compensatory behaviors, avoidance of physical activity and exercise, eating in secret, and binge eating (9,11–13).

To date, few longitudinal studies have assessed the effects of weight stigma on weight and body composition and these have primarily focused on adult samples (14,15). However, childhood marks a critical time for the study of weight and fat gain trajectory given that weight tends to track into adulthood, such that youths with overweight and obesity are much more likely to become adults with overweight and obesity (16). Only a small number of studies have assessed the longitudinal associations between WBT and weight-related pressures on weight and health indices among youth. One such study (17) assessed WBT and BMI among adolescents in 1999 and again in 2015. Findings indicated that WBT (assessed by a single item measure) in adolescence predicted higher self-reported BMI 15 years later. Another study followed a sample of girls from the age of 10 until 19 and found that being labelled “too fat” at baseline predicted obesity nine years later, after controlling for baseline BMI. In a third study, authors found that perceived pressure to be thin from parents and peers was associated with greater gains in BMI and body fat mass at 1-year follow-up (18). The relatively scant literature on the longitudinal effects of WBT among youth indicate that WBT and weight-related pressures may increase risk for excess weight and fat gain over the course of development and may increase the likelihood of a child developing obesity in young adulthood (17–19). Therefore, WBT may play a role in the maintenance and exacerbation of overweight/obesity during youth.

Given the preliminary data on weight-related stigma and weight gain, additional longitudinal research is needed to elucidate the relationship between WBT and body composition. We therefore investigated whether WBT reported at baseline was associated with change in measured BMI and fat mass among youths over an extensive (up to 15 years) follow-up

period. Based upon the existing data demonstrating that weight stigma and weight-related pressures may predict weight gain among both adults and youths (14,15,17–19), we hypothesized that greater WBT reported at baseline would be associated with a steeper gain in BMI and fat mass over adolescence and early adulthood.

Materials and Methods

Participants and procedures

Participants were recruited through mailings to local family physicians, pediatricians, and school districts for a longitudinal, observational study ([Clinicaltrials.gov](https://clinicaltrials.gov) ID #) aimed at identifying biological and behavioral factors predictive of excessive weight gain and obesity development in U.S. non-Hispanic Black and White Children, as previously described (20). Participants were enrolled in the study between July 12, 1996 and July 6, 2009, and invited for annual follow-up visits for up to 15 years. Participants who did not attend a visit were still invited to return each subsequent year. Only children with at least one follow-up visit were included in the present study. Children were eligible for the study if they had either a BMI percentile $\geq 85^{\text{th}}$ or two parents with overweight /obesity (BMI $\geq 25 \text{ kg/m}^2$) but were otherwise in good general health. In addition, the self-reported race of the participant's four grandparents must have been identified either as all non-Hispanic White or all non-Hispanic Black. Prior to assessments, parents provided informed consent and children provided written assent. The study was approved by the National Institute of Child Health and Human Development Institutional Review Board. The impact of teasing was not one of the primary study endpoints thus the current study should be considered an exploratory analysis.

Anthropometrics

Participants presented to an 8:00am appointment following a fast initiated at 10:00pm the night prior. Height and weight were obtained with participants clothed, but not wearing shoes. Height was measured in triplicate to the nearest millimeter by a stadiometer (Holtain, Crymmych, Wales) calibrated before each measurement and weight was measured to the nearest 0.1 kg with a calibrated digital scale (Scale-Tronix, Wheaton, IL) from which body mass index (BMI; kg/m^2) was calculated. Body composition was measured using Dual Energy X-Ray Absorptiometry (DXA) to determine lean and fat mass. Given the extensive follow-up period, several different DXA machines were used over the course of the study duration. All participants underwent a medical history and a physical examination performed by an endocrinologist or a nurse practitioner.

Questionnaires

The Perception of Teasing Scale (POTS) (21) is a self-report questionnaire that assesses the frequency of teasing related to both competence and high weight status, as well as the effect on the targeted individual. For the purposes of the present study, the weight-based teasing frequency subscale (e.g., *People made fun of you because you were heavy; People called you names like "fatso."*) was assessed (6 items; Cronbach's $\alpha = .81$). Participants were asked to indicate how often each experience had occurred (ranging from 1= never to 5= very often). Total scores range from 6 to 30, with higher scores indicating greater frequency of WBT. The POTS has demonstrated stable factor structure, acceptable internal consistency,

and convergent validity with related constructs (20–22). A pencil and paper version of the POTS was administered during the in-person baseline clinic visit. All participants completed the POTS in its entirety.

The Hollingshead scale (23) was used to assess socioeconomic status (SES) based on parental occupation and education. Total scores range from 1 to 5, wherein lower scores indicate higher SES. The Hollingshead is a widely used measure of SES and has shown reliability across diverse samples and high correlation with other measures of SES (24).

Data Analytic Plan

All analyses were conducted using SPSS for Windows version 24 (SPSS, Inc., Chicago, IL). Data were examined for outliers, skewness, and kurtosis. Outliers (<1% of all data points) were adjusted to fall 1.5 times the interquartile range below the 25th percentile or above the 75th percentile. In accordance with recommended practices (25,26), WBT and BMI were examined in all models as continuous variables (except to determine the frequency of WBT reported). A series of linear mixed models using repeated measures for BMI/fat mass (kg) were conducted, all controlling for sex, race, SES (27–29), age at baseline, total amount of time in the study (years), and baseline levels of BMI/fat mass. Repeated measures of height (cm) were also included in the model of fat mass. For each model, both the main effect of WBT and the interaction of WBT by time in study were assessed. Whereas BMI z-score and/or BMI percentile are considered optimal indices of adiposity among youths for a single (cross-sectional) measurement, data indicate that BMI is, in fact, preferable for the assessment of change in adiposity over time among youths (30,31); therefore, the current analyses utilize BMI. For ease of interpretation, Figure 1 depicts predicted values for no WBT (POTS score = 6), the midpoint of WBT (POTS score = 18), and the maximum possible WBT (POTS score = 30), controlling for covariates as specified in the Methods. Differences were considered significant when *p* values were ≤ 0.05 . All tests were two-tailed. As the current study was a tertiary investigation, there was no a priori power calculation.

Results

Participant characteristics

One hundred ten youths (55% female) with overweight/obesity (BMI $\geq 85^{\text{th}}$ percentile; 53%) or who did not have overweight (BMI < 85th percentile; 47%) but who were considered at-risk for adult obesity because they had two parents with overweight or obesity participated. The racial distribution of the sample was 65% non-Hispanic White and 35% non-Hispanic Black. Average age at baseline was 11.8 ± 2.4 y. Twenty percent of youth participated between 1 and 5 years, 37% participated between 5 and 10 years, and 42% participated between 10–15 years. The mean time to the last follow-up was 8.5 ± 3.7 y. The mean number of study visits was 9.3 ± 4.9 y, such that the mean age at the last follow-up visit was 20.3 ± 4.1 y. Age and BMI were associated with number of follow-up visits, such that participants who were younger and had a lower BMI at baseline came in for more visits ($p = .005$). Race and sex were unrelated to number of visits. Mean SES for the sample was 2.92 ± 1.13 . See Table 1 for demographic information.

Weight Based Teasing

Responses on the POTS were dichotomized to ascertain the proportion of youths who reported WBT. Responses of “occasionally”, “sometimes”, “often”, and “frequently” were coded as *yes* while a response of “never” was coded as *no*. Results indicated that 43% of all respondents (21% of those who did not have overweight and 62% of those with overweight, $\chi^2 = 18.8$, $p < .001$) reported at least one instance of WBT.

Weight Based Teasing and BMI

Adjusting for relevant variables, WBT at baseline was significantly associated with BMI throughout the follow-up period (main effect of weight-based teasing: $F = 29.48$, $p < .001$). In addition, the interaction of WBT by time in study was significant such that youths reporting greater WBT also evidenced a steeper gain in BMI across the follow-up period ($F = 7.33$, $p = .007$) (See Table 2 and Figure 1A). More specifically, those with no reported WBT (POTS score = 6) were estimated to gain .57 BMI units per year while those who scored two standard deviations above the mean (POTS score = 15.07) were estimated to gain .76 BMI units per year (an additional .20 units of BMI), adjusting for relevant covariates. Thus, youth who reported high levels of WBT experienced a 33% greater gain in BMI per year compared to youth with no WBT.

Weight Based Teasing and Fat Mass

In a similar model, adjusting for relevant variables including height (cm), WBT at baseline was significantly associated with fat mass throughout the follow-up period (main effect of WBT: $F = 22.83$, $p < .001$) and with a steeper increase in fat mass gain over time (interaction of WBT and time in study: $F = 14.93$, $p < .001$; See Table 2 and Figure 1B). Those with no WBT (POTS score = 6) were estimated to gain .71 kilograms of fat mass per year whereas those who scored two standard deviations above the mean (POTS score = 15.07) were estimated to gain 1.36 kilograms of fat per year (an additional .65 kilograms of fat) adjusting for relevant covariates. Therefore, youth reporting high levels of WBT experienced a 91% greater gain in fat mass per year compared to youth with no WBT.

Discussion

In this study of youths with childhood-onset overweight or obesity or who were at-risk for adult overweight/obesity, 43% of the total sample and 62% of youths with overweight/obesity reported the presence of at least one instance of WBT. Furthermore, WBT was associated with BMI and fat mass throughout childhood, adolescence, and early adulthood, such that youths who were teased more at baseline started heavier and remained heavier throughout the follow-up period. Importantly, WBT was also associated with greater rates of both BMI and fat mass gain over time, such that youths who reported high WBT (two standard deviations above the mean) evidenced a 33% greater gain in BMI (.76 versus .57) and a 91% greater gain in kilograms of fat (1.36 versus .71) per year as compared to youth who report no WBT even after adjusting for baseline levels of these variables.

Taken together, these data suggest that WBT may promote greater gains in BMI and fat mass among youths at-risk for adult obesity, and that the experience of WBT in youth might

contribute to the likelihood of developing overweight/obesity as an adult. Alternatively, children at high risk for excessive weight gain might be more prone to report WBT or an unmeasured factor might place children at-risk both for rapid weight gain and WBT. For instance, the presence of disinhibited eating may be one such factor that confers vulnerability to both rapid weight gain (32) and WBT, especially in the home and school environments where disinhibited eating behavior might be evident. There are several possible mechanisms, both psychological and physiological, that might account for the present findings. For instance, the associations of weight stigma with unhealthy weight control behaviors, binge eating, body dissatisfaction, and avoidance of physical activity are well-documented (33–36), all of which might collectively place an individual at increased risk for excess weight and adiposity gain. Thus, a child who is teased for his/her weight might be more likely to experience body dissatisfaction and engage in unhealthy behaviors, such as binge eating, to cope with subsequent negative affect (37,38). Additionally, weight stigma is a source of biochemical stress and may contribute to elevated secretion of the glucocorticoid stress hormone, cortisol. Indeed, extant research among adults has observed increases in oxidative stress and cortisol in response to weight stigmatizing stimuli (39–41). Chronically elevated cortisol may, in turn, stimulate the appetite, blunt satiety cues, inhibit self-control, and increase preference for highly palatable, energy-dense food (42–46), all of which may increase risk for overweight and obesity. Additional longitudinal research is required to elucidate the biobehavioral mechanisms accounting for the association between WBT and weight and fat gain.

Our findings support previous research among youths and adults linking WBT and weight stigma to adverse health- and weight-related outcomes over time. Given that prior studies have detected differences in the effects of weight-related pressures, such as being labelled “too fat” and pressure to be thin, depending on the nature, perpetrator, and setting (17,18), future studies are required to ascertain if various sources (e.g., parents versus peers) and types (e.g., relational versus physical) of WBT have differential effects on youth. The measure of WBT in the current study assessed fairly overt WBT, for instance, being laughed at, made fun of, and called names, however, previous research has documented adverse effects of subtler forms of bias, such as being labelled “too fat” and pressure to be thin (18,19,47). As weight stigma may take many forms among youth, ranging from cyberbullying via social media to social exclusion and rumor spreading, further research is needed to elucidate the unique effects of various facets of stigma. In addition, given the limited sample variance in the present study (all youths were at high-risk for adult obesity), future research should examine these associations among more heterogeneous samples.

Findings from the present exploratory study, if replicated in future research, may indicate a need to assess WBT among youths, and in particular, those at high-risk for adult obesity. In addition, continued efforts should be made to educate the public about the potentially harmful effects of WBT; this may be especially important within families and schools given that many children with overweight report WBT from parents, siblings, and classmates (3,6,8) and social exclusion may be common among youth with high weight (4). Because childhood and adolescence are times of increased vulnerability to WBT, disordered eating, and the onset of overweight/obesity (48–52), it may be beneficial to assess youth for WBT, which could identify them as being at increased risk for weight and fat gain over time.

Study strengths include the longitudinal design and extensive follow-up period. The present study also included the repeated measurement of height, weight, and body composition. Limitations of the study include the limited sample variance; more specifically, all participants were at high-risk for adult obesity, and only non-Hispanic White and Black youths were included. Our measure of WBT was only administered at a single baseline visit; therefore, we were unable to assess changes in WBT over time. In addition, this measure assesses teasing based on high weight status, therefore, we were unable to assess teasing that may have occurred due to low weight. Finally, because of machine obsolescence, several different DXA machines had to be used to measure body fat mass over the many years of study follow-up. It remains possible that the magnitude of differences in fat mass may have been affected. Since there was no evidence that the machine used for DXA analysis varied systematically according to POTS score, this issue appears unlikely to explain the observed associations of WBT with undue gain of adipose tissue.

Conclusion

In conclusion, the experience of WBT may place children and adolescents at increased risk for excess weight and fat gain throughout the developmental period. As adolescence marks a critical period for the study of weight gain (53), it will be important to further explore the effects of WBT and weight-related pressures on indices of weight and health throughout development and to identify both risk and protective factors. The present findings, if replicated in other samples, may provide a foundation upon which to initiate clinical pediatric interventions to determine whether reducing WBT affects weight and fat gain trajectory.

Acknowledgments:

Supported by Intramural Research Program Grant Z1A-HD-00641 from the National Institute of Child Health and Human Development (to JAY). Funding sources had no involvement in the study design, data collection and analysis, preparation of the manuscript, or decision to submit the article for publication. JAY is a Commissioned Officer in the United States Public Health Service. The corresponding author affirms that she has listed everyone who contributed significantly to the work. JAY conceived and designed the study. All co-authors assisted with participant visits and data collection. The first draft of the manuscript was written by NAS; it was revised to incorporate the suggestions and edits of all co-authors. All authors had final approval of the submitted and published versions. The authors wish to acknowledge the support of Dr. Cara Olsen, who provided consultation on statistical analyses and interpretation. None of the authors accepted payment for the production of the current manuscript. Portions of this work were reported at the 2016 meeting of The Obesity Society and the 2017 meeting of the Association for Psychological Science. Disclaimer: The opinions and assertions expressed herein are those of the authors and are not to be construed as reflecting the views of USUHS or the U.S. Department of Defense.

References

1. Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: The Bogalusa Heart Study. *J Pediatr*. 2007;150(1):12–17.e12. [PubMed: 17188605]
2. Dietz WH. Overweight in childhood and adolescence. *New Engl J Med*. 2004;350(9):855–857. [PubMed: 14985480]
3. Puhl R, Luedicke J, Heuer C. Weight-based victimization toward overweight and obese adolescents: Observations and reactions of peers. *J School Health*. 2011;81:696–703. [PubMed: 21972990]
4. Griffiths LJ, Wolke D, Page AS, Horwood J. Obesity and bullying: different effects for boys and girls. *Arch Dis Child*. 2006;91(2):121–125. [PubMed: 16174642]

5. Goldfield G, Moore C, Henderson K, Buchholz A, Obeid N, Flament M. The relation between weight-based teasing and psychological adjustment in adolescents. *J Paediatr Child H.* 2010;15(5): 283–288.
6. Puhl R, Peterson JL, Luedicke J. Weight-based victimization: Bullying experiences of weight loss treatment-seeking youth. *Pediatrics.* 2013;131(1):2012–1106.
7. Callahan D Obesity: Chasing an Elusive Epidemic. *Hastings Cent Rep.* 2013;43(1):34–40.
8. Puhl R, Luedicke J. Weight-based victimization among adolescents in the school setting: Emotional reactions and coping behaviors. *J Youth Adolescence.* 2012;41(1):27–40.
9. Greenleaf C, Petrie TA, Martin SB. Relationship of weight-based teasing and adolescents' psychological well-being and physical health. *J School Health.* 2014;84(1):49–55. [PubMed: 24320152]
10. Eisenberg ME, Neumark-Sztainer D, Haines J, Wall M. Weight-teasing and emotional well-being in adolescents: Longitudinal findings from Project EAT. *J Adolescent Health.* 2006;38(6):675–683.
11. Lampard AM, MacLehose RF, Eisenberg ME, Neumark-Sztainer D, Davison KK. Weight-related teasing in the school environment: Associations with psychosocial health and weight control practices among adolescent boys and girls. *J Youth Adolescence.* 2014;43(10):1770–1780.
12. Haines J, Neumark-Sztainer D, Eisenberg ME, Hannan PJ. Weight teasing and disordered eating behaviors in adolescents: Longitudinal findings from Project EAT (Eating Among Teens). *Pediatrics.* 2006;117(2):e209–e215. [PubMed: 16452330]
13. Libbey HP, Story MT, Neumark-Sztainer DR, Boutelle KN. Teasing, disordered eating behaviors, and psychological morbidities among overweight adolescents. *Obesity.* 2008;16(S2):S24–S29. [PubMed: 18978759]
14. Jackson SE, Beeken RJ, Wardle J. Perceived weight discrimination and changes in weight, waist circumference, and weight status. *Obesity.* 2014;n/a-n/a.
15. Sutin AR, Terracciano A. Perceived weight discrimination and obesity. *PLOS ONE.* 2013;8(7):e70048. [PubMed: 23894586]
16. Singh AS, Mulder C, Twisk JW, Van Mechelen W, Chinapaw MJ. Tracking of childhood overweight into adulthood: A systematic review of the literature. *Obes Rev.* 2008;9(5):474–488. [PubMed: 18331423]
17. Puhl RM, Wall MM, Chen C, Austin SB, Eisenberg ME, Neumark-Sztainer D. Experiences of weight teasing in adolescence and weight-related outcomes in adulthood: A 15-year longitudinal study. *Prev Med.* 2017;100:173–179. [PubMed: 28450124]
18. Suelter C, Schvey N, Kelly N, et al. Relationship of pressure to be thin with gains in body weight and fat mass in adolescents. *Pediatr Obes.* 2016.
19. Hunger JM, Tomiyama AJ. Weight labeling and obesity: A longitudinal study of girls aged 10 to 19 years. *JAMA Pediatr.* 2014;168(6):579–580. [PubMed: 24781349]
20. Young-Hyman D, Tanofsky-Kraff M, Yanovski SZ, et al. Psychological status and weight-related distress in overweight or at-risk-for-overweight children. *Obesity.* 2006;14(12):2249–2258. [PubMed: 17189553]
21. Thompson JK, Cattarin J, Barbara Fowler B, Fisher E. The Perception of Teasing Scale (POTS): A Revision and Extension of the Physical Appearance Related Teasing Scale (PARTS). *J Pers Assess.* 1995;65(1):146–157. [PubMed: 16367650]
22. Jensen CD, Steele RG. Validation of the Perceptions of Teasing Scale (POTS) in a preadolescent sample: Associations with attitudes toward physical activity. *Child Health Care.* 2010;39:249–265.
23. Hollingshead A Four factor index of social status Unpublished manuscript. New Haven, CT: Yale University; 1975.
24. Cirino PT, Chin CE, Sevcik RA, Wolf M, Lovett M, Morris RD. Measuring socioeconomic status: reliability and preliminary validity for different approaches. *Assessment.* 2002;9(2):145–155. [PubMed: 12066829]
25. Royston P, Altman DG, Sauerbrei W. Dichotomizing continuous predictors in multiple regression: A bad idea. *Stat Med.* 2006;25(1):127–141. [PubMed: 16217841]
26. MacCallum RC, Zhang S, Preacher KJ, Rucker DD. On the practice of dichotomization of quantitative variables. *Psychol Methods.* 2002;7(1):19. [PubMed: 11928888]

27. Tippet N, Wolke D. Socioeconomic status and bullying: a meta-analysis. *Am J Public Health.* 2014;104(6):e48–e59.
28. Tippet N, Wolke D. Socioeconomic status and bullying: a meta-analysis. *Am J Public Health.* 2014;104(6):e48–59.
29. Due P, Merlo J, Harel-Fisch Y, et al. Socioeconomic inequality in exposure to bullying during adolescence: a comparative, cross-sectional, multilevel study in 35 countries. *Am J Public Health.* 2009;99(5):907–914. [PubMed: 19299676]
30. Cole TJ, Faith MS, Pietrobelli A, Heo M. What is the best measure of adiposity change in growing children: BMI, BMI%, BMI z-score or BMI centile? *Eur J Clin Nutr.* 2005;59(3):419–425. [PubMed: 15674315]
31. Kakinami L, Henderson M, Chiolero A, Cole TJ, Paradis G. Identifying the best body mass index metric to assess adiposity change in children. *Arch Dis Child.* 2014;archdischild-2013–305163.
32. Tanofsky-Kraff M, Yanovski SZ, Schvey NA, Olsen CH, Gustafson J, Yanovski JA. A prospective study of loss of control eating for body weight gain in children at high risk for adult obesity. *Int J Eat Disorder.* 2009;42(1):26–30.
33. Vartanian L, Novak S. Internalized societal attitudes moderate the impact of weight stigma on avoidance of exercise. *Obesity.* 2010.
34. Vartanian L, Shaprow J. Effects of weight stigma on exercise motivation and behavior: A preliminary investigation among college-aged females. *J Health Psychol.* 2008;13(1):131–138. [PubMed: 18086724]
35. Friedman K, Ashmore J, Applegate K. Recent Experiences of Weight-based Stigmatization in a Weight Loss Surgery Population: Psychological and Behavioral Correlates. *Obesity.* 2008;16(S2):S69–S74. [PubMed: 18978766]
36. Ashmore J, Friedman K, Reichmann S, Musante G. Weight-based stigmatization, psychological distress, & binge eating behavior among obese treatment-seeking adults. *Eat Behav.* 2008;9(2): 203–209. [PubMed: 18329599]
37. Heatherton T, Baumeister R. Binge Eating as Escape from Self-Awareness. *Psychol Bull.* 1991;110:86–108. [PubMed: 1891520]
38. Stein RI, Kenardy J, Wiseman CV, Dounchis JZ, Arnow BA, Wilfley DE. What's driving the binge in binge eating disorder?: A prospective examination of precursors and consequences. *Int J Eat Disorder.* 2007;40(3):195–203.
39. Jackson SE, Kirschbaum C, Steptoe A. Perceived weight discrimination and chronic biochemical stress: A population-based study using cortisol in scalp hair. *Obesity.* 2016;24(12):2515–2521. [PubMed: 27740706]
40. Schvey NA, Puhl R, Brownell K. The stress of stigma: Exploring the effect of weight stigma on cortisol reactivity. *Psychosom Med.* 2014;76(2):156–162. [PubMed: 24434951]
41. Tomiyama AJ, Epel E, McClatchey TM, et al. Associations of weight stigma with cortisol and oxidative stress independent of adiposity. *Health Psychol.* 2014;33(8):862–867. [PubMed: 25068456]
42. Aschbacher K, Kornfeld S, Picard M, et al. Chronic stress increases vulnerability to diet-related abdominal fat, oxidative stress, and metabolic risk. *Psychoneuroendocrino.* 2014;46(0):14–22.
43. Tomiyama AJ, Dallman MF, Epel ES. Comfort food is comforting to those most stressed: Evidence of the chronic stress response network in high stress women. *Psychoneuroendocrino.* 2011;36(10): 1513–1519.
44. Adam TC, Epel ES. Stress, eating and the reward system. *Physiol Behav.* 2007;91(4):449–458. [PubMed: 17543357]
45. Epel E, Lapidus R, McEwen B, Brownell K. Stress may add bite to appetite in women: a laboratory study of stress-induced cortisol and eating behavior. *Psychoneuroendocrino.* 2001;26(1):37–49.
46. Epel E, McEwen B, Seeman T, et al. Stress and body shape: stress-induced cortisol secretion is consistently greater among women with central fat. *Psychosom Med.* 2000;62:623 – 632. [PubMed: 11020091]
47. Hunger JM, Tomiyama AJ. Weight Labeling and Disordered Eating Among Adolescent Girls: Longitudinal Evidence From the National Heart, Lung, and Blood Institute Growth and Health Study. *J Adolescent Health.* 2018;63(3):360–362.

48. Neumark-Sztainer D, Story M, Hannan PJ, Perry CL, Irving LM. Weight-related concerns and behaviors among overweight and nonoverweight adolescents: Implications for preventing weight-related disorders. *Arch Pediatr Adol Med.* 2002;156(2):171–178.
49. Neumark-Sztainer D, Falkner N, Story M, Perry C, Hannan PJ, Mulert S. Weight-teasing among adolescents: Correlations with weight status and disordered eating behaviors. *Int J Obesity.* 2002;26(1):123.
50. Swanson SA, Crow SJ, Le Grange D, Swendsen J, Merikangas KR. Prevalence and correlates of eating disorders in adolescents: Results from the national comorbidity survey replication adolescent supplement. *Arch Gen Psychiatr.* 2011;68(7):714–723. [PubMed: 21383252]
51. Stice E, Agras WS, Hammer LD. Risk factors for the emergence of childhood eating disturbances: A five-year prospective study. *Int J Eat Disorder.* 1999;25(4):375–387.
52. Stice E, Killen J, Hayward C, Taylor C. Age of onset for binge eating and purging during adolescence: A four-year survival analysis. *J Abnorm Psych.* 1998;107:671–675.
53. Haines J, Kleinman KP, Rifas-Shiman SL, Field AE, Austin SB. Examination of shared risk and protective factors for overweight and disordered eating among adolescents. *Arch Pediatr Adolesc Med.* 2010;164(4):336–343. [PubMed: 20368486]

Implications and Contribution

Among youths with or at-risk for obesity, weight-based teasing was associated with a greater rate of BMI and fat mass gain over time, after adjusting for relevant variables, including baseline measures of these two variables. Weight-based teasing may exacerbate risk for excess weight and fat gain throughout development.

Figure 1:

Association of Weight-Based Teasing (WBT) with: (A) BMI and (B) Fat Mass. For BMI: there was a significant main effect of WBT and a significant WBT x time interaction (A; p s < .003). For Fat Mass: there was a significant main effect of WBT and a significant WBT x time interaction (B; p s < .008).

Predicted values are shown for no WBT (POTS score = 6), the midpoint of WBT (POTS score = 18), and the maximum possible value of WBT (POTS score = 30), adjusting for covariates as specified in the Methods.

Baseline Participant Demographics

Table 1.

Measure	With Overweight (n = 52)		Without Overweight (n = 58)		χ^2	Total Sample (n = 110)			
	M	SD	N	M	SD	N	M	SD	N
Sex									
Male			34.5						
Female			65.5						
Race									
Black			41.1						
White			58.9						
Presence of Weight-Based Teasing			62.0						
Age (y)	12.8	2.1	58	10.6	2.1	52	11.8	2.4	110
Socioeconomic Status	2.98	1.21	58	2.85	1.06	52	2.92	1.13	110
Time to Follow-up (y)	8.2	3.8	58	8.9	3.7	52	8.5	3.8	110
BMI (kg/m ²)	32.9	5.8	58	19.5	2.9	52	26.6	8.1	110
BMI Standard Deviation Score	2.2	.5	58	.6	.9	52	1.5	1.1	110
Fat Mass (kg)	35.1	10.2	42	11.9	6.1	39	23.9	14.4	81
Weight-Based Teasing Score	9.4	4.0	58	6.6	1.9	52	8.1	3.5	110

With Overweight: Body Mass Index 85th percentileWithout Overweight: Body Mass Index < 85th percentile

M = mean; SD = standard deviation

BMI = Body Mass Index

Statistical tests conducted: chi-square, one-way analysis of variance

*,
p < .05,***,
p < .01,****,
p < .001

Table 2:

Linear Mixed Models

Parameter	Unstandardized Coefficient	Standard Error	95% CI	p
A: Model Predicting BMI (kg/m²)				
Intercept	8.13	7.09	−6.22 – 22.47	.26
Sex (Reference Group: Male)	−4.94	2.40	−9.79 – −.08	.05
Race (Reference Group: White)	−.93	2.33	−5.66 – 3.80	.69
Age at baseline (y)	1.40	.51	.37 – 2.43	.01
Time in study (y)	.27	.11	.06 – .49	.01
Socioeconomic Status	−1.00	1.24	−3.51 – 1.50	.42
Weight-Based Teasing	.82	.26	.29 – 1.34	.003
Time in study * Weight-Based Teasing	.04	.01	.02 – .06	.000
B. Model Predicting Fat Mass (kg)				
Intercept	−33.09	13.71	−60.65 – −5.52	.02
Sex (Reference Group: Male)	−16.29	4.34	−25.10 – −7.49	.001
Race (Reference Group: White)	.63	.42	−7.92 – 9.18	.88
Age at baseline (y)	2.24	.93	.36 – 4.14	.02
Height (cm)	.18	.04	.10 – .27	.000
Time in study (y)	−.01	.26	−.53 – .50	.97
Socioeconomic Sstatus	−1.88	2.23	−6.41 – 2.64	.40
Weight-Based Teasing	1.33	.48	.36 – 2.29	.008
Time in study * Weight-Based Teasing	.10	.02	.05 – .15	.000