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Prospective association between overvaluation of weight and binge eating among overweight adolescent girls

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Abstract

Purpose—We investigated whether overvaluation of weight, defined as having a high degree of concern with weight such that it unduly influences self-evaluation, was prospectively associated with binge eating onset among overweight adolescent girls and whether overvaluation of weight signaled greater impairment among those with weekly binge eating.

Methods—We used generalized estimating equations to assess the prospective association between weight overvaluation at time 1 and the onset of weekly binge eating at time 2 among 767 overweight adolescent girls (ages 12–18) participating in the Growing Up Today Study. In a cross-sectional analysis of overweight girls with weekly binge eating at time 2, we examined whether

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The authors have no competing interest.

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overvaluation of weight was associated with greater impairment assessed by examining their rates of more severe depressive symptoms and low subjective social status.

Results—At time 1, 24.5% of overweight/obese girls overvalued weight. Overweight girls who overvalued weight were more likely to have started binge eating weekly two years later (OR=2.9, 95% CI=1.2–7.3). Among overweight girls who reported weekly binge eating at time 2, those who overvalued weight were at greater risk of having more severe depressive symptoms (OR=10.4, 95% CI=1.3–85.6). Also among girls with weekly binge eating at time 2, we saw a significant association between continuous measures of overvaluation and subjective social status ($\beta=0.71$, 95% CI= 0.08–1.34), but not in analyses using binary measures.

Conclusions—We found that overvaluation was associated with the development of weekly binge eating in overweight girls and with greater impairment among those with weekly binge eating.

Keywords

Obesity; binge eating disorder; weight overvaluation; adolescent; depression

Introduction

Weight and shape overvaluation refers to overconcern about weight and/or shape to the degree that it largely or unduly influences self-evaluation or self-worth.[1] In contrast to body dissatisfaction which is experienced by many individuals in our society to varying degrees, relatively fewer people define or judge themselves primarily based on their weight and/or shape (i.e., overvaluation).[1, 2] Overvaluation of weight and/or shape has historically been considered the core psychopathology of eating disorders.[1, 3] Indeed, diagnostic criteria for anorexia nervosa and bulimia nervosa require the presence of overvaluation of weight and/or shape.[3] In contrast, binge eating disorder (BED) does not include a cognitive criterion pertaining to body image. However, body dissatisfaction is a known risk factor for the development of binge eating among youth, and overweight youth in particular.[4–6] In addition, an amassing literature suggests that overvaluation of weight and/or shape has diagnostic and clinical relevance among individuals with BED.[1, 7]

Studies conducted among adults suggest that weight and/or shape overvaluation warrants consideration as a diagnostic specifier because it signals greater severity within BED.[1] Among adults with BED, those who overvalue weight and/or shape have more severe eating disorder psychopathology,[8, 9] higher depression levels,[8] greater psychiatric and psychosocial impairment,[7] worse treatment outcomes,[10] and lower rates of remission. [11–14] Others have suggested that overvaluation of weight and/or shape be considered a diagnostic requirement rather than a diagnostic specifier. This recommendation is based on observations that levels of eating disorder psychopathology and functional impairment were markedly elevated among BED cases with extreme weight and/or shape concerns only and that BED cases without extreme weight and/or shape concerns resembled obese non-binge eaters in most respects.[15]

Studies of adolescent girls have found that weight concerns, including body dissatisfaction and weight and shape overvaluation, predict the onset of eating disorder symptoms.[2, 5, 16, 17] However, the importance of overvaluation as an indicator of diagnostic severity among youth with BED remains understudied and results from existing studies of youth have yielded inconsistent findings. A prospective study of adolescent girls identified both body dissatisfaction and appearance overvaluation as independent risk factors for binge eating onset.[5] Another study which separately examined weight concerns and overvaluation found that weight and shape concern, but not overvaluation, predicted binge eating onset.[2] One cross-sectional study of children found that the overvaluation of weight or shape criterion was sensitive in discriminating meaningful subtypes of youth with loss of control eating,[18] while another study did not.[19]

Exploring the relationship of overvaluation of weight and the onset of binge eating among overweight youth is of particular importance given their high co-occurrence.[20, 21] Youth who binge eat are at risk for developing obesity,[22, 23] presumably due to excess weight gain from caloric intake during binge eating episodes. The relationship between binge eating and weight is bi-directional, however, with higher BMI among youth associated with binge eating onset.[5] Research with adolescents and adults has provided support for two main pathways to the development of binge eating, a restraint pathway and an affect-regulation pathway, both of which may be relevant to adolescents with weight concerns.[6, 24] Overweight youth are also at particularly high risk for body dissatisfaction[25, 26] and, accordingly, body dissatisfaction is a known predictor of the onset of binge eating among overweight in adolescent girls.[4] It may be expected then, that a more severe form of weight concern (overvaluation of weight) would be a more potent predictor of binge eating onset and, thus, we hypothesized that overvaluation of weight in our sample would predict the onset of binge eating symptoms.

In this longitudinal study of adolescent girls, we sought to test the significance of weight overvaluation prospectively as a risk factor for developing weekly binge eating. We further aimed to examine the importance of weight overvaluation as a severity indicator amongst those who binge eat weekly. Using a sample of overweight girls participating in an ongoing cohort, we assessed longitudinally whether overweight adolescent girls who overvalued weight were at greater risk of starting to binge eat weekly than overweight girls who did not overvalue weight. We then explored cross-sectionally whether overweight girls who reported weekly binge eating who overvalued weight experienced greater impairment than those who did not overvalue weight. Greater impairment was assessed by examining co-occurring depressive symptoms, as has been done in adult studies.[8, 15] We further explored differences in social stratification as reflected by subjective social status, with low subjective social status potentially signaling greater impairment. Subjective social status is associated with popularity, global self-esteem, depressive symptoms, and overweight/obesity among youth and may be an important determinant of adolescents' health and well-being.[27, 28] We hypothesized that among participants who were binge eating on a weekly basis, those who overvalued weight would report higher depressive symptoms and lower subjective social status.

Methods

Participants

Participants are members of the Growing Up Today Study (GUTS), an ongoing cohort study of adolescents throughout the United States that was established in 1996.[29] GUTS participants are the children of women participating in the Nurses' Health Study II, an ongoing cohort study of female registered nurses. Data from the Nurses' Health Study II were used to identify mothers who had children ages 9 to 14 years and children whose mothers gave us consent to invite them to participate were mailed an invitation letter and a questionnaire. A total of 9039 female participants (68% of the invited female participants) returned completed questionnaires, thereby assenting to participate in the cohort. Participants have been asked to complete questionnaires annually or biennially since enrollment. Girls who were overweight or obese in 1999 and responded to the questions about weight overvaluation and binge eating in 1999 and 2001 were eligible for the present analysis. Overweight status was determined using body mass index (BMI) [wt (kg)/ht (m)²] calculated using self-reported weight and height assessed on the 1999 questionnaire. Children and adolescents younger than 18 years were classified as overweight based on age- and gender-specific International Obesity Task Force cut-offs.[30] Participants 18 years or older were classified as overweight/obese if they had a BMI greater than or equal to 25. Of the 9039 girls originally enrolled, 7120 responded to the 1999 survey and, of those, 1223 were overweight or obese and thus eligible for the present study. 123 participants had missing data for overvaluation of weight or binge eating in 1999 and 343 were missing information on binge eating or overvaluation of weight in 2001. Thus, 767 participants had complete information for all analyses. Analyses were restricted to girls because too few overweight boys reported binge eating in 2001 to explore the relationship among boys. The study was approved by the human subjects committees at Boston Children's Hospital and Brigham and Women's Hospital in Boston, MA.

Measurement

Overvaluation of weight was assessed on the 1999 (time 1) and 2001 (time 2) waves of GUTS using a question from the validated McKnight Risk Factor Survey (MRFS). [31] Participants were asked, "In the past year, how much has your weight made a difference in how you feel about yourself?" with the response categories: "totally", "a lot", "pretty much", "a little", or "not at all". Study participants who answered "totally" or "a lot", were considered to overvalue weight. Those who answered "a little", "not at all", or "pretty much" were considered not to overvalue weight. Analyses using a continuous measure of degree of overvaluation were also run. Binge eating was assessed at every survey wave using a two-part question. Participants were first asked about overeating ("During the past year, how often have you eaten so much food in a short period of time that you would be embarrassed if others saw you [binge-eating or gorging?]"). Response options for the overeating question were: never, a couple of times, less than once a month, 1–3 times a month, once a week, or more than once a week. Participants who reported never overeating were not asked a follow-up question about loss of control. Those who reported at least occasional overeating (a couple of times, less than once a month, 1–3 times a month, once a week, or more than once a week) were asked a follow-up question about loss of control

during the overeating episodes (“Did you feel out of control, like you couldn’t stop eating, even if you wanted to stop?”). Participants who reported at least weekly episodes of overeating with loss of control and who did not use compensatory behaviors, such as self-induced vomiting or laxatives, were classified as having BED based on frequency criteria from the Fifth Edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5). [3]

Depressive symptoms were assessed using the six item validated scale of the MRFS IV.[32] All responses were scored on a 5-point Likert-type scale ranging from “never” to “always”. Among individuals with weekly binge eating, we explored associations between a continuous and a binary measure of depressive symptoms. Consistent with cutoffs previously used in this cohort,[33] participants with scores in the top quintile were considered to have more severe depressive symptoms. Subjective social status was assessed using the MacArthur Scale of Subjective Social Status-Youth Version.[27] The scale consists of a ladder with 10 rungs designed to represent the participant’s school community. Participants are asked to place themselves on a rung of the ladder at a level which represents their standing with higher scores representing lower subjective social status. Among individuals with weekly binge eating, we explored associations between a continuous and a binary measure of subjective social status.

Analyses

To quantify the contribution of overvaluation of weight to the onset of weekly binge eating among overweight adolescent girls, we first examined the prospective association between overvaluation of weight measured at time 1 and the onset of binge eating disorder at time 2. In this prospective analysis, existing cases of weekly binge eating at time 1 were excluded in the analyses. To explore whether weight overvaluation among those with weekly binge eating was associated with impairment, we examined the cross-sectional association between overvaluation (measured at time 2) and measures of depressive symptoms and subjective social status at time 2. The cross-sectional analyses were restricted to overweight individuals with weekly binge eating at time 2. In the prospective analysis of overvaluation at time 1 and the onset of weekly binge eating, fully adjusted models included age and BMI. For the cross-sectional analysis of overvaluation and impairment at time 2, we ran unadjusted models, models adjusted for age and BMI, and fully adjusted models which also included impairment at time 1. Models were fit using generalized estimating equations (GEE) with an independent working covariance matrix and empirical variance to account for the correlation between siblings using SAS version 9.2. For analyses using binary variables, we exponentiated estimates from GEE models and report odds ratios (ORs) with 95% confidence intervals (CIs) representing the top quintile of depressive symptoms versus the bottom 4 quintiles and the quintile which captures participants with the lowest subjective social status compared to the other 4 quintiles.

Results

At time 1, the mean (sd) age of the participants was 14.7 (1.6) years and the mean (sd) BMI of this overweight sample was 26.4 (2.9). At time 2, the mean (sd) age of the participants

was 17.4 (1.6) years and the mean (sd) BMI was 26.8 (3.8). 93% (n=714) of participants included in the analyses self-identified their race as white. Prevalence of overvaluation of weight in this sample increased from 24.5% (n=188) to 34.5% (n=265) from time 1 to time 2, as did the percent of participants who reported weekly binge eating, from 1.1% (n=9) to 2.6% (n=22). In models controlling for age and BMI and excluding prevalent cases of weekly binge eating at time 1, overweight girls with overvaluation of weight at time 1 were more likely to start binge eating weekly at time 2 (OR=2.9, 95% CI=1.2–7.3) than overweight girls who did not overvalue weight. Results of the cross-sectional association between overvaluation of weight and impairment among overweight girls who reported weekly binge eating at time 2 (n=22) are shown in Table 1. Overvaluation of weight (binary) at time 2 was cross-sectionally associated with more severe depressive symptoms (binary) in models adjusted for age, BMI, and time 1 depressive symptoms (OR=10.6, 95% CI=1.3–89.1). Similarly, degree of overvaluation (continuous) was associated with higher depressive symptoms (continuous) in fully adjusted models ($\beta=2.82$, 95% CI= 1.08–4.55). Also among girls weekly binge eating at time 2, overvaluation of weight (binary) at time 2 was not significantly associated with a binary measure of low subjective social status in models adjusted for age, BMI, and time 1 subjective social status (OR=7.0, 95% CI=0.4–116.1). However, degree of overvaluation (continuous) was associated with lower subjective social status (continuous) in fully-adjusted models ($\beta=0.71$, 95% CI= 0.08–1.34).

Discussion

Among a sample of overweight adolescent and young adult girls, we found that the odds of developing weekly binge eating two years later was almost 3 times higher among those who overvalued their weight compared to those who did not overvalue weight. Among girls with weekly binge eating, those who overvalued weight had more severe depressive symptoms than their less weight concerned peers. Degree of overvaluation among girls with weekly binge eating was associated cross-sectionally with lower subjective social status in analyses using continuous measures only.

Our findings build on the known relationship between weight concerns and the onset of disordered eating,[2, 5, 16, 17] specifically that overvaluation of weight predicts the onset of binge eating among overweight girls. Although one of these studies by Allen et al. conducted among 259 pre-adolescent boys and girls ages 8 to 13 years (mean (sd) age of subjects with objective binge episodes = 10.1 (1.1) years; mean (sd) age of subjects with no overeating or binge episodes = 10.3 (1.4) years) showed weight and shape concern, but not overvaluation, predicted binge eating onset.[2] Our study adds to the small body of work which has examined the utility of overvaluation of weight as a diagnostic indicator or specifier for BED. Our findings align with studies conducted among adults that have found greater levels of depression among individuals with BED who overvalue weight.[8, 34–36] To our knowledge, ours is the first study to examine the significance of overvaluation of weight in BED in a sample of older adolescents. Similar to our findings, Hilbert and Czaja found that among children ages 8 to 13 years (mean (sd) age = 10.78 (1.5) years), the criterion of “undue influence of weight or shape on self-evaluation” was sensitive in discriminating children with loss of control eating suffering from clinically significant eating disorders from subclinical cases.[18] Findings from this study suggest that overvaluation of

weight may be diagnostically meaningful among children with loss of control eating problems.[18] Our results are not consistent with those of Goldschmidt et al. who found that overvaluation of shape and weight did not demarcate meaningful subtypes among youth with loss of control eating in a study of 526 children and adolescents (mean (sd) age=11.0 (2.3) years).[19] The difference in age of our sample compared to the Allen et al. and Goldschmidt et al. studies may explain the discrepancy in results. Differences in the stage of adolescent development could have a substantial impact on a youth's ability to understand the complex construct of overvaluation of weight. Inconsistencies in findings may also reflect a developmental phenomenon with overvaluation having different meaning or relevance among older adolescents. Differences in assessment of both binge eating and overvaluation and in the inclusion of measures of impairment may also explain discrepant findings. The discrepancy with the Goldschmidt study could be due to the fact that we focused on at least weekly episodes of loss of control eating (which is considered a clinically-significant threshold according to DSM-5), whereas, Goldschmidt et al. studied less frequent loss of control eating.

Collectively, our complementary prospective and cross-sectional analyses provide new and much needed information about weekly binge eating and the prognostic significance of overvaluation of weight, both as a risk factor and as a severity indicator, among older adolescent girls. Our study was the first to examine these issues in older adolescents and because our sample was drawn from an ongoing cohort study, the findings may have greater generalizability than previous studies with smaller and treatment-seeking study groups. We note, however, several limitations. First, all data were self-reported. Overvaluation of weight and binge eating are both complex constructs that we measure using a one- or two-item measure. Although our measure of binge eating has been validated,[37] weekly binge eating was defined using self-reported frequency of binge eating and cases are not confirmed with diagnostic interviews. Further, our assessment did not include any of the associated features of binge eating episodes necessary for diagnosing BED. BMI was calculated using self-reported weight and height, which would result in some misclassification of weight status. However, self-report weight and height has this has been found to be a valid measure in large epidemiological studies.[38] Our assessment of overvaluation included only weight and, thus, our findings pertain to weight overvaluation and not the more commonly used broader construct of weight and/or shape overvaluation. Among adults, however, overvaluation of weight and overvaluation of shape have been documented to be highly correlated.[9] Although our sample is geographically diverse, it is more than 90% white. In addition, our sample likely under represents youth of low socioeconomic status (SES) because our sample consists of children of nurses. Thus, it is unclear if our results are generalizable to youth of color or adolescents of low SES or to adolescent boys. Our study is the first to use subjective social status as a marker of impairment among youth with disordered eating. It remains to be seen whether low subjective social status has health-related implications long-term. However, the association we observed between the continuous measure of degree of overvaluation and subjective social status may indicate that overvaluation of weight impacts adolescents' health and well-being in ways that are distinct from traditional psychopathology.

We found that overvaluation of weight among overweight girls was associated prospectively with the increased risk for onset of weekly binge eating and that, among girls with weekly binge eating, the presence of overvaluation of weight may signal greater severity as reflected in greater depressive levels. Our findings suggest that clinicians should assess for weight concerns, specifically overvaluation of weight, when interacting with overweight youth and should avoid praising these youth for high levels of overconcern with weight. The presence of overvaluation of weight should lead to further screening for binge eating behaviors and, among those who report binge eating, should prompt screening for further comorbidity. Overvaluation of weight among adolescent girls represents a potential target for prevention and intervention efforts. Diagnostically, the presence of overvaluation in those with BED may signal a more severe variant and thus warrants consideration as a diagnostic specifier for BED in our classification system.

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Abbreviations

| | |
|--------------|--|
| BED | Binge eating disorder |
| BMI | body mass index |
| GUTS | Growing Up Today Study |
| OR | odds ratio |
| CI | confidence interval |
| GEE | generalized estimating equations |
| DSM-5 | Fifth Edition of Diagnostic and Statistical Manual of Mental Disorders |
| MRFS | McKnight Risk Factor Survey |
| SES | socioeconomic status |

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Implications and Contribution

Overvaluation of weight among overweight girls increases risk for the *onset* of weekly binge eating as well as greater severity and co-morbidity. Overvaluation of weight represents a potential target for prevention and intervention efforts, as well as a diagnostic specifier.

Table 1
 Association of overvaluation of weight with depressive symptoms and subjective social status among overweight girls with BED

| | Severe depressive symptoms | | | Low subjective social status | | |
|--|---|---|---|---|---|---|
| | Unadjusted OR (95% CI) | Adjusted ^a OR (95% CI) | Adjusted ^b OR (95% CI) | Unadjusted OR (95% CI) | Adjusted ^b OR (95% CI) | Adjusted ^c OR (95% CI) |
| No Overvaluation | | | | | | |
| Overweight girls with BED who do not overvalue weight | 1.0 (ref) | 1.0 (ref) | 1.0 (ref) | 1.0 (ref) | 1.0 (ref) | 1.0 (ref) |
| Overvaluation | | | | | | |
| Overweight girls with BED who overvalue weight | 11.0 (1.4, 85.2) | 10.4 (1.3, 85.6) | 10.6 (1.3, 89.1) | 3.9 (0.4, 41.3) | 7.0 (0.2, 286.2) | 7.0 (0.4, 116.1) |
| | Depression score (continuous) | | | Subjective social status (continuous) | | |
| | Unadjusted β (95% CI) | Adjusted^a β (95% CI) | Adjusted^b β (95% CI) | Unadjusted β (95% CI) | Adjusted^b β (95% CI) | Adjusted^c β (95% CI) |
| Degree of Overvaluation | | | | | | |
| Continuous (Likert) score of overvaluation of weight among overweight girls with BED | 2.27 (0.67, 3.88) | 2.99 (1.27, 4.72) | 2.82 (1.08, 4.55) | 0.22 (-0.25, 0.69) | 0.68 (0.04, 1.32) | 0.71 (0.08, 1.34) |

^a Adjusted for includes BMI age

^b Additionally adjusted for depressive symptoms at time 1

^c Additionally adjusted for subjective social status at time 1