Are Overweight Children Unhappy?

Body Mass Index, Depressive Symptoms, and Overweight Concerns in Elementary School Children

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Background: It is commonly believed that overweight children are unhappy with their weight. However, population-based data addressing this association are lacking.

Objectives: To evaluate the association between obesity and depressive symptoms in a diverse, school-based sample of preadolescent children, and to examine whether overweight concerns play a role in this association.

Design, Setting, and Participants: Third-grade students (N=868, mean age, 8.4 years) attending 13 public elementary schools in Northern California were measured for weight and height, and were asked to complete self-report assessments of depressive symptoms and overweight concerns.

Results: A modest association between depressive symptoms and body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters) was found for girls (r=0.14, P<.01), but not for boys (r=0.01, P=.78). Among girls, depressive symptoms were strongly associated with overweight concerns (r=0.32, P<.001). After controlling for level of overweight concerns, BMI was no longer significantly associated with depressive symptoms among girls. In contrast, after controlling for BMI, overweight concerns remained significantly associated with depressive symptoms.

Conclusions: This study provides cross-sectional evidence for a relationship between depressive symptoms and BMI in preadolescent girls, but not in preadolescent boys. This relationship seems to be explained by an excess of overweight concerns. Assessing overweight concerns may be a useful method to identify those overweight girls who are at highest risk for associated depressive symptoms.

SUBJECTS AND METHODS

SUBJECTS

This study was conducted during October and November 1996 in 13 Northern California public elementary schools within a single school district. A passive consent procedure was used. Parents were informed of the study in writing and given the opportunity to refuse their children’s participation. Children could refuse participation at any time. Classroom surveys and physical measures were completed during regular school hours by trained personnel. This study was approved by the Human Subjects Panel at Stanford University, Palo Alto, Calif.

MEASURES

Body Mass Index

Children’s weight was measured in kilograms on a portable electronic scale. Weight was measured twice, to the nearest 0.1 kg, without shoes or outer clothing, and the mean was used in the analysis. If the 2 measures differed by more than 0.2 kg, a third measure was taken, and the median of the 3 values was used. Height was measured in meters by a direct reading stadiometer. Height was measured twice, to the nearest millimeter, and the mean of the 2 measures was used in the analysis. If the 2 measures differed by more than 5 mm, a third measure was taken, and the median of the 3 values was used. Test-retest reliability was high for both weight (Spearman r = 0.99) and height (Spearman r = 0.99). Children’s body mass index (BMI, calculated as weight in kilograms divided by the square of height in meters) was then calculated from measures of weight and height as a measure of adiposity. Body mass index is the preferred measure of childhood adiposity for epidemiological and clinical studies.19,20

Depressive Symptoms

The short form of the Children’s Depression Inventory (CDI)21 was used to assess depressive symptoms. The CDI is the most commonly used instrument for assessing depressive symptoms in children. The CDI is a modification of the Beck Depression Inventory22 designed for use with preadolescents. The 10-item CDI is generally employed as a depression screen. The short form was developed from a backward stepwise internal reliability analysis to maximize the internal consistency of the items retained.21 Retained items were taken from 4 of the 5 CDI factors (negative mood, anhedonia, ineffectiveness, and negative self-esteem). The CDI short form has been demonstrated to be internally consistent (Cronbach α = .80) and highly correlated with the full CDI (r = .89) in a normative sample of 1266 children aged 7 through 13 years.21

Overweight Concerns

Children completed the first 5 items of the Kids Eating Disorder Survey (KEDS).23 The KEDS is a 14-item self-report inventory of eating disorder attitudes and behaviors based on the Eating Symptoms Inventory.24 The instrument has been shown to have good 4-month test-retest reliability (r = .83) and adequate internal consistency (Cronbach α = .73) in a school sample of 1883 fifth through eighth graders.25 Children responded yes, no, or I don’t know to questions concerning the following 5 attitudes and behaviors: desire to lose weight (Do you want to lose weight now?); feeling fat (Have you ever thought that you looked fat to other people?); fear of gaining weight (Have you ever been afraid to eat because you thought you would gain weight?); dieting to lose weight (Have you ever tried to lose weight by dieting?); and fasting to lose weight (Have you ever tried to lose weight by fasting?). Definitions of dieting and fasting were provided. Because a principal components analysis yielded only 1 significant factor on which all 3 items loaded most strongly (accounting for 43% of the total variance in the full sample; Cronbach α = .70 for girls and .67 for boys), the sum of endorsed attitudes and behaviors was used as a measure of overweight concerns in the analysis.

STATISTICAL ANALYSES

Bivariate Analyses

The strength of the relationship between BMI and CDI was assessed by a Spearman correlation coefficient. Because the research to date has indicated that the prevalence of depressive symptoms and weight concerns differs between boys and girls, all analyses were conducted separately by gender. Differences between boys and girls were assessed with Wilcoxon rank sum tests. In girls only, Spearman correlation coefficients were employed to explore the role of overweight concerns in the relationship between BMI and depressive symptoms.

Multivariate Analyses

Because the correlation between BMI and overweight concerns was moderately high (Spearman r = 0.45, P < .001), the threat of multicollinearity prevented the use of multiple regression. Therefore, to examine the independent and interactive associations of BMI and overweight concerns with depressive symptoms, BMI and overweight concerns were stratified. Differences in depressive symptoms between BMI by overweight concerns strata were tested by omnibus Kruskal-Wallis tests. All tests of statistical significance were 2 tailed with α = .05.
diverse population-based sample of third-grade girls and boys. Based on the existing literature with adolescent and adult samples, we hypothesized that body fatness and depressive symptoms would be modestly associated, and that this association would be stronger for girls than for boys.

We also examined the role of subclinical eating-disordered attitudes and behaviors in the hypothesized relationship between obesity and depressive symptoms in children. Body fatness has been directly associated with eating-disordered attitudes and behaviors, both cross-sectionally and prospectively. Hence, we hypothesized that concerns about weight and body dissatisfaction among children may at least partially account for a relationship between weight and depressive symptoms.

In summary, obesity in childhood is prevalent and has been associated with a variety of physical and mental health risks. In particular, there has been a hypothesized relationship between obesity and depression. While some clinical studies support the association between these constructs, adolescent and adult epidemiological studies generally do not, and population-based data with children are lacking. To examine this question we assessed obesity and depressive symptoms in a large school-based sample of third graders. To examine whether eating-disordered attitudes and behaviors play a role in this hypothesized association, we assessed these constructs as well.

### RESULTS

A total of 999 third-grade children were enrolled in the 13 schools at the time of the study. Parents refused participation for 29 children, and 1 child was absent throughout data collection. The remaining sample included 12 sets of siblings. One child from each sibling pair was randomly selected for use in the analyses. An additional 62 children were classified as being in special education classes or having limited English proficiency and participated in physical measures but not self-report surveys, resulting in a possible total sample of 895 children. Of these children, 868 had complete data for the variables of primary interest in this study.

### DESCRIPTIVE STATISTICS

Descriptive statistics of children in the analysis sample are presented in the table. The gender and ethnic distribution of the analysis sample was 49.4% boys and 50.6% girls; 43.9% white, 21.2% Latino, 19.4% Asian American, 8.0% Filipino, 5.1% African American, 1.3% Pacific Islander, and 1.1% Native American.

Internal consistencies on the CDI short form in this sample were moderately high (Cronbach $\alpha = .81$ and $.78$ for girls and boys, respectively). These $\alpha$ coefficients are comparable to the .80 Cronbach $\alpha$ for the normative sample on which the CDI short form was developed. As expected in this nonclinical sample, depressive symptom scores were relatively low (median scores of 2 and 1 for girls and boys, respectively), as were overweight concerns scores (median scores of 1 and 0 for girls and boys, respectively). In fact, only 44 (10.02%) of the 439 girls and 31 (7.23%) of the 429 boys reported clinically significant depressive symptoms (raw scores $\geq 8$ representing T scores $\geq 65$).

Both depressive symptom scores and overweight concerns scores were significantly greater for girls vs boys ($P<.05$ vs $P<.001$, respectively), whereas there was no significant gender difference on BMI.

### BIVARIATE ANALYSES

Body mass index and depressive symptoms were not correlated for boys ($r=0.01$, $P<.78$). The correlation between BMI and depressive symptoms for girls was modest but statistically significant ($r=0.14$, $P<.01$). Furthermore, the plots (by gender) of the associations between BMI and depressive symptoms revealed no evidence of a threshold effect or other nonlinear relationship and hence, no attenuation of correlations. We also explored possible ethnic group differences in the relationship between BMI and depressive symptoms. There were no significant associations within ethnic groups of boys. Among girls, correlations were statistically significant among Asian American girls ($r=0.23$, $P<.01$), but not among white ($r=0.13$, $P=.09$), Latina ($r=0.02$, $P=.84$), or African American girls ($r=0.09$, $P=.70$). Because we found no association between BMI and depressive symptoms among boys, all subsequent analyses were conducted for girls only.

We hypothesized that overweight concerns and body dissatisfaction may partially explain the relationship between BMI and depressive symptoms in girls. As expected, overweight concerns were significantly and positively associated with depressive symptoms ($r=0.32$, $P<.001$) and BMI ($r=0.52$, $P<.001$) among girls. These associations were similar in direction when examined within each ethnic group ($r=0.38$ and $r=0.55$ in white

| Age, BMI, * Depressive Symptoms, and Overweight Concerns for Girls and Boys |
| --- | --- | --- | --- |
| Girls (n = 439) | Boys (n = 429) |
| **Mean (SD)** | **Median (Interquartile Range)** | **Mean (SD)** | **Median (Interquartile Range)** |
| Age, y | 8.41 (0.36) | 8.40 (8.14-8.65) | 8.47 (0.38) | 8.45 (8.17-8.72) |
| BMI, kg/m² | 17.65 (3.21) | 16.79 (15.32-19.07) | 17.90 (3.39) | 16.80 (15.71-18.87) |
| Depressive symptoms (range, 0-20) | 2.79 (3.46) | 2 (0-4) | 2.31 (3.11) | 1 (0-3) |
| Overweight concerns (range, 0-5) | 1.13 (1.40) | 1 (0-2) | 0.75 (1.15) | 0 (0-1) |

* BMI indicates body mass index.
significantly associated with depressive symptoms after controlling for BMI, reported overweight concerns were still significantly associated with depressive symptoms. Three strata of overweight concerns were defined by ratings of 0, 1 to 2, and 3 to 5. To examine the independent and interactive relationships of BMI and overweight concerns, levels of reported depressive symptoms were compared across BMI by overweight concerns strata.

As illustrated in the Figure, after controlling for level of overweight concerns, BMI was no longer significantly associated with depressive symptoms (P = .74, P = .24, and P = .76, for low, middle, and high levels of overweight concerns, respectively). In contrast, after controlling for BMI, reported overweight concerns were still significantly associated with depressive symptoms after controlling for BMI in 2 of the 3 BMI strata (P < .001, P < .01, and P < .10, for lean, middle, and overweight girls, respectively). Because there were only 8 overweight girls who reported 0 overweight concerns, we combined overweight girls with overweight concerns scores of 0 and 1 to 2 for a post hoc analysis. This combined group reported significantly fewer depressive symptoms compared with overweight girls with overweight concerns scores of 3 to 5 (P < .001). Sample sizes were insufficient to examine multivariate relationships by ethnic groups.

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Score</th>
<th>Depressive Symptoms (means and SEs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &lt; 50th</td>
<td>0 n = 150</td>
<td>0.16 ± 0.16</td>
</tr>
<tr>
<td>BMI 50th-85th</td>
<td>1-2 n = 57</td>
<td>0.14 ± 0.14</td>
</tr>
<tr>
<td>BMI ≥ 85th</td>
<td>3-5 n = 8</td>
<td>0.48 ± 0.48</td>
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</tbody>
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This study suggests that overweight girls, but not overweight boys, manifest more depressive symptoms than their normal-weight peers. Although this relationship is quite modest, it seems to be mediated by overweight concerns in girls. Despite the common belief that overweight children are more unhappy than their peers, data on the relationship between obesity and depressive symptoms from a diverse, population-based sample of young children were previously lacking. Previous epidemiological studies have not found an association between depressive symptoms and obesity in population-based samples of female adolescents and young women.13,27 However, studies have found increased psychopathology among clinical samples of obese children,14 and improvements in psychological functioning with successful weight loss.9

Body mass index was associated with mildly increased depressive symptoms among girls, but not boys, in our sample. This gender difference may partially reflect a difference in the prevalence of depressive symptoms between boys and girls. Although most children in our sample reported very few depressive symptoms, girls reported statistically significantly greater depressive symptoms than boys (median CDI short form scores 2 and 1, respectively; P < .05). Previous studies have suggested that gender differences in clinical depressive syndromes do not emerge until puberty,28-30 and women are twice as likely to be depressed as men.21 Our data suggest that these gender differences may emerge earlier in childhood. It has been hypothesized that preadolescent girls develop more risk factors for depression than boys and that these risk factors lead to depression in early adolescence.31 As demonstrated by our study, these risk factors may include increased body fatness and overweight concerns.

We also examined the role of overweight concerns in the relationship between body fatness and depressive symptoms among girls. As seen in older samples of children and adolescents,17,18 BMI was significantly associated with more overweight concerns among these third-grade girls. Overweight concerns were also significantly associated with depressive symptoms.

In a multivariate analysis, we were able to assess the independent and interactive relationships of BMI and overweight concerns with levels of depressive symptoms. We found that overweight concerns were associated with depressive symptoms after controlling for body fatness. In contrast, BMI was no longer significantly associated with depressive symptoms after controlling for the level of overweight concerns. Therefore, the relationship between BMI and depressive symptoms was mostly limited to those girls who also reported overweight concerns. Overweight girls who did not report overweight concerns also did not report significantly more depressive symptoms than their leaner peers. Although this study is limited by its cross-sectional design, these results suggest that overweight concerns may mediate the relationship between BMI and depressive symptoms. This can only be tested, however, with prospective and experimental data.
Because of the representative nature of the sample population, the findings of this study are more generalizable than those from clinical samples. By assessing all third-grade students in 13 Northern California elementary schools, we obtained an ethnically diverse sample that qualitatively differs from clinical samples. In addition, our sample was large enough to address potential problems of collinearity by employing stratification methods to examine independent relationships. We also used reliable and internally consistent state-of-the-art measures to assess depressive symptoms and overweight concerns.

This study is limited by its cross-sectional nature and subsequent inability to address questions of causality. In addition, although the sample is large and the levels of depressive symptoms reported are in the normative range, with sufficient numbers of children having higher scores, the distribution of depressive symptoms is positively skewed. This may limit the ability to detect the strength of associations between depressive symptoms and other variables of interest. However, examination of our data plots revealed no evidence of nonlinear or threshold relationships.

Our exploratory analyses indicate some ethnic group differences in the strength of the relationship between overweight concerns and depressive symptoms among girls. However, our sample sizes were insufficient to examine multivariate relationships by ethnic group. This would be an important area for future exploration.

CONCLUSIONS

This study confirms that overweight girls, but not boys, have more depressive symptoms than their normal-weight peers. However, this relationship seems to be explained by an excess of overweight concerns. As a group, overweight girls who do not report eating-disordered attitudes and behaviors also do not report more depressive symptoms. In addition, lean and normal-weight girls who report more overweight concerns also report more depressive symptoms. These findings have direct clinical and practical relevance. Health professionals and others who interact with overweight children should not assume that they suffer from more depressive symptoms than their peers. When overweight girls present to clinicians, assessing overweight concerns with the 5-question measure used in this study may be a brief and simple way to identify overweight girls at highest risk for associated depressive symptoms.

In addition, overweight girls who manifest depressive symptoms are in greater need of weight-control treatment because they are already manifesting psychological morbidity.12 However, these girls may also be at higher risk of developing clinically significant eating disorders. Previous prospective studies have demonstrated that weight concerns are a strong predictor of subsequent eating-disordered behaviors in adolescents.17,18 Therefore, treatment approaches need to be developed to specifically address both weight control and risk of eating disorder development in this subgroup of girls.

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