Weight Status and Emotional Well-Being: Longitudinal Findings from Project EAT

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Objectives To learn more about how overweight is associated with emotional well-being in adolescents and examine change in associations over time. Methods A prospective study was conducted with a sample of 2,516 adolescents who participated in Project EAT-I (1999) and Project EAT-II (2004). Results At baseline, overweight participants had lower body satisfaction and decreased self-esteem as compared to normal weight participants. Additionally, an association was found between overweight and depressive symptoms among males during middle adolescence. Longitudinal findings suggest that the adverse impact of overweight on emotional well-being persists into young adulthood, including a marked increase in depressive mood among overweight males between early and middle adolescence. Conclusions The persistent nature of the association between overweight and emotional well-being suggests that the normal developmental process of adolescence will not “take care” of this association. Instead, clinicians should regularly screen overweight adolescents for markers of poor emotional well-being and consider intervention when appropriate.

Key words adolescence; depression; longitudinal research; obesity.

While it is known that overweight children experience greater stigmatization and social isolation than their normal weight counterparts (Myers & Rosen, 1999; Strauss & Pollack, 2003), adverse effects of overweight on emotional well-being have not been consistently observed in epidemiological studies (French, Story, & Perry, 1995; Friedman & Brownell, 1995; Jansen, van de Looij-Jansen, de Wilde, & Brug, 2008; Mond & Hay, 2007; Wardle & Cooke, 2005). However, research findings do suggest that among certain subgroups of children and adolescents, being overweight is negatively associated with emotional well-being (French et al., 1995; Friedman & Brownell, 1995; Jansen et al., 2008; Mond & Hay, 2007; Wardle & Cooke, 2005).

Gender appears to be one important moderator of the relationship between weight status and emotional well-being. In a large, population-based sample of adolescents, Falkner and colleagues (2001) found that overweight status was associated with emotional problems, hopelessness and suicidal ideation in females, but not in males. Similar findings showing a stronger association between overweight status and poor psychological health among females, as compared to males, have been reported in several other community-based, cross-sectional studies of children and adolescents (Dater & Sturm, 2006; Erickson, Robinson, Haydel, & Killen, 2000; Mond, Stich, Hay, Kraemer, & Baune, 2007; Needham & Crosnoe, 2005). Sweeting and colleagues (2005) utilized
a longitudinal study design to enable examination of the association between adolescents’ body weight and their emotional well-being over time and found that this association might also be moderated by gender. This study revealed that obese females had lower self-esteem and obese males had lower self-esteem and greater depressed mood than their normal weight counterparts when assessed at age 11. By age 15, however, only the difference in self-esteem between obese and normal weight females was apparent. These findings likely reflect, at least in part, greater social pressures on females to be thin and a larger adverse impact of negative body image and/or weight-related stigma on emotional well-being in females (Dater & Sturm, 2006; Erickson et al., 2000; Mond et al., 2007; Needham & Crosnoe, 2005; Sweeting et al., 2005).

Findings from cross-sectional studies suggest that the impact of overweight on emotional well-being may also differ as a function of children’s developmental stage. Swallen and colleagues (2005) found that being overweight was associated with depressive symptoms, decreased self-esteem and poor school and social functioning in younger adolescents, but not in older adolescents. Similarly, Needham and Crosnoe (2005) found, for both male and female adolescents aged 11–21 years, that the association between overweight status and depression was stronger for younger adolescents than for older adolescents. These findings may reflect heightened sensitivity to changes in body weight and shape associated with puberty. It is also possible that adaptation occurs among individuals who remain overweight, such that the impact of being overweight on psychosocial functioning diminishes over time.

The use of different study designs and populations, as well as different measures of well-being, in these various studies makes the findings difficult to interpret, but do indicate that further investigation of the association between overweight and emotional well-being during adolescence would be of interest. Research examining this association through use of a prospective study design would add greatly to the existing literature by helping to elucidate the role of developmental influences in this association. For example, if the association between overweight and impairment in emotional well-being was found to diminish over time, this might suggest that as adolescents develop, they become more immune to social pressures to be thin or more comfortable with themselves, regardless of weight status. If, on the other hand, such an association was found to persist throughout adolescence, this would suggest that weight status continues to play a role in the emotional well-being of young people during their transition to adulthood. Finally, research including both male and female participants can improve our understanding of how this longitudinal association might differ by gender.

In the present study, therefore, we expanded upon previous research by examining (1) the cross-sectional baseline associations between weight status and markers of emotional well-being, and (2) the longitudinal change in association between weight status and markers of emotional well-being within a general population sample of young men and women who were followed either from early to middle adolescence or from middle to late adolescence. We hypothesized that the baseline association between overweight and emotional well-being would be greatest among female participants and those individuals in our younger cohort. Based upon findings from previous research, we further hypothesized that the adverse impact of overweight on emotional well-being would decrease over time for both male and female participants.

**Methods**

**Study Design and Participant Demographics**

Participants were 2,516 adolescents who participated in both the first (EAT-I) and second (EAT-II) phases of Project EAT (Eating Among Teens), a longitudinal study of the socioenvironmental, personal, and behavioral determinants of dietary intake and weight status among a large, ethnically diverse sample of adolescent boys and girls (Neumark-Sztainer et al., 2002; Neumark-Sztainer, Story, Hannan, & Croll, 2002; Neumark-Sztainer, Wall, Story, & Perry, 2003). During EAT-I (1999), 4,746 middle school and high school students from 31 Minnesota schools completed surveys and anthropometric measures. EAT-II (2004) aimed to resurvey by mail all original participants to examine changes in their eating patterns and weight status. The University of Minnesota’s Institutional Review Board Human Subjects Committee approved all study protocols.

Of the original cohort, 1,074 (22.6%) were lost to follow-up for various reasons, primarily missing contact information from EAT-I (n = 411) and no address found at follow-up (n = 591). Of the remaining 3,672 participants contacted, 2,516 completed surveys, representing 53.0% of the original cohort and 68.4% of participants who were contacted during EAT-II. The final study population included 1,130 males (44.9%) and 1,386 females (55.1%). One-third of the participants (32%) were in the
younger cohort; at Time 1, their mean age was 12.8 years (SD = 0.8) and at Time 2 their mean age was 17.2 years (SD = 0.6). Two-thirds of participants (68%) were in the older cohort; at Time 1, their mean age was 15.8 years (SD = 0.8) and at Time 2 their mean age was 20.4 (SD = 0.8).

Because attrition in the study population during the 5-year study period did not occur completely at random, the data were weighted to adjust for differential response rates in Project EAT-II using a response propensity method (Little, 1986). The use of this method with Project EAT data are described in detail elsewhere, where it has been evaluated as a means of correcting potential response bias (Neumark-Sztainer, Wall, Eisenberg, Story, & Hannan, 2006). The weighted Project EAT-II sample has a similar demographic makeup of the original EAT-I sample. The weighted ethnic/racial proportions are as follows: 48.3% white, 18.9% black, 5.8% Hispanic, 19.6% Asian, 3.6% Native American, and 3.8% mixed or other race. The weighted SES proportions are as follows: 17.8% low, 18.9% middle-low, 26.7% middle, 23.3% middle-high, and 13.3% high. Additionally, after controlling for non-response weighting, the Time 1 mean values of body satisfaction, self-esteem, and depression for the Time 2 responders were not significantly different than the mean values for the entire Time 1 sample stratified by gender.

Study Measures

Weight status, body satisfaction, depressive symptoms, and self-esteem were assessed using self-report at both Time 1 and Time 2. These items were included within the context of the larger Project EAT survey and each measure was separated from the others by several other questions (e.g., questions addressing dietary intake and physical activity). At both time points, participants were asked questions related to the measures in the present study in this sequence: height and weight, body satisfaction, depression, and for the Time 2 responders were not significantly different than the mean values for the entire Time 1 sample stratified by gender.

Classification of Weight Status

Body mass index (BMI, kg/m²) was calculated based on self-reported height and weight at both time points. Adolescents’ height and weight was also recorded by trained study staff at Time 1. A high correlation between BMI calculated from self-reported height and weight and BMI calculated from actual (measured) height and weight was observed in EAT-I for both female (r = .85) and male (r = .89) participants (Himes, Hannan, Wall, & Neumark-Sztainer, 2005). Thus, self-reported height and weight was determined to be a valid measure of adolescents’ true height and weight.

Participants were classified as overweight or normal weight using the Must age- and gender-specific cut-points, which provide for a range of values from childhood to early adulthood (Must, Dallal, & Dietz, 1991a, 1991b). Since we were interested in the emotional well-being of overweight individuals (>85th percentile), when compared with that of normal weight individuals (15th–85th percentile), participants who were underweight (<15th percentile) at either of the time points were excluded from the present analysis (N = 254). As shown in Table I, approximately 60% of the sample was normal weight at both Time 1 and Time 2 and approximately 20% of the population was overweight at both time points.

Assessment of Emotional Well-Being

The assessment of emotional well-being comprised measures of body satisfaction (Pingitore, Spring, & Garfield, 1997), self-esteem (Rosenberg, 1965), and depressive mood (Kandel & Davies, 1982) as follows:

Body Satisfaction

Body satisfaction, consisting of 10 items, was assessed with a modified version of the Body Shape Satisfaction Scale (Pingitore et al., 1997). Ten items assessed satisfaction with each of ten body features (height, weight, shape, waist, shoulders, hips, etc.). For each item there were five Likert response categories ranging from “very dissatisfied” (1) to “very satisfied” (5) and responses were

| Table I. Five-Year Examination of Weight Status Over Time: Percentage (%) of Male and Female Participants in Each Cohort in Each of Four Possible Weight-Trajectory Categoriesa |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Normal weight time 1/normal weight time 2 | Normal weight time 1/overweight time 2 | Overweight time 1/overweight time 2 | Overweight time 1/normal weight time 2 |
| % (N) | % (N) | % (N) | % (N) |
| Younger cohort |
| Male | 63.2 (214) | 6.1 (21) | 20.0 (36) | 10.6 (41) |
| Female | 58.6 (237) | 10.5 (42) | 17.0 (153) | 6.3 (53) |
| Older cohort |
| Male | 67.8 (493) | 7.8 (36) | 16.1 (117) | 8.3 (60) |
| Female | 68.4 (612) | 8.1 (73) | 17.0 (153) | 6.3 (53) |
| aParticipants underweight at one of the two time points (N = 254) were not included in this table.
summed. Scores ranged from 10 to 50, and higher scores indicated greater dissatisfaction. Principal Components Analysis was conducted with the items, and a single factor was found to be a good fit to the data for both boys and girls. Factor loadings were similar for boys and girls, and Cronbach’s alpha at both time points was .93 for the boys and .92 for the girls.

**Depressive Symptoms**
The six items under depressive symptoms were assessed with the six-item Depressive Mood Scale developed by Kandel and Davies (1982). Items such as “During the past 12 months, how often have you been bothered or troubled by feeling unhappy, sad or depressed?” was rated on a 3-point scale from “not at all” (1) to “very much” (3). Responses were summed across items with higher scores indicating a higher level of depressive symptoms. Kandel and Davies validated the Depressive Mood Scale in adolescents who presented at two psychiatric clinics. They observed a significant correlation between the Depressive Mood Scale and the depressive mood subscale of the Symptom Check List—90 (Derogatis, 1977) and higher scores on the Depressive Mood Scale in adolescents diagnosed with major depressive illness compared to those who were not. Internal reliability of the Depressive Mood Scale was supported by a Cronbach’s alpha of .82 at Time 1 for both genders and .81 at Time 2 for both genders.

**Self-Esteem**
Self-esteem, comprising six items, was assessed with a shortened version of Rosenberg’s Self-Esteem Inventory (Rosenberg, 1965). The original scale is widely used, scores from the measure have been found to be reliable in adolescent samples, and prior research has indicated that valid inferences may be made using the scale (Wylie, 1989). A shortened version was used to reduce participant burden. The shortened version contained six items such as “I certainly feel useless at times” and “On the whole, I am satisfied with myself” and was rated on a 4-point scale from “strongly disagree” (1) to “strongly agree” (4). Item scores were summed. The range was 6–24, and higher scores indicated higher self-esteem. The validity of the shortened version as compared to the full version was examined in a separate sample of middle school students, and correlations with measures of body image, disordered eating, perfectionism, and depressive symptoms were nearly identical for the full and shortened versions (van den Berg & Keery, unpublished data). Internal consistency of the shortened version in the current study was good with a Cronbach’s alpha of .80 at Time 1 for both genders and .82 at Time 2 for both genders.

**Statistical Analysis**
Preliminary analysis was conducted to determine the associations between weight status (normal weight, overweight) and each of the outcome measures, by cohort and gender, at the time of the baseline assessment. Linear regression was utilized to assess baseline associations and analyses were adjusted for age, ethnicity/race, and socioeconomic status.

In all subsequent analysis, all psychosocial outcome variables were standardized across the study population and across time to facilitate interpretation of results as standard deviation or “effect size” differences where approximate differences of .2 are small, .5 are moderate, and .8 are considered large (Cohen, 1988). Thus, in examining the findings, importance should be attributed to the changes in ES in addition to the p-values that are provided.

Because of the varying sample sizes in the different groups (e.g., more normal weight individuals than overweight and a larger sample from the older cohort than the younger cohort), the statistical power for detecting certain ES of change over time varies. Power calculations, based on actual subgroup sample sizes, indicated that in the smallest groups, namely, participants in the young cohort who were overweight at both assessments (n = 68 boys; n = 83 girls), there was 80% power to detect changes for .40 using a two-sided .05 level test and assuming a correlation of r = .30 over time in each outcome. In the younger cohort who are normal weight at both times (n = 118 boys and n = 153 girls), ES for change over time equaling .30 can be detected with 80% power. In the older cohort, with its larger sample size, ES ranging from .14 among normal weight girls (n = 612) to .23 among overweight boys (n = 210) could be detected with 80% power again assuming a correlation over time of .30 and alpha = .05.

In order to assess change in the association between weight status and emotional well-being, the standardized outcomes were compared between two subgroups of participants, namely, those who were overweight at both time points, and those who were of normal weight at both time points. In this way, it was possible to consider whether any observed changes among participants who remained overweight were in fact weight-related.

A longitudinal linear mixed effect model that accounted for correlation within individuals over time was employed in order to test the significance of time trends in
each subgroup as well as differences in trends between subgroups (i.e., using the time by weight-status interaction). Mean values for each standardized outcome, adjusted for SES and race/ethnicity, were plotted in order to provide a graphical representation of effect size change. All analyses were stratified by gender, used non-response sampling weights, and were performed in SAS 9.1.

Results

Associations between Weight Status and Emotional Well-Being at Baseline

At the baseline assessment, overweight participants had lower body satisfaction than normal weight participants and this was the case for both female and male participants in both cohorts (all p < .01) (Table II). Overweight male participants in both cohorts had lower self-esteem than normal weight males (both p < .01). For female participants, self-esteem was found to be significantly lower among overweight participants as compared to normal weight males (p = .03) within the older cohort. Baseline differences in depressive mood did not reach statistical significance in any of the other groups assessed (all p > .10).

Longitudinal Trends: Associations between Overweight and Emotional Well-Being

Figures 1 and 2 show changes in scores on each outcome measure, by gender and cohort, for participants who remained overweight between Time 1 and Time 2 and for those who were of normal weight at both times.

Males: Body Satisfaction

A small, non-significant decrease in body satisfaction was observed among males who remained overweight between early adolescence and middle adolescence (ES of change = −.24, p = .08), whereas a small, statistically significant decrease in body satisfaction was observed among normal weight males moving from early to middle adolescence (ES of change = −.23, p < .01). However, the slopes of the respective trends (i.e., for participants who remained overweight and those who remained normal weight) did not differ from each other (p = .95). A small, non-significant decrease in body satisfaction was observed among males who remained overweight between middle adolescence and late adolescence (ES of change = −.16, p = .09), whereas a small, non-significant increase in body satisfaction was observed among normal weight males during this transition (ES of change = .08, p = .18). These differences in opposite directions were such that the slopes of the respective trends differed significantly from each other (p = .02).

Males: Self-Esteem

A small, non-significant increase in self-esteem was observed among male participants who remained overweight between early adolescence and middle adolescence (ES of change = .10, p = .51), whereas self-esteem increased significantly among males who remained at normal weight during this transition (ES of change = .19, p = .03). However the slopes of the respective trends did not differ

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Table II. Baseline Means and Difference Estimates for Body Satisfaction, Self-Esteem and Depressive Symptoms by Weight Status and Cohort

<table>
<thead>
<tr>
<th></th>
<th>Body satisfaction</th>
<th>Self-esteem</th>
<th>Depressive symptoms</th>
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<tbody>
<tr>
<td></td>
<td>Mean (SE)</td>
<td>Effect size</td>
<td>p-value</td>
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<tr>
<td>Younger males</td>
<td></td>
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<tr>
<td>Normal weight</td>
<td>40.1 (0.64)</td>
<td>0.81</td>
<td>&lt;.01</td>
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<td>(N = 214)</td>
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<tr>
<td>Overweight</td>
<td>32.4 (1.11)</td>
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<td>(N = 36)</td>
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<tr>
<td>Older males</td>
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<tr>
<td>Normal weight</td>
<td>38.3 (0.44)</td>
<td>0.67</td>
<td>&lt;.01</td>
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<td>(N = 493)</td>
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<tr>
<td>Overweight</td>
<td>31.9 (0.77)</td>
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<td>(N = 117)</td>
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<tr>
<td>Younger females</td>
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<tr>
<td>Normal weight</td>
<td>35.7 (0.63)</td>
<td>0.91</td>
<td>&lt;.01</td>
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<td>(N = 237)</td>
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<tr>
<td>Overweight</td>
<td>27.0 (0.99)</td>
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<tr>
<td>(N = 83)</td>
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<tr>
<td>Older females</td>
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<tr>
<td>Normal weight</td>
<td>32.8 (0.43)</td>
<td>0.71</td>
<td>&lt;.01</td>
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<td>(N = 612)</td>
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<tr>
<td>Overweight</td>
<td>26.0 (0.75)</td>
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<td>(N = 153)</td>
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*Analyses are adjusted for age, ethnicity/race, and socioeconomic status.*
significantly from each other ($p = .60$). Self-esteem did not change among male participants who remained overweight between middle adolescence and late adolescence (ES of change $= .18$, $p = .06$), whereas a statistically significant increase in self-esteem (ES of change $= .18$, $p < .01$) was observed among participants who remained at normal weight between middle adolescence and late adolescence. Again, however, the slopes of the respective trend lines did not differ significantly from each other ($p = .85$).

**Males: Depressive Mood**
Depressive mood increased among male participants who remained overweight between early adolescence and middle adolescence (ES of change $= .59$, $p < .01$) and among those who remained normal weight during this transition (ES of change $= .23$, $p = .02$). However, comparison of the slopes of the respective trends indicated that the increase was more pronounced among overweight participants ($p = .02$). Between middle adolescence and late adolescence, small, statistically significant decreases in

Figure 1. Male adolescents: Five-year longitudinal associations between weight status and emotional well-being. (A) Body satisfaction, (B) Self-esteem, and (C) Depression. Overweight participants are represented by bold line and ‘O’; normal-weight participants are represented by the thin line and ‘N’. Asterisks are shown to indicate longitudinal trends that were statistically significant. *$p < .05$, **$p < .01$

Figure 2. Female adolescents: Five-year longitudinal associations between weight status and emotional well-being. (A) Body satisfaction, (B) Self-esteem, and (C) Depression. Overweight participants are represented by bold line and ‘O’; normal-weight participants are represented by the thin line and ‘N’. Asterisks are shown to indicate longitudinal trends that were statistically significant. *$p < .05$, **$p < .01$
Depressive mood were observed for both overweight (ES of change = −.36, p < .01) and normal weight subgroups (ES of change = −.33, p < .01), such that the slopes of the trend lines did not differ from each other (p = .85).

**Females: Body Satisfaction and Self-Esteem**
For females, there were no significant changes in either body satisfaction or self-esteem among participants who remained overweight between early and middle adolescence or between middle and late adolescence (all p > .10). While there were instances in which a statistically significant change occurred in one or both measures among normal weight participants, there were no instances in which the magnitude of change differed significantly between groups.

**Females: Depressive Mood**
Depressive mood increased significantly among female participants who remained overweight between early and middle adolescence (ES of change = .47, p < .01). A similar trend was apparent among female participants who remained at normal weight during this period (ES of change = .34, p < .01), such that the slopes of the trend lines did not differ between groups (p = .35). Between middle adolescence and late adolescence, a small, non-significant decrease in depressive mood occurred among females who remained overweight (ES of change = −.17, p = .07), whereas a larger, statistically significant decrease was observed among participants who remained at normal weight during this period (ES of change = −.45, p < .01). There was a statistically significant difference in the slopes of the trend lines for these two groups (p < .01).

**Discussion**
The current study examined associations between weight status and emotional well-being and changes in this association during the transition from early to middle adolescence and from middle to late adolescence in a large, community-based sample. At baseline, overweight status was cross-sectionally associated with lower levels of body satisfaction in both age cohorts and genders and with lower levels of self-esteem in younger and older male adolescents and younger female adolescents. Overweight status was only associated with depressive symptoms among the older male adolescents in baseline, cross-sectional analyses. The longitudinal findings suggested that the impact of overweight on emotional well-being during adolescence is likely to vary considerably as a function of gender and developmental stage, as well as the specific measure of well-being employed. Notwithstanding this variability, and in contrast to our hypothesis, there was good evidence that an adverse impact of overweight on emotional well-being persists into young adulthood. The one exception to this statement was the decrease in depression that was seen in overweight males as they transitioned from middle to late adolescence.

Wardle and Cooke (2005) conducted a literature review examining the impact of obesity on emotional well-being and concluded that clinical samples of overweight adolescents typically report poorer psychosocial well-being when compared to both population-based overweight and normal weight adolescents. Within population-based samples, overweight adolescents experienced only moderately higher levels of body dissatisfaction, with no evidence of increased depression or lower self-esteem compared to normal-weight adolescents (Wardle & Cooke, 2005). Similarly, baseline findings from the current study found stronger and more consistent associations between overweight status and body dissatisfaction. However, we also found associations between overweight status and self-esteem among younger and older male adolescents and younger female adolescents, and associations with depression among older male adolescents. Furthermore, Wardle and Cooke concluded that overweight girls are at particular risk for poor emotional well-being, whereas the results of the current study indicate that overweight boys are also at significantly higher risk for markers of poor emotional health when compared to boys of normal weight status.

In order to elucidate the influence of body weight on emotional well-being over time, we focused on trends that differed between participants who continued to be overweight and those who remained at normal weight. Three such trends emerged. First, increases in depressive mood between early adolescence and middle adolescence were greater for overweight males than for normal weight males. Second, decreases in depressive mood between middle and late adolescence were greater for normal weight females than for overweight females. Third, whereas body satisfaction increased among normal weight males between middle and late adolescence, body satisfaction decreased among males who remained overweight during this transition. In each of these instances, overweight participants fared more poorly than normal weight participants in terms of the impact of developmental change on emotional well-being.
In view of these findings, clinicians and others working with adolescents should be mindful of the role that weight plays in the emotional well-being of youth. Furthermore, the persistent, if not increasing nature of the adverse association between overweight and emotional well-being provides evidence to suggest that the normal developmental process of adolescence will not “take care” of this association. Instead, clinicians should regularly screen overweight adolescents for markers of poor emotional well-being and consider an appropriate intervention for any individuals they find to be struggling.

The longitudinal association between body weight and emotional well-being in males is of particular interest, since evidence in this regard is limited. In the present study, there was a pronounced increase in depressive mood among males who remained overweight between early adolescence and middle adolescence, whereas in females, depressive mood increased to a similar extent in overweight and normal weight participants; it needs to be remembered though, that by early adolescence, body satisfaction and self-esteem are already lower, and depressive mood higher, among females than males, irrespective of body weight. One possible explanation for this pattern is that females experience an adverse impact of body weight on emotional well-being at an earlier age than males (Hill, Draper, & Stack, 1994). In females, these early effects are then likely to be compounded by changes in body weight and shape associated with the onset of puberty in early adolescence, whereas in boys, the transition from early to middle adolescence may signal the start of body weight impacting well-being. Subsequently, the gain in muscle mass that occurs in boys during middle adolescence (Leit, Pope, & Gray, 2001) may have the effect of reducing the impact of weight on depression during the transition from middle to late adolescence. In addition, findings relating to overweight boys may need to be interpreted with caution given the comparatively small number of participants (n = 36) in this subgroup.

Aspects of the present findings may appear counterintuitive. For example, among males who remained overweight between early and middle adolescence, depressive mood increased significantly whereas there was no change in self-esteem and little change in body satisfaction. During the same period, an increase in depressive mood among normal weight males coincided with an increase in self-esteem. Although weaker and more variable associations between body weight and emotional well-being, and between different measures of emotional well-being, might have been expected for males, such “inconsistencies” were also observed among females. For example, increases in depressive mood between early and mid-adolescence were observed in the absence of change in either body satisfaction or self-esteem and this was the case for both normal weight and overweight girls. In practice, it is likely that associations between body weight, body satisfaction and emotional well-being vary as a function of gender, developmental stage, the measure of well-being considered, and the operational definition of “overweight” employed. It also needs to be remembered that other factors likely to influence emotional well-being, such as school performance and interpersonal relationships, might also vary as a function of both age and gender.

Strengths of the current study included the recruitment of a large, diverse, study population, the use of a prospective study design, and stratification of the analysis by both gender and age. However, several limitations of the present study should also be noted. First, BMI was calculated based on self-reported height and weight. Although a high correlation between self-reported and measured height and weight was observed in the baseline assessment (r = .85 for females and .89 for males) (Himes et al., 2005), concordance in late adolescence was not assessed and discrepancies in absolute magnitude at either time point cannot be excluded. Further, the analysis was confined to the comparison of overweight and normal weight participants. Different findings, including a more pronounced effect of body weight on at least some aspects of emotional well-being, may have been observed had normal weight participants been compared with obese (i.e., ≥95th percentile), rather than overweight, participants. However, power to detect between-group difference would have been reduced substantially had this approach been taken. Second, the assessment of emotional well-being was confined to brief, self-report measures. Third, since the associations between study variables are likely to depend, to some extent, on the demographic characteristics of the population sampled, generalizations to other populations should be made with caution. Finally, only two assessments, 5 years apart, were conducted. Given the complexity of the developmental changes occurring during adolescence, it is recommended that future research in this area strive to include more frequent points of data collection. Additionally, future research directions should include replication of the present findings in a different sample and examination of these associations across varied ethnic groups. Finally, it is of interest to see if, and to what extent, being overweight continues to
impact one’s emotional well-being beyond adolescence throughout adulthood.

The present findings have helped to illustrate the complex role that weight plays in the emotional well-being of adolescents. Our findings suggest that the adverse effects of overweight on emotional well-being apparent in early adolescence are likely to persist, to different degrees, through late adolescence. The findings also suggest that overweight boys may not be as immune to weight-related impairment in emotional well-being as previously thought. Given concerns about the high prevalence of overweight, a deeper understanding of its impact on emotional impact will play a crucial role in the development of appropriate interventions aimed at improving the mental health of adolescents.

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References

of body mass index (wt/ht²)—a correction. American Journal of Clinical Nutrition, 54, 773.