



Published in final edited form as:

J Adolesc Health. 2011 April ; 48(4): 373–378. doi:10.1016/j.jadohealth.2010.07.022.

Obesity, body dissatisfaction and emotional well-being in early and late adolescence: findings from the Project EAT study

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Abstract

Purpose—We tested the hypothesis that, at two different stages of adolescence, impairment in emotional well-being associated with obesity is mediated by body dissatisfaction.

Methods—Self-report measures of body dissatisfaction, emotional well-being (self-esteem, depressive mood), height and weight and socio-demographic information were completed by the same female (n=366) and male (n=440) participants during early (mean age = 12.8 years) and late (17.3 years) adolescence. For each measure and at each time point, the hypothesis of mediation was tested using the methods suggested by Baron & Kenny (1986).

Results—The conditions of complete mediation were satisfied in all 6 cases for which an effect of obesity on emotional well-being was observed. That is, in each of these cases, obesity was no longer associated with lower self-esteem or with higher depressive mood after the effects of body dissatisfaction were statistically controlled. Among females, there was no association between obesity and depressive mood at either time point.

Conclusions—Impairment in the emotional well-being of overweight adolescents, where this is observed, may be due primarily to the effects of weight-related body dissatisfaction. This appears to be the case for both boys and girls and during both early and late adolescence. The findings are consistent with the view that body dissatisfaction is central to the health and well-being of children and adolescents who are overweight and that distress associated with negative body image may warrant greater attention in the context of obesity prevention and treatment programs.

Keywords

obesity; body dissatisfaction; emotional well-being; mediation

Emotional well-being is a particularly important component of overall health and well-being during childhood and adolescence, in that the chronic medical conditions that often affect

physical health in adulthood are comparatively uncommon earlier in life [1]. That being the case, and given the marked increases in the prevalence of obesity observed in many countries in recent years, weight-related impairment in the emotional well-being of children and adolescents has come to assume greater significance in obesity research [2,3].

Population-based studies of the association between obesity and emotional well-being have, however, yielded inconsistent findings in both children and adolescents and adults [4,5]. Whereas obesity has been found to be associated with low self-esteem, depressive mood, and similar forms of impairment in some studies [2,6,7], in other studies no association has been observed [3,8,9]. As a consequence, attention has turned to variables that might mediate the association between obesity and emotional well-being; that is, variables that might account for the fact that emotional well-being is impaired in some obese individuals but not others [4,5].

One variable that appears to be worthy of further investigation in this regard is body dissatisfaction (BD), a construct that may be defined as a person's subjective dissatisfaction with his or her body size or shape [10]. BD is common among overweight children and adolescents and is itself a potent risk factor for a range of adverse outcomes, including eating disorders and other mental health problems, later in life [11,12]. Confirmation of the role of BD in mediating the association between obesity and impairment in emotional well-being during adolescence would suggest that greater consideration may need to be given to body image concerns in prevention and treatment programs for pediatric obesity [13–16].

Indirect evidence to support the role of BD in mediating the association between obesity and impairment in emotional well-being derives from the fact that such impairment is more likely to be observed in females than in males [14,17–19]. Given that obesity is associated with BD [4,8], and given that BD is more common in girls and women than in boys and men [11,12], it has been inferred that gender differences in the association between obesity and emotional well-being reflect, at least in part, greater pressure to conform to society's "thin ideal" in females [20,5]. In boys, by contrast, muscularity may be idealized, so that underweight may be as likely to be stigmatized as overweight [21]. Whether and how these gender differences might interact with age/developmental stage is unclear. There is some evidence that adverse effects of BD on the emotional well-being of adolescents may be apparent later in boys than in girls, perhaps because physical changes associated with puberty, and, in turn, heightened awareness of appearance-related pressures, occur later in boys than in girls [22,12].

A small number of studies have tested the hypothesis of mediation more directly [8,14–16,23–25]. Generally, findings from these studies support the hypothesis that impairment in the emotional well-being of adolescents who are overweight, where this occurs, is due to dissatisfaction with body size or shape, rather than body weight per se, and that this is the case during both early and late adolescence. However, the evidence is stronger for girls than for boys and stronger for younger adolescents than for older adolescents and no study has tested the hypothesis of mediation during both early and late adolescence in both boys and girls. Confirmation that adverse effects of obesity on emotional well-being are accounted for by BD in these different subgroups would underscore the need to take BD into account when considering the public health burden of obesity and in designing initiatives to reduce this burden [26].

With these considerations in mind, the aim of the present study was to test the hypothesis that BD mediates the association between obesity and impairment in emotional well-being at two points in the lives of a general-population sample of male and female adolescents. Based on the available evidence, we hypothesized that BD would be found to mediate the

association between obesity and impairment in emotional well-being in girls and that this would be the case during both early adolescence and late adolescence. It was also expected that obesity would be associated with comparatively lower levels of impairment in boys than in girls. The existing evidence did not, in our view, permit specific hypotheses as to whether and how gender differences in the presence or strength of the mediation effects might interact with age.

Method

Study design and participants

Participants were recruited as part of *Project EAT*, a prospective, epidemiological study of the determinants of dietary intake and weight status among adolescent girls and boys from diverse ethnic-racial and socio-economic backgrounds [11,12,27,28].

In-class surveys and anthropometric measures were initially completed by 4746 male and female middle- and high-school students selected from 31 schools in Minneapolis-St Paul, Minnesota during the 1998–1999 school year (first assessment; time 1). Minneapolis-St Paul is a metropolitan area located in the upper Mid-west of the USA (population of approximately 2.6 million in 1998–9) [29]. The survey was designed to assess a range of variables potentially affecting dietary intake and weight status, including BD, self-esteem and depressive mood [11,12,27,28]. The University of Minnesota Institutional Review Board approved all aspects of the study.

Approximately five years later (2003–4) (second assessment; time 2), all phase one participants were approached to complete a similar, self-report, survey. Of the original study population, 1074 (22.6%) were lost to follow-up for various reasons, including missing contact information (n=411) and no address found at follow-up (n=591). Of the remaining 3672 participants, 2516 (male: n = 1130; female: n = 1386) completed surveys representing 53.0% of the original cohort and 68.4% of participants with whom contact could be made.

Participants in the present study were 806 girls (n=440) and boys (n=366) who completed both the first and second assessments and who were in middle school at the time of the first assessment. Participants who were in high school at the time of the first assessment (n=1710) (and who were therefore adults by the time of second assessment) were excluded. Participants' mean age at time 1 was 12.8 years (SD=0.8), whereas their mean age at time 2 was 17.3 years (SD=0.6).

The ethnic-racial background of participants was: 33% white, 24% African American, 7% Hispanic, 23% Asian, 7% Native American and 6% mixed or other ethnicity. The proportions of participants in each of five socio-economic status (SES) categories were: 17% low; 19% middle-low; 31% middle; 18% middle-high; and 15% high [27].

Because the socio-demographic profile of participants who completed both assessments differed from that of the total time 1 sample, a sampling weight was applied in order to make the (sub-) sample of participants who completed both assessments “look like” the original sample for the purpose of analysis involving data from both time points [28]. This is important because the original sample was more diverse than that of the smaller sample and the racial/ethnic and socioeconomic diversity of the original sample is an important strength of Project EAT.

Assessment of body dissatisfaction

BD was assessed using a modified version of the Body Shape Satisfaction Scale [30], which required participants to rate their satisfaction with ten different body features, namely:

height; weight; body shape; waist; hips; thighs; stomach; face; body build; and shoulders. The original scale included only features that could be influenced by changes in body weight (e.g. thighs, stomach, etc.). The modified scale employed in the present study included, in addition, features that could not readily be changed (e.g. height and body build) as these might also be sources of dissatisfaction and were likely to be relevant for boys. Each item was rated on a 5-point Likert scale from “1” (“very dissatisfied”) to “5” (“very satisfied”) and responses were summed across items. Total scores therefore ranged from 10 to 50, with lower scores indicating higher levels of BD. For ease of readability, we refer to the modified scale as a measure of BD, as opposed to body satisfaction, in the present study. Previous analysis, in the same sample, confirmed the unitary structure, test-retest reliability, and concurrent and predictive validity of the modified scale for both girls and boys [11,12]. Cronbach’s alpha in the present study was 0.94 for males and 0.93 for females at time 1 and 0.94 for males and 0.92 for females at time 2.

Assessment of emotional well-being

Although there is no universally accepted operational definition of “emotional well-being”, self-esteem and depressive mood are generally considered to be core elements of emotional well-being early in life [4] and measures of these variables were included in both the 1998–9 and 2003–4 surveys. We therefore defined impairment in emotional well-being as impairment in self-esteem and/or depressive mood, measured as follows:

Self-esteem was assessed with a modified version of the Rosenberg Self-Esteem Inventory [31], a 10-item measure that has been widely used in epidemiological studies of children and adolescents [11,12]. In the present study, the original scale was reduced to 6 items, so as to reduce participant burden, by omitting two positive and two negative items. Specifically, participants indicated their level of agreement with each of the following statements: “On the whole, I am satisfied with myself”; “I feel that I have a number of good qualities”; “At times I think I am no good at all”; “I am able to do things as well as most other people”; “I wish I could have more respect for myself”; and “I certainly feel useless at time”. Each item was rated on a 4-point scale from “1” (“strongly disagree”) to “4” (“strongly agree”) and responses were summed across items (reverse-scored as appropriate). Total scores therefore ranged from 6 to 24, with higher scores indicating greater self-esteem. In separate analysis, involving middle school students, correlations with measures of disordered eating, perfectionism and depressive mood were nearly identical for the original and modified versions [32]. Cronbach’s alpha in the present study was 0.79 for males and 0.76 for females at time 1 and 0.83 for males and 0.80 for females at time 2.

Depressive mood was assessed with a 6-item measure (the Depressive Mood Scale) developed by Kandel & Davies [33] for use in general population studies of adolescents. Participants indicated the extent to which they had, during the past 12 months, been “bothered or troubled” by each of six states, namely: “feeling too tired to do things”; “having trouble going to sleep or staying asleep”; “feeling unhappy, sad, or depressed”; “feeling hopeless about the future”; “feeling nervous or tense”; and “worrying too much about things”. Each item was rated on a 3-point scale from “not at all” (1) to “very much” (3) and responses were summed across items. Total scores therefore ranged from 6 to 18, with higher scores indicating higher levels of depressive symptoms. The reliability and validity of the scale have been established by Kandel and colleagues and others [33–35]. Cronbach’s alpha in the present study was 0.81 for males and 0.78 for females at time 1 and 0.80 for males and 0.82 for females at time 2.

Classification of weight status

For the baseline survey, both self-reported and actual (measured) height and weight were available, whereas only self-reported height and weight were assessed at time 2. In order to be consistent, and given that a high correlation between BMI derived from self-reported height and weight and BMI derived from measured height and weight was observed at time 1 for both boys ($r = 0.88$) and girls ($r = 0.85$), BMI was derived from self-reported height and weight at both time points [28]. Classification of weight status was based on the age- and gender-specific cut-points recommended by the Centers for Disease Control and Prevention [36] at both time points. At time 1, 14.9% of males and 11.8% of females were classified as obese (95th percentile < BMI). At time 2, 16.3% of males and 10.6% of females were classified as obese.

Statistical analysis

Descriptively, analysis of variance was used to generate mean scores on each measure - BD, self-esteem and depressive mood - adjusted for age, SES and ethnicity/race, for obese and normal-weight participants by gender and time period.

The hypothesis of mediation was tested using the methods suggested by Baron & Kenny [37,38]. In this method, regression modelling is employed to determine the association between independent and dependent variables with and without the putative mediator in the model. Hence, in the present study, measures of emotional well-being were regressed on obesity and on both obesity and BD. Given an association between obesity and (impairment in) well-being, complete mediation is indicated if no such association is observed when BD is included in the regression model. Partial mediation is indicated if the strength of this association is reduced with the inclusion of BD in the model, but is still greater than zero [37,38].

Separate analysis was conducted for male and female participants at each time point for each outcome measure. Dichotomous variables indicating weight status (i.e. underweight, overweight and obese) were included in each regression model, with normal weight as the reference category and with age, SES and race/ethnicity as covariates. The significance of the mediation effects, where observed, was tested using a modified version of Sobel's formula [38]. The analysis was conducted using SPSS Version 16.0 and SAS Version 9.1.

Since mediation also requires the presence of significant associations between the independent variable and the mediator [37], preliminary analysis was conducted to determine the associations between obesity and BD. This analysis confirmed that obesity related strongly to BD for both males and females at both time points (time 1, males: $\beta = -10.5$, $SE = 1.5$; time 1, females: $\beta = -8.2$, $SE = 1.4$; time 2, males: $\beta = -9.1$, $SE = 1.3$; time 2, females: $\beta = -10.6$, $SE = 1.5$; all $p < .001$).

Results

Mean scores on measures of BD, self-esteem and depressive mood by weight status, time and gender are given in Table 1. As can be seen, obese participants tended to have lower self-esteem and higher depressive mood than normal-weight participants, although the effect sizes were small and the differences did not reach statistical significance at the 0.05 level in all cases.

Results of the regression analysis are summarized in Table 2. It is apparent that complete mediation occurred in all six cases for which an effect of obesity on emotional well-being was observed, namely, self-esteem for males and females at both times and depressive mood for males at both times. That is, in each of these analyses, obesity was no longer associated

with lower self-esteem or with higher depressive mood after BD was included in the regression model. All but one of these effects was highly significant ($p < 0.001$). For depressive mood among males at time 1, the mediated effect approached significance ($p = .09$).

Because associations between body weight, BD and emotional well-being may be sensitive to the classification of weight status employed, the analysis was repeated, first, using an alternative set of age- and gender-specific BMI cut-points [39]; and second, using observed, rather than self-reported, values for height and weight at time 1. In each case the findings were unchanged (details are available from the first author upon request).

Discussion

Summary of main findings

We tested the hypothesis that associations between obesity and impairment in emotional well-being, where these occur, are accounted for by variation in individuals' levels of BD. The findings were consistent with this hypothesis. During both early and late adolescence, and in both boys and girls, associations between obesity and low self-esteem were no longer apparent when BD was statistically controlled. In boys, similar findings were observed in relation to the association between obesity and depressive mood. In girls, obesity was not associated with depressive mood at either time, hence there was no effect to mediate in these instances.

Study limitations and other methodological considerations

Several limitations of the present study should be considered when interpreting these findings. First, we relied on self-reported height and weight in the classification of weight status at both time points. Although a high correlation between self-reported and measured height and weight was observed at baseline, concordance in late adolescence was not assessed.

Second, the assessment of each of the study variables - BD, self-esteem and depressive mood - was based on a relatively small number of questions. In particular, BD is only one component of the more complex construct of "body image" and it is possible that a different pattern of findings would have been observed had other components, such as the cognitive aspects of self-appraisal or body-image-related behavioural avoidance, been assessed [10].

Third, the study was confined to cross-sectional analysis conducted at two points in time [40,13]. This approach was taken, in preference to a "longitudinal" analysis, because our goal was to test the hypothesis of mediation at two different stages of development rather than to explore developmental pathways. Analysis of data from the same (cohort of younger) participants was chosen, in preference to comparison of younger and older participants in the total time 1 sample, because the advantage of preempting a cohort bias was considered to outweigh the disadvantages of attrition and reliance on self-reported height and weight.

Fourth, the proportion of variance in emotional well-being accounted for by differences in body weight was modest for both boys and girls and at both time points. Although a stronger a priori effect of obesity would have made the demonstration of mediation more impressive, the findings underscore the fact that in the absence of BD and other mediating variables, obesity is associated with little or no impairment in mental health [4,5].

Finally, participants were recruited from a single, urban population in the upper midWest region of USA. Although the findings are consistent with those of research conducted in

other regions of the USA and in other Western nations, external validity cannot be taken for granted. Strengths of the present study were the recruitment of participants from a general population sample, inclusion of male and female participants, assessment of participants at two time points and inclusion of two different measures of emotional well-being.

Study implications

The present findings suggest that impairment in the emotional well-being of overweight adolescents, where this occurs, is due primarily to dissatisfaction with body size and shape. Findings from other recent studies, employing various study designs and populations, have led to similar conclusions [8,9,13,15]. If this premise is accepted, and if it also is accepted that emotional well-being is a key component of overall health and well-being during childhood and adolescence, then at least two implications of the present findings may be noted.

First, greater attention may need to be given to the role of BD when considering the impact of obesity on health and well-being early in life and in developing programs to address this impact, whether through prevention, early intervention or treatment approaches. In particular, obesity prevention programs that focus on body weight, to the exclusion of BD, run the risk of ignoring or, worse, exacerbating, emotional well-being, irrespective of whether they are successful in terms of weight-related outcomes [15,41,42]. Further, weight-related outcomes may be improved through the incorporation in obesity prevention and treatment programs of components specifically targeting BD and related constructs [43,44].

Second, overweight adolescents who have high levels of BD may constitute a particularly vulnerable group in terms of reduced quality of life, since impairment in emotional well-being may be compounded by poor physical health and the reciprocal relations between physical and mental health problems [1,15]. Hence, this subgroup may warrant particular attention in health promotion programs. From a clinical perspective, health professionals need to be aware of the effects of BD on mental health when counselling overweight children and adolescents, both girls and boys [45]. Further, and whereas assessment at only two time points limits any conclusions concerning developmental pathways, the fact that mediation effects were apparent both early and late in adolescence suggests that it should not be assumed that adverse effects of BD on emotional well-being are confined to any particular stage of development.

Finally, it is of interest that associations between obesity and self-esteem were similar for male and female participants, whereas stronger effects might have been expected in girls [17,19]. Moreover, obesity was associated with depressive mood in boys, but not girls. In these respects, the present findings might be seen to be consistent with the hypothesis that boys may be “catching up” with girls in terms of the effects of obesity on emotional well-being [46,21]. However, it should also be noted that absolute levels of BD and depressive mood remained higher, and levels of self-esteem lower, for girls at both time points, irrespective of body weight. The associations between BD and both outcomes were also stronger for girls at both time points.

In sum, the present findings suggest that associations between obesity and impairment in emotional well-being, where these occur, are likely to be due to the effects of weight-related BD. This appears to be the case for both boys and girls and during both early and late adolescence. The findings are consistent with the view that BD is central to the health and well-being of children and adolescents who are overweight and suggest that psychological distress associated with negative body image may warrant greater attention in developing programs to reduce the individual and community health burden of obesity.

Acknowledgments

The research was supported by Grant R40 MC 00319 from the Maternal and Child Health Bureau (Title V, Social Security Act), Health Resources and Services Administration, Department of Health and Human Services. Dr Mond is supported by a National Health and Medical Research Council Sidney Sax (Public Health) Fellowship.

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Table 1

Mean scores on measures of body dissatisfaction, self-esteem and depressive symptoms by gender, weight status and time of assessment (time 1, early adolescence; time 2, late adolescence).

	Normal weight		Obese		F ⁱ	p	Effect size ⁱⁱ
	Mean	±SE	Mean	±SE			
Time 1							
Body dissatisfaction							
Males	40.1	±0.6	29.5	± 1.3	54.2	<.01	0.18
Females	35.9	±0.6	27.7	±1.3	32.6	<.01	0.10
Self-esteem							
Males	19.1	±0.2	16.8	±0.5	14.7	<.01	0.05
Females	18.2	±0.2	16.8	±0.5	5.6	<.05	0.02
Depressive mood							
Males	9.1	±0.2	10.1	±0.4	5.3	<.05	0.02
Females	10.4	±0.2	10.9	±0.4	0.9	0.34	0.00
Time 2							
Body dissatisfaction							
Males	37.6	±0.6	28.4	±1.2	45.3	<.01	0.13
Females	33.4	±0.6	22.8	±1.4	48.3	<.01	0.13
Self-esteem							
Males	19.3	±0.2	17.6	±0.5	9.7	<.01	0.03
Females	18.1	±0.2	15.9	±0.5	14.4	<.01	0.05
Depressive mood							
Males	9.9	±0.2	11.4	±0.4	10.9	<.01	0.04
Females	11.5	±0.2	12.3	±0.5	2.1	0.15	0.01

ⁱF value obtained from an analysis of covariance, controlling for age, socio-economic status and ethnicity/race.

ⁱⁱPartial eta squared.

Table 2

Regression analyses testing mediation of the association between obesity and emotional well-being (self-esteem, depressive mood) by body dissatisfaction in males and females during early adolescence (time 1) and late adolescence (time 2)^{a,b}.

	Self-esteem					Depressive Mood				
	B	SE	B	SE	R ²	B	SE	B	SE	R ²
Time 1										
Males										
Obesity	-2.05	0.60	-0.58	<.001	0.13	1.03	0.46	0.38	0.025	0.07
Obesity, body dissatisfaction	-0.64	0.60	-0.18	0.287	0.24	0.66	0.49	0.25	0.177	0.08
Obesity, body dissatisfaction	0.14	0.02	0.36	<.001	0.24	-0.03	0.02	-0.10	0.086	0.08
Females										
Obesity	-1.36	0.55	-0.39	0.014	0.09	0.40	0.42	0.15	0.336	0.08
Obesity, body dissatisfaction	0.09	0.50	0.03	0.858	0.32	-0.53	0.40	-0.20	0.185	0.22
Obesity, body dissatisfaction	0.18	0.02	0.52	<.001	0.52	-0.11	0.01	-0.41	<.001	0.22
Time 2										
Males										
Obesity	-1.64	0.54	-0.48	0.002	0.16	1.43	0.45	0.51	0.002	0.11
Obesity, body dissatisfaction	-0.33	0.53	-0.10	0.536	0.28	0.75	0.47	0.27	0.110	0.16
Obesity, body dissatisfaction	0.15	0.02	0.39	<.001	0.28	-0.07	0.02	-0.24	<.001	0.16
Females										
Obesity	-2.15	0.58	-0.62	<.001	0.07	0.78	0.50	0.26	0.120	0.03
Obesity, body dissatisfaction	0.14	0.52	0.04	0.786	0.34	-0.24	0.51	-0.08	0.641	0.11
Obesity, body dissatisfaction	0.21	0.02	0.59	<.001	0.34	-0.10	0.02	-0.31	<.001	0.11

^a For each analysis, the first row gives results for the regression of the outcome variable on obesity, whereas the second and third rows give results for the regression of the outcome variable on both obesity and body dissatisfaction, with bold type indicating the predictor variable, i.e. obesity or body dissatisfaction, for which results are given.

^b Age, socio-economic status and ethnicity/race were included as covariates in all analyses.