

Original article

Overweight status and depressive symptoms during adolescence

Belinda L. Needham, M.A.*, and Robert Crosnoe, Ph.D.

Department of Sociology and Population Research Center, The University of Texas at Austin, Austin, TX

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Abstract

Purpose: To: (a) extend previous research on the association between overweight status and depressive symptoms among adults to adolescents, (b) consider whether this association varies across social structural contexts and school context, and (c) explore additional mechanisms linking overweight status to depressive symptoms.

Methods: We used survey regression procedures to analyze data from the first wave of the National Longitudinal Study of Adolescent Health. Degree of overweight was indicated by body mass index (BMI), which we calculated using self-reported height and weight information, whereas depressive symptoms were assessed with the Center for Epidemiological Studies Depression Scale (CES-D). Data were analyzed to determine (a) the social groups in which being overweight was least common, (b) the association between overweight status and depressive symptoms, and (c) potential mediators of the association between relative weight and symptoms of depression, including dieting and self-rated health. The analytic sample contained 18,924 adolescents aged 11 to 21 years (mean age was 15.68). Approximately half the sample consisted of females ($n = 9634$).

Results: Adjusting for exercise and sociodemographic characteristics, we found that relative weight was associated with depressive symptoms for girls but not boys. For both, the association between overweight status and symptoms of depression was stronger among adolescents in lower grades. Dieting explained the positive association between relative weight and depressive symptoms for girls, whereas self-rated health mediated the association between relative weight and symptoms of depression for adolescents in lower grades.

Conclusion: To fully understand both the physical and mental health consequences of adolescent obesity, the social dimension of weight must be examined. © 2005 Society for Adolescent Medicine. All rights reserved.

Keywords: Overweight; Depression; Schools; Dieting; Gender differences

A key tenet of social psychology is that we form opinions about ourselves based on the reactions we elicit from those around us. In this way, negative self-appraisal and self-rejection result when the individual perceives and then internalizes negative attitudes from the wider social group. For example, if society as a whole stigmatizes individuals based on characteristics such as skin color or weight, then individuals with these characteristics are likely to have

elevated rates of psychological distress, compared with those with more positively evaluated attributes [1]. In this way, mental health is a social phenomenon and not merely an individual state.

To examine this phenomenon, the present study considers the link between overweight status and mental health during adolescence, building on Ross' work on weight and depression during adulthood [1]. It considers whether weight is associated with symptoms of depression in a nationally representative sample of young people and whether this association varies across social groups that differ on norms about obesity. In taking this context-specific approach, we examine social structural contexts, such as

*Address correspondence to: Belinda L. Needham, Department of Sociology and Population Research Center, University of Texas at Austin, 1 University Station A1700, Austin, TX 78712-1088.

E-mail address: bneedham@prc.utexas.edu

race and class, as well as a key institutional context of adolescent development, the school. Finally, we examine two possible mediators of the association between overweight status and depressive symptoms: (a) the stress of dieting as a means to fit societal norms of thinness and (b) the physical health problems associated with being overweight.

Overweight status and depressive symptoms

Overweight status within context

The reflected self-appraisal hypothesis [1,2] is based on Cooley's concept of the looking-glass self, which posits that individuals' opinions of themselves are a reflection of the way that others perceive them [3]. If societal attitudes toward the overweight are negative, then overweight individuals will be more likely to view themselves negatively, perhaps leading to reduced self-esteem and increased symptoms of depression. Thus, the reflected self-appraisal hypothesis suggests an association between overweight status and depressive symptoms, especially within the subgroups or social contexts of the population in which obesity is most stigmatized or in which individuals are less able to cope with this stigma.

In this study we explore the association between overweight status and symptoms of depression, as well as potential variation in this association, in two key ways. First, although the concept of the looking-glass self applies to individuals regardless of developmental stage, the opinions of others likely have a greater influence on the self-appraisals of adolescents. Compared with adults, adolescents are more likely to lack adequate differentiation between the perspectives of self and other. Such egocentrism implies that adolescents are more likely than adults to form opinions about themselves that are undifferentiated from the opinions of others in their social group [4]. Because we are focusing on adolescents in the present study, we expect to find greater support than has been found in previous research for the reflected self-appraisal hypothesis, which has focused on adults.

Second, although being overweight is stigmatized in the United States population in general, this stigma is likely to be elevated in certain social groups and contexts within the general population, especially those in which being overweight is less common or acceptable [1,2]. Although most studies of adults offer little evidence that being overweight or obese is related to psychological distress, some have found an association between body weight and depression among the highly educated [1] and among ethnic groups with low average BMI [5], emphasizing the need for a context-specific approach to the study of overweight status and depressive symptoms. Although adolescent research has identified some groups in which obesity is less common, including those from higher socioeconomic backgrounds

[6], nonminorities [7], and younger adolescents [8], the moderating role of these contexts in the association between overweight status and symptoms of depression has not been explored.

Based on the emphasis on contextual variation in the reflected self-appraisal hypothesis, evidence of such variation in adult research, and evidence of variation in the rate of obesity across subgroups of the adolescent population, this study investigates whether the association between relative weight and symptoms of depression is greatest for adolescents in groups in which it is least common, including adolescents in lower grades, nonminorities, those from higher socioeconomic backgrounds, and those in schools with lower average BMI. Given the evidence that girls are more concerned with and judged by their weight [9], gender is likely a key part of the process of reflected self-appraisal. Thus, our contextual examination of overweight and depression is conducted separately for boys and girls.

Mechanisms linking overweight status to depressive symptoms

According to the reflected self-appraisal hypothesis, the association between weight and depression exists because overweight persons internalize others' negative perceptions of them. Being overweight may be distressing for other reasons, however, including the stressful nature of dieting, as well as increased physical health problems associated with obesity. Therefore, in addition to examining contextual variation in the association between relative weight and symptoms of depression, we also consider two potential explanatory mechanisms, or mediators, which might underlie this association: fitting appearance norms and perceived physical health.

Previous research suggests that adolescents are greatly concerned about appearance norms and that large numbers of them attempt to achieve a culturally ideal figure through dieting [10]. Thus, dieting to lose weight may be a means to gain positive appraisals from others. Yet, this attempt to fit norms of appearance can be highly stressful, maybe even more so than having a stigmatized characteristic in the first place. If so, the link between overweight status and depressive symptoms in contexts with strong stigmas about weight may be partially explained by dieting—a form of externalization, rather than internalization, of group evaluations. This occurs because dieting can incur a sense of deprivation from low-caloric intake, feelings of guilt and fear of failure, and preoccupation with food [1]. Thus, we expect that the association between overweight status and symptoms of depression in adolescence is explained, at least in part, by these dieting attempts.

Turning to physical health, adolescents with higher BMI are more likely to report poor health [11]. The physical health consequences of being overweight are significant because perceived poor health is correlated strongly with

Table 1
Descriptive statistics for all study variables

	Females		Males	
	Mean (SD)	Proportion	Mean (SD)	Proportion
BMI ($(\text{kg}/\text{cm}^2) \times 10^4$)	22.38 (4.37)	—	22.82 (4.44)	—
Grade	9.71 (1.63)	—	9.71 (1.61)	—
White	—	.51	—	.51
Parent college	—	.35	—	.37
Parents married	—	.56	—	.57
Family income (in \$1000s)	45.61 (46.23)	—	45.37 (45.21)	—
Sports (0 = not at all–3 = 5+ times/week)	1.06 (1.07)	—	1.69 (1.13)	—
Exercise (0 = not at all–3 = 5+ times/week)	1.65 (1.01)	—	1.61 (1.09)	—
School-level mean BMI	22.58 (.97)	—	22.60 (.94)	—
Dieting (1 = dieted in past 7 days to lose weight)	—	.21	—	.06
Self-rated health (–2 = poor to 2 = excellent)	.79 (.92)	—	.97 (.89)	—
Depressive symptoms (CES-D)	12.28 (8.22)	—	10.37 (6.76)	—
n	9634		9290	

depression [1,12]. Those who feel worse physically likely feel worse emotionally too. Thus, in addition to dieting, we also expect that self-reported health will mediate the association between overweight status and depressive symptoms in adolescence.

Methods

Data

This study draws on data from the National Longitudinal Study of Adolescent Health (Add Health) [13], a large, school-based study of adolescents, their schools, and their families. The Add Health sample is representative of schools in the United States with respect to region of country, urbanicity, school type, ethnicity, and school size. In 1994, all available students in all study schools (about 90,000) completed the In-School Survey. In 1995, a subsample ($n = 20,745$) of these adolescents, including a nationally representative core sample plus four special oversamples, completed the Wave 1 In-Home Interview. All students who completed the In-School Survey plus those who did not complete a questionnaire but were listed on a school roster were eligible for selection into the In-Home sample. Students in each school were stratified by grade and gender, and approximately 17 students were randomly chosen from each stratum. The In-Home Interview included questions about physical and mental health, daily activities, and relationships with family members and peers. In this study, we used data from the first wave of the adolescent In-Home Interview along with data from the In-School Survey to assess the association between overweight status and depressive symptoms. Data from the In-Home interviews could also be linked to data from the original In-School Survey to construct school-level variables. Because of the need to control for design effects and unequal probability of selection in the Add Health data, only adolescents

with valid sampling weights were included in the analytic sample (final $n = 18,924$).

Measures

We used the impute procedure in STATA to estimate missing values on the independent variables [14]. See Table 1 for univariate statistics for all measures.

Depressive symptoms. The sum of responses to 19 questions drawn from the Center for Epidemiological Studies' Depression Scale served as the measure of emotional distress (CES-D) [15]. Respondents reported how often they experienced symptoms, such as having a poor appetite, feeling tired, and talking less than usual, within the past week (ranging from 0 = "never or rarely" to 3 = "most or all of the time"). A score of 16 or above on the CES-D scale is highly correlated with a diagnosis of clinical depression. The alpha reliability of our scale is .87.

Degree of overweight. Consistent with Ross' study [1], we examine relative weight as a continuous variable, ranging from low to high levels. Degree of overweight was indicated by body mass index (BMI), the ratio of weight to height² ($[\text{kg}/\text{cm}^2] \times 10^4$). Our measure of BMI was based on self-reported weight and height.

Dieting. Dieting was a binary variable, coded 1 for adolescents who reported dieting within the past 7 days to lose weight or to prevent weight gain.

Self-rated health. Respondents reported on their general health, and their responses were coded as "poor" (–2), "fair" (–1), "good" (0), "very good" (1), or "excellent" (2). Self-rated physical health is a widely used, valid measure of health status [16] that taps general health status rather than acute problems.

Exercise. Exercise is known to be associated with both lower weight and fewer symptoms of depression and, therefore, should be controlled [17]. Our first measure of exercise indicated involvement in sports activities. Respondents were asked to report how often during the last week they had played an active sport, such as baseball, softball, basketball, soccer, swimming, or football (range: 0 = “not at all” to 3 = “5 or more times”). Our second measure of exercise indicated participation in activities other than sports. Respondents were asked to report how often during the last week they had engaged in activities such as jogging, walking, karate, jump rope, gymnastics, and dancing (range: 0 = “not at all” to 3 = “5 or more times”).

School-level mean BMI. We aggregated self-reported weight and height information from the In-School Survey, a near census of each school, across all students within schools to construct an average BMI score for the student body of each school.

Sociodemographic characteristics. All models controlled for three binary items: race/ethnicity (1 = “white”), parent education (1 = “at least one resident parent graduated from college”), and family structure (1 = “two biological parent family”). Continuous measures of grade-level (in years) and family income (in thousands of dollars) also served as controls.

Plan of analysis

The first objective of this study involved the identification of social groups in which being overweight was least common. To do this, we regressed BMI on each of the sociodemographic characteristics with the survey regression procedure in STATA [14]. This procedure produced robust standard errors by correcting for design effects and the unequal probability of selection in the Add Health data. The significance levels of the coefficients in these models were more accurate than those produced by standard ordinary least squares regression, and, therefore, gave better estimates of the associations between our constructs.

Our second objective involved an examination of the association between overweight status and depressive symptoms. Using the survey regression procedure in STATA, we regressed symptoms of depression on BMI, adjusting for exercise and sociodemographic characteristics. To test whether this association was greatest where being overweight was least common, interaction terms between relative weight and grade-level, mean school-level BMI, parent education, and race were added to this model.

Finally, the third objective in this study involved the examination of possible mediators of the association between overweight status and symptoms of depression. A variable functions as a mediator when it meets three

Table 2
Regression of BMI on sociodemographic characteristics

	Females	Males
Grade	.37** (.05)	.57** (.04)
White	-.87** (.14)	-.17 (.15)
Parent college	-.78** (.15)	-.72** (.15)
Parents married	-.14 (.12)	.17 (.16)
Family income (in \$1000s)	-.01* (.00)	-.00** (.00)
Constant	19.87	17.69
R ²	.05	.05
n	9274	9142

Note: Standard errors in parentheses.

* $p < 0.01$; ** $p < 0.001$.

conditions. First, the independent variable (overweight status) must be significantly associated with the presumed mediators (dieting and self-rated health). Second, variation in the mediators must significantly account for variation in the dependent variable (depressive symptoms). Third, when the mediators are entered in the model, a previously significant association between the independent and dependent variables must be reduced to nonsignificance [18]. Estimating the percent change in the coefficient for the association between overweight status and depressive symptoms before and after the inclusion of the two mediators, dieting and self-rated physical health, revealed the degree of mediation.

Results

Overweight status in different groups

Because the reflected self-appraisal hypothesis predicts that the association between weight and depression is greatest where it is least common, the first step in testing this hypothesis was identifying groups with lower average BMI. As shown in Table 2, our survey regression analyses revealed that adolescents in higher grades were more likely to be overweight than adolescents in lower grades and that adolescents from more advantaged family backgrounds (with at least one college-educated parent and higher family income) were less likely to be overweight. Finally, BMI varied by race (e.g., being white was negatively associated with BMI, but only for girls).

Overweight status and depressive symptoms

The next step in testing the reflected self-appraisal hypothesis was to establish that overweight status predicted depressive symptoms, in general, but even more so in social groups and contexts in which being overweight was least common. Beginning with the basic association between overweight status and symptoms of depression, relative weight as indexed by BMI significantly predicted greater levels of emotional distress, adjusting for exercise and sociodemographic characteristics for girls as a group

Table 3
Regression of depressive symptoms on BMI, exercise, and sociodemographic characteristics

	Females		Males	
	Model 1	Model 2	Model 1	Model 2
BMI	.08** (.02)	-.44 (.56)	-.01 (.02)	.38 (.49)
Grade	.22** (.08)	.82* (.32)	.30*** (.06)	.98** (.33)
White	-1.30*** (.34)	-1.19 (1.16)	-1.44*** (.21)	-.75 (1.08)
Parent college	-1.48*** (.29)	-1.21 (1.43)	-.90*** (.22)	-.95 (1.23)
Parents married	-1.31*** (.25)	-1.30*** (.25)	-1.32*** (.22)	-1.27*** (.21)
Family income (in \$1000s)	-.01** (.00)	-.01 (.01)	-.01* (.00)	-.04* (.01)
Sports	-.55*** (.11)	-.53*** (.11)	-.71*** (.09)	-.71*** (.09)
Exercise	-.03 (.11)	-.03 (.11)	-.21* (.09)	-.20* (.09)
School-level mean BMI		-.47 (.57)		.53 (.57)
BMI × grade		-.03* (.01)		-.04* (.01)
BMI × white		-.00 (.05)		-.02 (.05)
BMI × parent college		-.01 (.07)		.01 (.05)
BMI × income		-.00 (.00)		.00* (.00)
BMI × school-level mean BMI		.03 (.03)		-.00 (.02)
Constant	11.12	16.22	11.42	-6.01
R ²	.05	.05	.06	.07
n	9574	9574	9221	9221

Note: Standard errors in parentheses.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

(Table 3, Model 1) but not for boys (Model 3). Turning to contextual variation in this association, our analyses revealed that it was fairly consistent across social groups and contexts. Specifically, race/ethnicity, parent education, and mean school-level BMI did not moderate the association between overweight status and depressive symptoms (Table 3, Models 2 and 4). One instance of moderation did occur, however, for both boys and girls. Consistent with expectations, the significant relative weight × grade-level interaction terms indicated that the association between BMI and depression was stronger among adolescents in lower grades, for whom being overweight was less common.

These findings suggest that, in line with the reflected self-appraisal hypothesis, overweight status was related to depressive symptoms among some, but certainly not all, groups in the adolescent population. Because girls and younger adolescents of both genders demonstrated this pattern, subsequent analyses, which were predicated on the existence of an association between overweight status and symptoms of depression, focused exclusively on these two groups.

Mechanisms linking overweight status to depressive symptoms

According to the reflected self-appraisal hypothesis, social stigma makes weight problems distressing. Yet, the behaviors motivated by the desire to avoid such stigma, such as dieting, may also contribute to the negative psychological consequences of being overweight. In Table 4, the regression of depressive symptoms on BMI, adjusting for exercise and sociodemographic characteristics, shows that

relative weight was significantly and positively associated with symptoms of depression for girls (Table 4, Model 1). After adding the dieting variable, however, the association between BMI and depressive symptoms was reduced by approximately 50% to become statistically nonsignificant (Table 4, Model 2). This suggests that dieting does partially mediate, or explain, the association between relative weight and symptoms of depression among adolescent girls. In the case of adolescents in lower grades, including those in grades seven and eight, relative weight was also significantly positively associated with depressive symptoms (Table 5, Model 1). After adding the dieting variable, the association was reduced to statistical nonsignificance. The association was reduced by a mere 14%, however, suggesting a more minor mediational pathway of dieting in this group.

Another potential mechanism explaining the association between overweight status and depressive symptoms involves physical health. Consistent with past research, we found that relative weight was negatively associated with self-rated health, such that adolescents with higher BMI reported significantly lower levels of general health (results not shown). As shown in Model 3 of Table 4, the addition of the self-rated health variable to the model in which we regressed symptoms of depression on BMI, controlling for exercise, sociodemographic characteristics, and dieting, resulted in further reduction of the coefficient for relative weight among girls. In the case of adolescents in lower grades, we found evidence of strong mediation; after adding the self-rated health variable, the association between overweight status and depressive symptoms was reduced by approximately 100% (Table 5, Model 3). Although dieting

Table 4

Regression of depressive symptoms on BMI, controlling for exercise and sociodemographic characteristics (model 1), dieting (model 2), and self-rated health (model 3), females only

	Model 1	Model 2	Model 3
BMI	.08** (.02)	.04 (.03)	-.06* (.03)
Grade	.22** (.08)	.20* (.08)	.25** (.08)
White	-1.30*** (.34)	-1.38*** (.34)	-1.41*** (.31)
Parent college	-1.48*** (.28)	-1.51*** (.28)	-1.14*** (.28)
Parents married	-1.31*** (.25)	-1.31*** (.25)	-1.11*** (.24)
Family income (in \$1000s)	-.01** (.00)	-.01** (.00)	-.01* (.00)
Sports	-.55*** (.11)	-.53*** (.11)	-.32** (.10)
Exercise	-.03 (.11)	-.05 (.11)	.13 (.10)
Dieting		1.61*** (.30)	1.42*** (.31)
Self-rated health			-2.34*** (.13)
Constant	11.12	11.96	14.71
R ²	.05	.05	.12
n	9574	9574	9574

Note: Standard errors in parentheses.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

alone did not explain the association between relative weight and symptoms of depression among seventh and eighth graders, the combination of dieting and self-rated health did appear to account for the observed positive association in this group.

Discussion

The findings of this study did not reveal the expected general association between overweight status and depressive symptoms for adolescents as a single population. Perhaps the rising rates of obesity during this life stage have blocked some of the stigma associated with being overweight among young people, thereby buffering overweight adolescents from negative evaluations. In many ways, the adolescent population looked much like adults, as reported

by earlier research, with relative weight and symptoms of depression linked in a context-specific way. Girls and adolescents in lower grades both experienced being overweight more negatively. Girls have been widely reported as having more trouble coping with weight and being more focused on their weight [9], whereas early adolescence is defined by the pubertal transition, a period in which young people undergo intense physical growth and often feel self-conscious about their changing bodies [19]. Thus, these groups might be more likely to perceive negative evaluations or more likely to suffer from them.

Although we expected to find more evidence of contextual variation within our sample, we recognize the possibility that more support for the reflected self-appraisal hypothesis could be uncovered by the examination of highly proximate contexts, such as the family and

Table 5

Regression of depressive symptoms on BMI, controlling for exercise and sociodemographic characteristics (model 1), dieting (model 2), and self-rated health (model 3), seventh and eighth graders only

	Model 1	Model 2	Model 3
BMI	.07* (.03)	.06 (.03)	-.02 (.04)
Male	-1.24*** (.27)	-.19*** (.27)	-1.14*** (.27)
Grade	.13 (.27)	.13 (.27)	.28 (.29)
White	-1.31** (.39)	-1.61** (.39)	-1.29** (.37)
Parent college	-1.60*** (.27)	-1.61*** (.27)	-1.44*** (.27)
Parents married	-.94** (.29)	-.94** (.28)	-.87** (.29)
Family income (in \$1000s)	-.01** (.00)	-.01** (.00)	-.01** (.00)
Sports	-.71*** (.13)	-.70*** (.13)	-.55*** (.12)
Exercise	-.05 (.12)	-.05 (.12)	.09 (.11)
Dieting		.48 (.51)	.11 (.54)
Self-rated health			-1.81*** (.14)
Constant	11.94	12.06	13.52
R ²	.08	.08	.12
n	4820	4820	4820

Note: Standard errors in parentheses.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

friendship groups. These contexts may be more influential in shaping self-appraisals than the relatively distal contexts examined in this study, including race, class, and even the school context. For example, the effect of overweight status on depressive symptoms may be greater for adolescents whose siblings or friends are thin.

Mechanisms linking overweight status and depressive symptoms

Although this study was based on the reflected self-appraisal hypothesis, we recognized, like others in this area, that other mechanisms, both social and not, could also link relative weight and symptoms of depression. Among girls, being overweight was distressing largely because of dieting attempts. This phenomenon represents another side of reflected self-appraisal—girls react to the real or perceived stigma of their physical appearance by attempting to change their appearance, creating more anxiety in the process. At the same time, a combination of dieting and feelings of poor health explained the association between overweight status and depressive symptoms among adolescents in lower grades. This phenomenon could also be related to reflected self-appraisal. Perhaps younger adolescents feel poorly because of the stigma attached to their weight. Certainly, this scenario should be studied further. Regardless, both of these examples demonstrate the value of context-specific approaches to obesity and mental health in adolescents. Developmental patterns are unlikely to be monolithic across the adolescent population, and the underpinnings of these patterns can change dramatically from group to group. Add Health offers a unique tool to study these intricate processes.

Limitations

The measure of BMI used in this study was based on self-reported height and weight, which, in some cases, may not have been accurately stated. Although it would have been preferable to use actual weight and height to construct BMI, evidence suggests that the bias introduced by using self-reports is small. In a nationally representative sample of young adolescents, researchers found that the correlation between self-reported weight and actual weight ranged from .87 to .94, whereas the correlation between self-reported height and actual height ranged from .82 to .91. The use of self-reported weight and height in this study resulted in the correct classification of weight status in 94% of adolescents [20].

Consistent with previous research on adults, we used prevalence of overweight status within a particular group to indicate group attitudes toward being overweight. Owing to data limitations, we were not able to directly assess attitudes toward weight within social contexts, such as gender, race/ethnicity, and class. In the case of weight, attitudes and

behaviors may not necessarily correspond to one another. This suggests that in future research, we ought to measure group attitudes toward weight directly, rather than making inferences about attitudes based on the actual weight of group members.

Conclusions

This study, which applied a classic social psychological approach to the study of the mental health of overweight adolescents, illustrated the complex place of weight in human development, how it taps physical, psychological, and social dimensions. Recognition of this complexity will aid interventions aimed at improving the mental health of adolescents, including those who are overweight, think that they are overweight, or fear becoming overweight.

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