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Weight status and weight perception in relation to mental distress and psychosocial protective factors among adolescents

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Abstract

Objective—To measure how weight status and weight perception relate to mental distress and social protective factors in adolescents.

Methods—Adolescents in 8th, 9th, and 11th grade participating in the 2013 Minnesota Student Survey (N=122,180) were classified based on weight perception (overweight or not overweight) and weight status (not overweight, overweight, obese). Bivariate tests were used to assess the relationship of weight status and weight perception with internal mental distress, and generalized linear models were used to measure the association between weight status and weight perception with psychosocial protective factors including parent, school, and friend connectedness, social competency, and positive identity. Logistic regressions measured the relationship between psychosocial protective factors and internal mental distress.

Results—Prevalence of internal mental distress ranged from 14.5% for overweight males who perceived themselves as not overweight to 55.0% for females who were not overweight but self-perceived as overweight. Across all weight-status categories, adolescents who perceived themselves as overweight, compared to those who did not, had higher internal mental distress and lower mean levels of psychosocial protective factors. All psychosocial protective factors were related to lower odds of internal mental distress, with significant small differences by weight category and perception.

Conclusions—Weight status and weight perception both impacted mental distress and psychosocial protective factors. Those who perceived themselves as overweight, regardless of weight status, had the highest prevalence of mental distress and lowest levels of psychosocial protective factors. Healthcare providers should consider screening for weight perception to provide a tailored approach to adolescent care.

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Keywords

Adolescent health; BMI; weight status; weight perception; psychosocial protective factors

INTRODUCTION

Adolescent overweight and obesity are a major public health issue due to the high prevalence and effects on long-term physical health. Between 1988–1994 and 2013–2014, the obesity rate among US adolescents doubled from 10.5% to 20.6%.¹ In addition to neurologic, endocrine, and cardiovascular complications, among others, child and adolescent obesity are associated with psychosocial problems and lower self-esteem;² however, it is still unclear how weight status may impact psychosocial factors, and vice versa. Multiple studies have failed to show an independent relationship between depressive symptoms and obesity.^{3,4} Considering the high prevalence of body image dissatisfaction and unhealthy weight control behaviors among adolescents,⁵ it is crucial to understand how body image and weight worries together may be shaping emotional well-being. Weight stigma is pervasive in the US,⁶ and adolescents in a formative period of building social relationships may be particularly susceptible as they experience greater vulnerability and sensitivity to social and media pressures.⁷

To support adolescents in developing positive emotional well-being while maintaining a healthy weight trajectory, it is important for healthcare professionals to understand how weight status and perception, together, relate to well-being. A previous study found that adolescents who perceived themselves as overweight were at increased risk for depression, but actual weight status and congruency of weight status with perception did not impact depression.⁸ Conversely, another study found that normal-weight girls who incorrectly perceived themselves as overweight showed greater depressive symptoms than girls who correctly identified as overweight.⁹ For boys, those with overweight who correctly perceived themselves as overweight had greater depressive symptoms than overweight boys who misperceived as normal-weight; however, normal- and overweight boys who perceived themselves as overweight had equal risk of depressive symptoms.⁹ Thus, weight misperception may be linked to depression and mental health, but the nature of those associations may depend on both sex and weight status. Additionally, how weight status and perception interact with psychosocial protective factors is unknown, an important gap considering the importance of protective factors such as family, friend,¹⁰ and school connectedness¹¹ in supporting emotional health during adolescence.

The purpose of this study was to determine how weight status, weight perception, and the congruency between the two are related to adolescent mental distress, and to examine the association of weight status and weight perception with known psychosocial protective factors in a large population-based adolescent sample. A secondary goal of this study was to determine whether psychosocial factors were protective against internal mental distress for all weight status and perception groups.

METHODS

Study Design

Sample and data source—This secondary data analysis used data from the 2013 Minnesota Student Survey (MSS), a statewide, anonymous, cross-sectional survey given every three years to students in select grades. In 2013, 5th, 8th, 9th, and 11th graders were surveyed. The MSS assesses health-related behaviors, risk and protective factors.¹² In 2013, 162,034 students completed surveys, representing 84% of the school districts in Minnesota. Data from 5th grade students was not included because the survey version given to 5th graders did not include weight-related questions, leaving a total of 122,180 8th, 9th, and 11th grade students in the final dataset.

Since this study involved anonymous secondary data analysis, the University of Minnesota-Twin Cities Institutional Review Board deemed this study exempt from review.

Measures

Demographics—Demographic covariates included sex, grade (8th, 9th, and 11th), free/reduced price lunch status, living with two biological parents, and race/ethnicity. Race/ethnicity was assessed via two questions to create six categories: non-Hispanic American Indian; non-Hispanic Asian/Pacific Islander; non-Hispanic Black; non-Hispanic White; non-Hispanic multiple races; and Hispanic.

Weight-related measures—Weight perception was assessed from the question, “How would YOU describe your weight?” with possible answers of “Underweight,” “About the right weight,” or “Overweight.” For this study, the categories of “Underweight” and “About the right weight” were combined during analysis into one “Not overweight” perception category because of small cell sizes in the “underweight” group and to limit comparisons to those directly relevant to the study purpose. Self-reported height and weight were used to calculate weight status category, which has been shown to have strong validity in adolescents.¹³ Healthy weight status was defined as below the 85th percentile using age- and sex-specific Centers for Disease Control and Prevention growth charts. Overweight was defined as having a body mass index (BMI) between the 85–95th percentiles, and obesity was defined as having a BMI greater than the 95th percentile.¹⁴

Internal Mental Distress—The MSS included five questions adapted from the Global Appraisal of Individual Needs Short Screener (GAIN-SS),¹⁵ a validated screener among adolescents. The GAIN-SS measured internal mental distress in the past year with five questions ($\alpha=0.80$). Students indicated whether or not they had “significant” problems during the last 12 months on each item; significant was defined as “having a problem for two or more weeks that keeps coming back, interferes with responsibilities, or makes one feel like they cannot go on.” Students answering “yes” to three or more items were considered at high risk of requiring formal assessment and intervention for internalizing mental distress, as recommended by GAIN-SS developers.¹⁵

Psychosocial Protective Factors—Five protective factors were examined: school, parent, and friend connectedness, social competency, and positive identity. All multi-item scales were averaged. School connectedness was assessed via four questions from the Teacher-Student Relationships subscale of the School Engagement Inventory,¹⁶ including “adults at my school listen to the students”. Students responded on a 1 (Strongly disagree) to 4 (strongly agree) scale ($\alpha = .84$). Parent connectedness was measured via three questions (e.g., “How much do you feel your parents care about you?” $\alpha = .66$), with Likert scale responses ranging from 1 (Not at all) to 5 (Very much). Friend connectedness was assessed via one question, “how much do you feel your friends care about you”, with Likert scale responses ranging from 1 (Not at all) to 5 (Very much). Internal assets were assessed with the Developmental Assets Profile.¹⁷ Two subscales were included: Social Competency was assessed via eight questions (e.g. “I resolve conflicts without anyone getting hurt” $\alpha = .84$), and Positive Identity was assessed via six questions (e.g. “I feel in control of my life and future” $\alpha = .82$), both with Likert scale responses ranging from 1 (Not at all or rarely) to 4 (Extremely or almost always).

Data Analysis

Chi-squared tests were used to measure the bivariate association between weight status and weight perception; all analyses were performed separately for each sex because of the known interaction between sex and weight perception.^{8,9} ANOVAs were used to test the relationship between weight status/perception and internal mental distress for both males and females; this relationship was further assessed using logistic regressions accounting for race, grade, family structure, and free/reduced price lunch status. General linear models were used to compare mean levels of psychosocial protective factors (teacher-student relationships, parent connectedness, friend connectedness, social competency, and positive identity) between weight/weight perception classifications while controlling for race, grade, living with two biological parents, and free/reduced price lunch status. Pairwise comparisons compared mean levels of psychosocial protective factors for all groups compared to those who were not overweight and perceived themselves as not overweight, and among those who correctly perceived and misperceived their weight within each weight category.

Logistic regressions were used to test whether psychosocial protective factors protected against internal mental distress similarly across weight category/weight perception groups. Separate logistic regressions, stratified by sex, examined the role of each of the five protective factors by including weight category/weight perception, the protective factor, and the multiplicative interaction term of the two as independent variables, along with the same sociodemographic controls as above. Where the interaction term was significant, models were stratified by weight category/weight perception and sex and rerun. Each protective factor was standardized so that a one unit change represents a one standard deviation change in the level of the protective factor. Analyses were conducted using SPSS version 22.

RESULTS

Table 1 includes descriptive statistics for study variables. The sample was 73.7% white and roughly evenly split by sex and grade in school. Approximately a quarter of the sample

reported receiving free or reduced price lunch, an indicator of poverty, and nearly one third reported not living with two biological parents.

Weight Status and Weight Perception

Table 2 shows weight perceptions for males and females who were not overweight, overweight, or obese. Overall, 17.2% ($n = 9,062$) of males and 15.9% ($n = 8,283$) of females misperceived their weight status. Weight misperception was much higher among overweight adolescents and differed by sex; only 42.2% of males with overweight or obesity accurately perceived themselves as overweight compared to 67.0% of females with overweight or obesity who perceived themselves as overweight. More females perceived themselves as overweight, regardless of actual weight status ($p < .05$).

Internal Mental Distress

Those perceiving themselves as overweight when they were not overweight reported the highest frequency of high internal mental distress, among both males and females (Table 2). Moreover, within each weight status, adolescents perceiving themselves as overweight, accurately or not, had higher rates of high internal mental distress ($p < .05$). Females had about twice the frequency of distress as males in every weight status/perception group. After adjustment for sociodemographic factors, males who self-perceived as overweight when they were not overweight had 2.8 greater odds ($p < .05$) of high internal distress compared to those who were not overweight and self-perceived as not overweight, while those with overweight or obesity who did not self-perceive as overweight either had equal or lower odds compared to the reference group. For females in all three weight status categories, self-perceiving as overweight was associated with 2.0–2.9 times the odds of high internal mental distress compared to the reference group. In contrast, for females with overweight and obesity, self-perceiving as not overweight was associated with only 1.1–1.2 times the odds of high internal mental distress compared to the reference group of girls who were not overweight and self-perceived as not overweight.

Psychosocial Protective Factors

Adolescents who were not overweight but perceived themselves as overweight had the lowest mean levels of all five psychosocial protective factors (Table 3). Adolescents correctly perceiving themselves as not overweight had significantly higher mean levels of all of the five protective factors assessed compared to those in every weight category who self-perceived as overweight. Among each weight status group, adolescents perceiving themselves as overweight had significantly lower scores on all five protective factors than their counterparts who perceived themselves to be not overweight, with the exception of school connectedness for females.

Misperceivers who considered themselves overweight but were not overweight had significantly lower levels of each protective factor. However, among those with overweight or obesity, misperceivers had significantly higher mean levels across all protective factors compared to those who accurately perceived themselves as overweight, with the exception of school connectedness for females with obesity.

Adolescents who were not overweight and perceived themselves as not overweight had the highest mean levels for social competency compared to all other weight status/weight perception groups. The same was generally not true for the other four protective factors, wherein those with overweight or obesity who misperceived themselves as not overweight exhibited similar mean levels to those who were not overweight and self-perceived as not overweight.

Psychosocial Protective Factors in Relation to Internal Mental Distress

Logistic regression analyses examined whether protective factors were related to lower odds of internal mental distress similarly across weight category/perception groups. Interaction terms for all five protective factors were significant, so regressions were rerun, stratified by sex and weight status/weight perception groups (Table 4). For all protective factors, a one unit increase in the protective factor (one standard deviation) was related to lower odds of internal mental distress; however, both sex and weight category/perception impacted these relationships. Importantly, differences were small; in general, each protective factor was more protective for those who were not overweight and perceived themselves as not overweight compared to one or more groups of students who were overweight/obese.

DISCUSSION

This study assessed the relationship between weight status and weight perception with mental health and psychosocial protective factors. More females than males perceived themselves as overweight, regardless of actual weight status. Importantly, less than half of overweight males perceived themselves as overweight, whereas two-thirds of all overweight females perceived themselves as overweight. Other studies have shown similarly high prevalence of weight misperception,¹⁸ particularly among those with high weight status.¹⁹ Sex differences in weight misperception also have been noted, with males being more likely to misperceive their weight than females.^{18, 20, 21} One study showed almost 70% of moderately overweight females compared to 38% of moderately overweight males perceiving themselves as overweight; further, over a quarter of average-weight girls considered themselves overweight compared to just 6% of males.²⁰ Additionally, sex differences emerged for mental distress and the interaction between mental distress and weight perception. For example, almost double the number of females compared to males experienced high internal mental distress. Further, females who accurately perceived themselves as overweight had higher odds of experiencing internal mental distress than males who accurately perceived as overweight. This agrees with work showing that adolescent females suffer greater mental distress²² and depression⁵ than males, but also suggests the interaction between mental distress and weight perception may be greater for females.

Weight perception across all weight status groups had greater impact than weight status on both internal mental distress and psychosocial protective factors. Although some groups (e.g. those who perceived as overweight) reported lower mean levels of psychosocial protective factors, when those connections were present, they were protective against internal mental distress for all weight category/perception groups. While there were small

differences in the level of protection conferred, based on weight category/perception and sex, the results overall point to psychosocial factors as possible points to leverage in intervention design. This study supports research showing that weight perception is more important than actual weight status in affecting adolescent mental health.^{8, 9, 23} Perception of a healthy weight has been associated with protective factors including personal resources, self-esteem,²³ and lower future weight gain,²⁴ even at higher weight status.

For both internal mental distress and social protective factors, adolescents who inaccurately perceived themselves as overweight were at greatest risk. The risk associated with overestimation of weight may be related to factors such as body dissatisfaction or weight preoccupation. While research suggests those with higher weight experience greater body image dissatisfaction, this relationship is moderated by factors such as body ideal internalization, weight-related bullying, perceived pressures, and social comparison.²⁵ Those who are under- or normal-weight and overestimate their weight may be at particular risk for extreme weight control behaviors; one study found that underweight females and healthy-weight adolescents who overestimated their weight were significantly more likely than other groups to perform extreme weight management practices, such as purging or fasting for more than 24 hours.²⁶ Others have shown overestimation of weight or weight status is related to risk behaviors²⁷ and depressive symptoms.²⁸

Our findings highlight the need for healthcare practitioners to screen for both weight perception and status and promote healthy weight via behaviors such as increased activity, decreased sedentary behavior, and a healthy diet.²⁹ While weight misperception may have some positive impact on adolescent mental health, it has the potential to thwart obesity prevention efforts that rely on recognition of obesity as a significant health issue. The American Academy of Pediatrics (AAP) recommends measuring and plotting BMI as a part of routine clinical practice, and actively discussing weight, healthy diet, and physical activity recommendations with all families.²⁹ Physician communication with parents concerning overweight status in children has increased in recent years;³⁰ however, fewer than half of parents of children with obesity and fewer than a fifth of parents with children with overweight reported being told by a healthcare provider about their child's weight status.³⁰

Findings from this study indicate simply tracking BMI and discussing healthy weight trajectories may not be a sufficient approach. Adolescents in all weight status categories who perceived themselves as overweight reported higher internal mental distress and lower levels of social protective factors than those who did not identify as overweight. This pinpoints an important risk factor healthcare providers should be aware of, particularly in primary care pediatrics and adolescent weight management. The identification of overweight perception as a risk factor for mental health comorbidity and targetable protective factors that may be concomitantly low has important implications for adolescent health. Our results support screening for overweight perception as a component of a thorough psychosocial assessment, with appropriate management, follow-up, and referral to further services as needed. Because body dissatisfaction or weight concerns can predict eating disorders³¹ and weight gain³² pediatricians should discuss weight status and related factors in an empathetic way, particularly for those who self-perceive as overweight. For adolescent patients with overweight or obesity, study findings support focusing discussions on health behaviors that

are associated with healthy weight status rather than on the patient's weight status itself. Motivational interviewing may be an effective approach.³³ The AAP recommends surveillance of social and emotional health and recognizes the need to promote a healthy lifestyle rather than dieting.²⁹ Given the high prevalence of eating disorders and disordered eating in adolescents³¹, mental health screening using a validated screener such as the Patient Health Questionnaire (PHQ9)³⁴ may also be beneficial,¹⁵ particularly for adolescents misperceiving as overweight.

Strengths and Limitations

This study had a number of strengths. First, because of the large, state-wide sample, we had adequate power to examine all six weight status/perception groups by sex, an important contribution given prior work^{8,9} suggesting weight perception differs by sex; further, this study built upon previous work by providing a more comprehensive approach, including six weight status/perception categories. Second, this study reported on both risk and protective factors, which do not act in isolation and should be further assessed together. Third, this study observed weight misperceivers identifying as normal-weight in addition to weight misperceivers identifying as overweight, an understudied group.

This study was limited by its use of cross-sectional data. We were thus unable to assess directionality or give insight into long-term impacts of weight status and weight perception on mental health and protective factors. Further, height and weight were self-reported, which could have resulted in weight underestimates. However, prior research in adolescents assessing weight perception has used this approach,¹⁸ and has shown a strong correlation between self-reported and measured height and weight.¹³ Third, weight status categories include a range of BMI, and it is possible that, for instance, adolescents who were overweight but self-perceived as not overweight were less overweight than adolescents who both were overweight and self-perceived as overweight. To reduce this potential bias, adolescents were categorized into both overweight and obese groups. Fourth, while this study sample was reflective of the state and had excellent state-wide coverage, the sample of adolescents was almost three-quarters white, and the findings reported should not be assumed to reflect those in other states or countries.

CONCLUSIONS

This study suggests that weight misperception is negatively associated with mental health for those who are a healthy weight, and positively related to mental health for those with overweight/obesity. The findings highlight the need to combat weight misperception, mental distress, and overweight and obesity among adolescents in a nuanced way that accounts for both obesity and weight perception. Non-overweight females perceiving themselves as overweight may be at particular risk for experiencing high internal distress; however, all adolescents perceiving themselves as overweight may be at risk of internal distress and lower levels of protective factors, regardless of weight status. Primary healthcare and weight-management providers should consider screening for weight perception when working with adolescents. A significant number of adolescents misperceived their weight status, showing a need to address healthy weight maintenance. However, this topic must be

addressed with care, given the protective effect of weight misperception among youth with overweight and obesity. Instead of focusing on weight, healthcare providers can focus on promoting healthy lifestyle behaviors such as decreased sedentary behavior, increased activity, and a healthier diet with fewer discretionary calories.

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What's new

In a large statewide adolescent sample, assessing weight status and weight perception together indicated that overweight perception across all weight status groups was more strongly associated than weight status with internal mental distress and lower psychosocial protective factors.

Table 1

Characteristics of respondents to the 2013 Minnesota Student Survey.

Variables	Male, % (N)	Female, % (N)
Sex	50.2 (61,341)	49.8 (60,839)
Grade		
<i>Eighth</i>	35.1 (21,548)	35.0 (21,293)
<i>Ninth</i>	34.5 (21,183)	34.8 (21,198)
<i>Eleventh</i>	30.3 (18,610)	30.2 (18,348)
Free or reduced lunch	26.2 (15,791)	27.5 (16,522)
Family living situation		
<i>Two biological parents</i>	67.2 (40,792)	65.8 (39,783)
Race/ethnicity		
<i>White</i>	73.7 (44,624)	73.8 (44,394)
<i>Black</i>	5.6 (3,399)	5.0 (3,036)
<i>Asian or Pacific Islander</i>	5.6 (3,370)	5.6 (3,375)
<i>American Indian</i>	1.3 (810)	1.0 (599)
<i>Hispanic</i>	7.1 (4,324)	7.5 (4,514)
<i>Multiple Races</i>	6.7 (4,032)	7.0 (4,238)
Internal Mental Distress	17.2 (9,661)	34.1 (19,715)
Protective Factors		
<i>School connectedness (mean ± SD), range:1–4</i>	2.97 ± 0.63	2.95 ± 0.60
<i>Parent connectedness (mean ± SD), range:1–5</i>	4.28 ± 0.80	4.15 ± 0.83
<i>Friend connectedness (mean ± SD), range:1–5</i>	3.98 ± 0.97	4.16 ± 0.97
<i>Social competencies (mean ± SD), range:1–4</i>	2.99 ± 0.62	3.10 ± 0.59
<i>Positive identity (mean ± SD), range:1–4</i>	3.00 ± 0.64	2.82 ± 0.67

Table 2

Bivariate and multivariable associations between weight status, weight perception, and internal mental distress by sex.

Weight status/weight perception	Percentage (N) in each weight and weight status category ^a	Percentage (N) reporting internal mental distress ^b	Odds ratio, Internal mental distress [95% Confidence Interval]
Males			
Correct Perceivers			
Not OV/Not OV *	71.9 (37,851)	15.2 (5,531)	1 (ref)
OV/OV	3.6% (1,889)	24.8 (449)	1.74 [1.55, 1.94] ^c
OB/OV	7.4% (3,875)	25.2 (941)	1.68 [1.55, 1.82] ^c
Misperceivers			
Not OV/OV	2.2% (1,176)	34.2 (386)	2.76 [2.42, 3.14] ^c
OV/Not OV	10.6% (5,594)	14.5 (778)	0.91 [.83, .99] ^c
OB/Not OV	4.4% (2,292)	15.9 (348)	0.96 [.85, 1.08]
Total N	52,677	50,566	50,566
Females			
Correct Perceivers			
Not OV/Not OV	72.3% (37,651)	28.4 (10,453)	1 (ref)
OV/OV	6.7% (3,499)	47.8 (1638)	2.02 [1.88, 2.18] ^c
OB/OV	5.1% (2,678)	51.4 (1347)	2.14 [1.96, 2.32] ^c
Misperceivers			
Not OV/OV	10.0% (5,237)	55.0 (2,821)	2.89 [2.72, 3.08] ^c
OV/Not OV	5.0% (2,581)	34.0 (851)	1.11 [1.02, 1.22] ^c
OB/Not OV	0.9% (465)	38.1 (173)	1.15 [0.94, 1.41]
Total N	52,111	50,942	50,942

* OV=overweight, OB=obese. Weight status category is listed first, and weight perception second.

^a Sex was significantly related to the distribution of weight status/weight perception groups ($\chi^2=5590$, $df=5$, $p<.001$). Within each weight status/weight perception group, there were differences ($p<.05$) in prevalence by sex for each group except the first group (those who were not overweight and perceived themselves as not overweight).

^b Internal mental distress was significantly related to weight status/weight perception groups ($\chi^2=3789$, $df=5$, $p<.001$).

^c Using the not overweight/not overweight perception group as the reference, the odds of individuals in each group having high internal mental distress, significant at the level of $p<.05$, from logistic regressions stratified by sex and controlling for grade, race, free/reduced price lunch status, and family structure.

Table 3

Marginal means from general linear models showing associations between weight status, weight perception, and psychosocial protective factors.*

Weight category/weight perception	Males					Positive Identity (range 1–4)
	School Connectedness (range 1–4)	Parent Connectedness (range 1–5)	Friend Connectedness (range 1–5)	Social Competency (range 1–4)		
Correct Perceivers						
Not OV/not OV [†]	2.95	4.11	3.93	2.95	2.98	2.98
OV/OV	2.89 ^a	3.96 ^a	3.68 ^a	2.81 ^a	2.78 ^a	2.78 ^a
OB/OV	2.89 ^a	3.98 ^a	3.71 ^a	2.79 ^a	2.76 ^a	2.76 ^a
Misperceivers						
Not OV/OV	2.76 ^{ab}	3.81 ^{ab}	3.54 ^{ab}	2.74 ^{ab}	2.63 ^{ab}	2.63 ^{ab}
OV/not OV	2.94 ^b	4.13 ^{ab}	3.91 ^b	2.93 ^{ab}	3.00 ^b	3.00 ^b
OB/not OV	2.95 ^b	4.09 ^b	3.91 ^b	2.91 ^{ab}	2.98 ^b	2.98 ^b
			Females			
Correct Perceivers						
Not OV/not OV	2.90	3.99	4.07	3.02	2.80	2.80
OV/OV	2.79 ^a	3.75 ^a	3.80 ^a	2.82 ^a	2.49 ^a	2.49 ^a
OB/OV	2.82 ^a	3.78 ^a	3.78 ^a	2.81 ^a	2.49 ^a	2.49 ^a
Misperceivers						
Not OV/OV	1.67 ^{ab}	3.59 ^{ab}	3.63 ^{ab}	2.73 ^{ab}	2.34 ^{ab}	2.34 ^{ab}
OV/not OV	2.91 ^b	4.01 ^b	4.10 ^b	2.97 ^{ab}	2.79 ^b	2.79 ^b
OB/not OV	2.86	3.94 ^b	4.02 ^b	2.95 ^{ab}	2.80 ^{ab}	2.80 ^{ab}

* Each model accounted for race, grade, family structure, and free/reduced price lunch status.

[†] OV=overweight, OB=obese.

^a Within each column: pairwise comparison with the reference group (not overweight), perceive as not overweight); significant (p<.05) comparisons are denoted.

^b Within each column: pairwise comparison between accurate weight perception and inaccurate perception (e.g. overweight perceived as overweight vs. overweight perceived as not overweight); significant (p<.05) comparisons are denoted.

Table 4

Odds ratios for associations between each protective factor and internal mental distress, stratified by sex and weight category/perception.

Weight category/weight perception	School Connectedness OR [95% CI]	Parent Connectedness OR [95% CI]	Friend Connectedness OR [95% CI]	Social Competency OR [95% CI]	Positive Identity OR [95% CI]
Males					
Correct Perceivers					
Not OV/not OV	.61 [.57, .65]	.46 [.45, .48]	.61 [.59, .63]	.55 [.53, .57]	.35 [.34, .36]
OV/OV	.67 [.60, .75]	.48 [.42, .54]	.56 [.50, .62]	.55 [.49, .62]	.36 [.31, .41]
OB/OV	.70 [.65, .75]	.50 [.46, .55]	.72 [.67, .77]	.64 [.59, .69]	.43 [.40, .47]
Misperceivers					
Not OV/OV	.76 [.68, .85]	.47 [.41, .54]	.70 [.63, .79]	.66 [.58, .74]	.42 [.36, .49]
OV/not OV	.68 [.63, .74]	.51 [.47, .56]	.64 [.59, .70]	.63 [.58, .68]	.42 [.38, .46]
OB/not OV	.76 [.68, .85]	.54 [.49, .61]	.71 [.64, .79]	.62 [.56, .70]	.45 [.40, .52]
Females					
Correct Perceivers					
Not OV/not OV	.57 [.55, .58]	.41 [.40, .42]	.56 [.54, .57]	.43 [.42, .44]	.30 [.29, .31]
OV/OV	.67 [.52, .62]	.44 [.40, .48]	.65 [.61, .70]	.48 [.44, .52]	.32 [.29, .35]
OB/OV	.59 [.54, .64]	.46 [.42, .51]	.63 [.62, .87]	.46 [.42, .51]	.35 [.32, .39]
Misperceivers					
Not OV/OV	.59 [.55, .62]	.50 [.43, .49]	.60 [.56, .63]	.46 [.42, .49]	.30 [.28, .33]
OV/not OV	.67 [.61, .73]	.45 [.40, .50]	.70 [.64, .77]	.49 [.44, .54]	.37 [.33, .41]
OB/not OV	.79 [.65, .95]	.56 [.45, .70]	.64 [.52, .78]	.57 [.46, .70]	.48 [.38, .61]

Note. Logistic regressions testing an interaction term for weight category/perception and each protective factor were run separately. Every interaction term was significant, so models were stratified by weight category/perception and sex and return. Each protective factor was standardized so that a one unit increase represents a one standard deviation change in the level of the protective factor. Model controlled for race, grade, family structure, and free/reduced price lunch status.

† OV=overweight, OB=obese.