



Published in final edited form as:

J Behav Med. 2016 April ; 39(2): 334–345. doi:10.1007/s10865-015-9682-x.

Perceived size of friends and weight evaluation among low-income adolescents

Jenna C. Ramirez¹ and Stephanie Milan¹

¹Department of Psychology, University of Connecticut, 406 Babbidge Road U1020, Storrs, CT 06269, USA

Abstract

Drawing from social comparison theory, we examine how perceptions of friends' body sizes may influence adolescents' subjective evaluations of their own body (e.g., how accurate they are in judging their weight, how much body dissatisfaction they feel), particularly for adolescent females. Participants were low-income, minority adolescents (Study 1: N = 194 females, Mean age = 15.4; Study 2: N = 409 males and females; Mean age = 14.9). Adolescents used figure rating scales to indicate their perceived size and that of four of their closest friends and completed several measures of subjective weight evaluation (e.g., weight classification, body dissatisfaction, internalized weight bias). In both studies, how adolescents perceived their body size and the body sizes of their thinnest and heaviest friends were positively correlated. In Study 1, overweight females based on measured BMI were less likely to accurately judge themselves as overweight if they had a close friend they perceived as heavy. In addition, females who viewed themselves as having a larger figure reported more internalized weight bias when they had friends they viewed as relatively thin. Findings from Study 2 suggest that how friends' bodies are perceived is predictive of subjective weight evaluation measures only for adolescent females. Programs that address negative aspects of social comparison may be important in preventing both obesity and eating disorder symptoms in adolescent females.

Keywords

Obesity; Internalized weight bias; Figure rating; Peers

Introduction

According to social comparison theory (Festinger, 1954), humans have an innate drive towards ongoing self-evaluation that is based on comparison to others. People with whom we interact regularly and share similar attributes, such as close friends, often act as key

Correspondence to: Jenna C. Ramirez.

Compliance with ethical standards

Conflict of interest

Jenna C. Ramirez and Stephanie Milan declare they have no conflict of interest.

Human and animal rights and informed consent

All procedures followed were in accordance with ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

referents for social comparison (Wood, 1989). Although engaging in social comparison is normative, comparisons based on weight or body size can contribute to negative thoughts and feelings about one's own body (e.g., greater body dissatisfaction), particularly when comparisons are made to close friends (Cunningham et al., 2012; Rancourt et al., 2015). Friendships may be particularly important in shaping adolescents' evaluations of their body. Compared to younger children, adolescents spend more time with peers, experience more pressure towards conformity, and put greater emphasis on their social standing (see Lerner & Steinberg, 2009). Adolescents also tend to cluster into peer groups with similar attributes (Clark & Loheac, 2007); consequently, certain behaviors and beliefs may be mutually reinforcing within friend groups.

In this paper, we examine two ways that adolescents' perceptions of their friends' bodies may influence subjective evaluations of their own body in two samples of diverse, low-income adolescents. Much of the previous research on peer influences on weight has focused on university students (e.g., Leahey et al., 2011) or White, middle class adolescents in a relatively homogeneous area (e.g., de la Haye et al., 2011). Given that obesity rates are highest in low-income areas, it is important that research on peer influences on weight and weight-related behaviors and beliefs also include this population. We hypothesized that: (1) overweight adolescent girls may be less accurate in recognizing they are overweight if they have a close friend who they view as relatively heavy; and (2) adolescent girls who have close friends they view as relatively thin may feel more negatively about their own body size, particularly if they see themselves as relatively heavy compared to their close friends. In a second sample, we tested a third hypothesis that: (3) perceptions of friends' body sizes are more predictive of subjective weight evaluation measures in adolescent females compared to males.

Currently, approximately 34 % of adolescents are overweight or obese, with youth of color and those growing up in low-income households having the highest obesity rate (Ogden et al., 2010). Obese children and adolescents are at increased risk for concurrent and future health problems, which results in an annual cost of an estimated \$14 billion (Trasande & Chatterjee, 2009). Within the U.S., there has been a widely documented increase in the prevalence of obesity among adolescents during the last two decades. At the same time, there has been a decrease in the number of individuals who accurately identify themselves as overweight or obese (Burke et al., 2010). This lack of accuracy has implications for the increase of obesity. Individuals who are overweight, but do not accurately judge themselves as being overweight, may be less likely to engage in behavioral change efforts since recognizing that a health risk is personally relevant is a key component in most models of health behavior change (Khambalia et al., 2012). Thus, determining factors that potentially keep adolescents from recognizing their level of obesity risk is important for targeted health intervention and prevention programs.

Several recent studies suggest that adolescents who have heavier social referents may be less likely to judge their own weight accurately. In two large studies including multiple schools, Maximova et al. (2008) and Brown et al. (2010) found that adolescents who attended schools with more overweight students based on objective BMI were less likely to accurately view themselves as overweight. In a similar study using self-reported weight,

overweight adolescents were more likely to misclassify themselves as normal weight if they had friends with a higher BMI (Ali et al., 2011). These studies suggest that having heavier social referents for comparison may lead overweight adolescents to underestimate their own weight status. However, because these studies used objective or self-reported BMI, it is unclear how adolescents actually perceived their friends' body sizes. BMI measures do not correspond entirely with perceived body size, whether reporting on one's own body (Gardner, 2011) or on a friend's body (Cazzato et al., 2015). Similarly, adolescents' perceptions of peer weight norms (i.e., estimates of the average weight of peers) only moderately relate to actual peer weight norms (Perkins et al., 2014). Given that perceptual measures are often a stronger or unique predictor of weight-related behaviors and beliefs (Gardner, 2011), studies that include measures of how adolescents actually perceive their friends' bodies can add to the literature on peer influences on subjective weight evaluation.

While accurate assessment of one's weight is important for health reasons, adolescents who feel negatively about their body size are at risk for mental health issues, including eating disorders and major depression (Hyde et al., 2008; Myers & Crowther, 2009). Engaging in social comparison based on body size may contribute to negative beliefs and feelings about one's body. Specifically, if an adolescent views herself as heavier than all of her friends, regardless of her actual body size, she may feel more negatively about her body. Although the standards of what is considered "heavy" differ by race, region, or culture, there is stigma and bias associated with obesity across all demographic groups with overweight/obese people being judged as more lazy, undesirable, and unlikable (Latner et al., 2005). When weight bias or stigma is internalized, meaning that the individual applies negative views about overweight people to herself, she is more likely to become depressed or engage in unhealthy weight change efforts (Durso & Latner, 2008). Not all people who are overweight endorse internalized weight bias (IWB) beliefs, however, and some normal weight people report a high level of IWB. Thus, the extent to which an individual's actual weight is predictive of IWB depends on other factors.

Plausibly, the extent to which an adolescent endorses IWB may depend on who she uses as referents for social comparison (i.e., downward or upward social comparison targets). Adolescents who have friends they perceive as relatively heavy, a source of potential downward social comparison, may not internalize weight bias, even if they are overweight. In contrast, adolescents with friends viewed as relatively thin are exposed to a source of potential upward social comparison on a regular basis. As a result, they may be especially prone to IWB if they are heavier. Consistent with this possibility, several studies have shown that comparing oneself to thinner referents is predictive of more body dissatisfaction and eating disorder behaviors (Fitzsimmons-Craft et al., 2012; Mueller et al., 2010).

In this paper, we report results from two studies in which adolescents completed perceptual measures of how they saw their own body size and how they saw the bodies of close friends. In the first study, we examined whether the perceived size of one's close friends is predictive of *inaccuracy* in body evaluations (i.e., seeing oneself as a normal weight when actually overweight or seeing oneself as overweight when actually normal weight) by testing whether the relationship between actual weight and identifying oneself as overweight is moderated by perceived friend size. We hypothesized that overweight adolescent females with friends

who they perceived as relatively large would be less likely to accurately judge themselves as overweight (i.e., they have a referent for downward social comparison on body size). In addition, we tested whether perceived friend size moderates the relationship between individual weight measures and IWB. We hypothesized that the relation between individual weight, or perceived body size, and IWB would be strongest among adolescents with friends who they perceived as relatively thin. In other words, being relatively heavy—either in actuality as measured by BMI or based on perceived body size—will be a stronger predictor of IWB when adolescents have friends they view as relatively thin (i.e., they have a referent for upward social comparison on body size).

Because the first study only included adolescent females, we could not assess whether findings may generalize to adolescent males. In Study 2, we tested if the relationship between perceived size of friends and subjective evaluations about one's own body (negative appearance evaluation, body dissatisfaction, and eating disorder symptoms) are the same across gender using data from a school-based survey within the same community. Research on social comparison indicates that the influence of peers differs by gender, with females engaging in more social comparison and more influenced by social comparison on weight-related measures (Jones, 2001; Myers & Crowther, 2009). Therefore, we hypothesized that the extent to which adolescents perceive their bodies as heavier than their friends' bodies would be a stronger predictor of negative body evaluation for females compared to males.

Study 1 methods

Participants and procedures

Study participants included 194 adolescent females residing in a mid-sized, low-income city in the Northeast U.S. who were participating in a larger NIH-funded study on the cultural context of health disparities among adolescent females. Female adolescents entering 9th through 11th grade were eligible for participation, with the average age of participants at 15.4 years ($SD = 1.05$; Range = 13–17). Fifty-eight percent of participants identified as Latina (primarily Puerto Rican), 28 % as African-American/Black, and 16 % as White. Thirty percent of adolescents were living in a home that included both biological parents at the time of participation. The majority of adolescents (87 %) qualified for free or reduced lunch at school. Sample characteristics are consistent with city demographics.

Participants were recruited from city schools, community centers, health centers, YWCA, local media outlets, and word-of-mouth. Interviews were conducted in English and Spanish (20 %) based on participant preference. When possible, measures were selected that have been validated with Spanish-speaking populations in previous studies. All measures were translated and back translated and then piloted with local residents in an iterative process, following recommendations by the World Health Organization. Adolescents participated in a semi-structured interview and then completed survey instruments privately using Audio Computer Assisted Survey Instruments (ACASI) programmed in their preferred language. Interviews took approximately 2 h, and participants were paid \$40 each for their time. All procedures were approved by the University of Connecticut Institutional Review Board.

Measures

Perceived body size—The figure rating scale (FRS; Stunkard et al., 1983) includes a series of nine schematic female figures ranging in size from underweight to overweight. For this study, adolescents circled a hash mark for where they would place their body on the continuum. Marks were placed under and between figures for a total possible range of 1–18.

Close friend's body size—Adolescents were given a form in which they were asked to identify their four closest same-sex friends by initials and provide information about each individual (e.g., race/ethnicity, age, sports involvement, sexual activity, etc.). Afterwards, they were given the FRS (Stunkard et al., 1983) described above and asked to indicate where they would place each friend on the figure size continuum. This information was used to determine the demographics and perceived body size of individuals closest to the participant. For the current study, the heaviest and thinnest rating given to same-sex friends (i.e., minimum and maximum score on the FRS ratings given to the four friends) were used to reflect the perceived size of each participant's heaviest and thinnest close friend.¹

Weight classification—One item from the Youth Risk Behavior Surveillance Survey (YRBSS; CDC, 2010) was used to assess adolescent's judgment of their own weight. Adolescents were asked to judge their weight as "Very underweight," "Slightly underweight," "About the right weight," "Slightly overweight" or "Very overweight." For the current purposes, adolescents were dichotomized as either judging themselves as overweight (slightly or very combined) or not.

Internalized weight bias—The 11-item Weight Bias Internalization Scale (IWB; Durso & Latner, 2008) was used to assess the extent to which the respondent believes that negative stereotypes and self-statements about overweight and obese people apply to herself. Participants provide responses on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree." Participants were asked to rate their agreement with items such as, "I am less attractive than most other people because of my weight". Chronbach alpha was high ($\alpha = .87$).

Actual BMI—At the end of the study, participants had their weight measured without shoes to the nearest .1 pound using a digital scale (BT-350e; Tanita, Arlington Heights, IL). Height was measured to the nearest .25 inch using a height rod on a standard spring scale. Weight and height were converted to BMI as kg/m^2 and were categorized (healthy weight, overweight, obesity) using CDC percentiles by age.

Control variables—Adolescent race/ethnicity was used as a covariate because of widely documented racial/ethnic differences in weight. Although other socioeconomic indicators were collected, none of these related to variables of interest in this study and therefore were not included as covariates.

¹We considered other metrics, such as the mean of the friend group size. We used the thinnest and heaviest friend rating because means can obscure within group differences, and because people compare themselves to specific individuals (i.e., social comparison Festinge, 1954).

Data analytic plan—Partial correlations were run to examine the association between FRS ratings of self and friends controlling for race/ethnicity and racial/ethnic makeup of friend group (% White). Then, logistic and linear regression were used to test for interactions between adolescent measures of their own weight and body size (BMI and self FRS) and friend ratings (thinnest and heaviest friend) on subjective weight evaluation measures (judging oneself as overweight and internalized weight bias). Analyses were conducted using the SPSS process macro for regression approaches to moderation using heteroscedasticity consistent standard errors (Hayes, 2013). Significant interaction terms were followed with posthoc probing graphing simple slopes following strategies recommended by Aiken and West (1991) and Hayes (2013).

Study 1 results

The average BMI across the sample was 25.4 (SD = 6.3, Range = 15–50). Based on CDC percentiles calculated from BMI measures, 18 % of participants were overweight and 29 % were obese. Only one female fell into the “underweight” category. Overall, 40 % of females stated that they were slightly or very overweight, including 70 % of those who actually were overweight or obese and 13 % of those who were normal weight based on BMI. Thus, within this sample, the majority of adolescents who were overweight from objective BMI measures accurately identified overweight, and relatively few who were not overweight inaccurately stated that they were. On the FRS with a possible range of 1–18, the average rating adolescents gave themselves was 9.1 (SD = 2.0, Range = 5–15). The average rating given to the thinnest friend was 7.0 (SD = 1.7, Range = 1–11) and to the heaviest friend was 10.7 (SD = 2.1, Range = 6–17). On average, the difference between the heaviest and thinnest friend was 3.6 (SD = 2.9, Range = 0–12), suggesting that most adolescents perceived some variability in the size of their friends.

Figure rating scale ratings given to the thinnest and heaviest friend were positively correlated ($r = .39, p < .001$) and FRS self rating was significantly correlated with heaviest ($r = .15, p < .05$) but not thinnest friend ($r = .10, p = .15$) rating. Participant BMI was strongly correlated with self FRS score ($r = .69, p < .01$), but not thinnest or heaviest friend FRS scores. Thus, adolescents tended to have friend that they viewed as relatively heavy or thin (i.e., higher or lower on the FRS scale); however, how they viewed their friends’ size was not associated with their actual BMI.

To examine our first hypothesis about accuracy in weight classification, we tested whether the relationship between objective weight based on BMI and identification of oneself as overweight was moderated by the perceived size of the heaviest and thinnest friend using logistic regression approaches to moderation. As shown in Table 1, adolescents with a higher BMI and who rated themselves as larger on the FRS were more likely to say they were overweight. Of interest, the interaction between BMI and heaviest friend was significant, indicating that the association between actual BMI category (normal weight or overweight) and weight classification (identifying as overweight) varied depending on the size of the heaviest friend. Post hoc probing was conducted to determine the nature of the interaction (Hayes, 2013). For those whose perceived heaviest friend was relatively thin (-1 SD), the association between actual BMI and weight classification was strongest ($B = 7.37, SE =$

2.28, $p < .001$), with only 25 % of overweight females misclassifying themselves as normal weight. For those whose perceived their heaviest friend was in the average range of the FRS, the association between actual BMI category and weight classification was significant but weaker ($B = 5.20$, $SE = 1.91$, $p < .001$), with 30 % of overweight females misclassifying themselves as normal weight. For adolescents who indicated they had a relatively large close friend (+1 SD), the association between actual BMI category and weight classification was smallest ($B = 3.05$, $SE = 1.25$, $p < .01$), with 38 % of overweight females inaccurately classifying themselves as normal weight. In other words, overweight females were less likely to consider themselves as overweight if they had a close friend who they perceived as relatively large on the FRS scale. There was no interaction between FRS self rating and perceived friend size.

To test our second hypothesis, we examined whether perceived size of friends moderated the relation between BMI or perceived self figure rating and IWB. To reduce the effect of collinearity, we first tested each interaction term separately and then included significant interaction terms in a final model. Neither thinnest nor heaviest friend rating interacted with actual BMI in predicting IWB. However, both thinnest and heaviest friend rating interacted with self figure rating in predicting IWB, as shown in Table 2. Simple slopes based on post hoc probing of the interaction terms, controlling for other variables, are presented in Fig. 1 with beta weights and standard error terms. As shown, the strongest relation between self figure rating and internalized weight bias was for adolescents who had relatively thin friends (i.e., -1 SD average rating for their thinnest friend and their heaviest friend). In other words, among females whose close friends were perceived as particularly thin, those who judged themselves as having a larger figure reported the most internalized weight bias. For adolescents with relatively heavy friends, the relation between self figure rating and internalized weight bias was statistically significant, but diminished in magnitude. The pattern of findings is consistent with the idea that adolescents who perceive themselves as relatively heavy but have friends who they view as relatively thin are the most likely to internalize negative feelings about weight.

In the above analyses we included both self FRS rating and actual BMI as predictors. Because the high correlation between these two variables could influence results, we reran analysis with only one variable included at a time. The pattern of results was unchanged.

Study 2 methods

Participants and procedures

Study 2 included 409 9th grade students from a public high school in a low-income, central Connecticut city. Youth ranged from 14 to 17 years of age ($M = 14.91$, $SD = .62$). The sample was 51 % male and 49 % female. Of the participants, 50 % were Latina, 22 % were African American, 22 % were White, and 6 % reported other identifications. Within the school, 85 % of students qualify for free or reduced lunch, and approximately 40 % come from a family where English is a second language. The study was conducted in conjunction with the school-based health center (SBHC) at the high school, which serves as primary care provider to 70 % of the student population. The SBHC conducted an anonymous survey during Health class, a course taken by all ninth grade students at the school. Students were

provided with a verbal and written description of the purpose of the study and the voluntary and anonymous nature of participation. Any student who did not wish to participate was given alternative work during the class. Overall, 70 % of eligible students participated, with the majority of nonparticipants due to absence that day. Participants completed measures of demographics, health knowledge and behaviors, weight evaluation, and peer contextual factors.

Measures

Perceived body size: self and close same sex friends—Adolescents completed the same FRS measure described in Study 1 with figures representing adolescent females and males. In this study, however, the scale only included hash marks below each figure, so possible responses ranged from 1 to 9. Participants again reported on their own body size and the perceived size of their four closest friends, and ratings of the heaviest and thinnest friend were used in subsequent analysis.

Negative body evaluation—The appearance evaluation scale (AE) from the widely used Multidimensional Body Self-Relations Questionnaire (Cash, 1994) was administered. The AE includes 6-items assessing participant's self evaluation of their body shape. Responses are on a 1–5 scale with higher scores reflecting more positive evaluation (Chronbach alpha = .81).

Weight dissatisfaction—One item from the body areas satisfaction (BS) subdomain of the Multidimensional Body Self-Relations Questionnaire (Cash, 1994) was used as a global indicator of weight dissatisfaction. Specifically, adolescents were asked to indicate how satisfied they were with their weight, with response options from 1 (very satisfied) to 5 (very dissatisfied).

Disordered eating—Participants completed several domains of the adolescent psychopathology scale-short form (APS; Reynolds, 2000), including seven symptoms from the Eating Disturbance scale. These items included fear of getting fat or gaining weight, frequent feelings of being fat after eating, use of restrictive activities or purging to avoid getting fat, and periods of uncontrolled eating. Response options range from (1) to (3), with higher scores indicating increased disordered eating ($\alpha = .82$).

Descriptive characteristics—Participants reported on demographic characteristics (e.g., age, race/ethnicity) and their height and weight, which was used to estimate their BMI according to the BMI table of the Center for Disease Control and Prevention (CDC, 2011).

Data analytic plan—Pearson correlations were used to examine associations between adolescent's self-reported BMI, FRS self rating, and FRS ratings given to the heaviest and thinnest friend. Then, the model presented in Fig. 2 was used to test whether perceptions of friends' body sizes were more predictive of subjective weight evaluation measures for females than males. A multigroup nested analysis in SEM was used to test whether the model differed by gender, with follow-up critical ratio z-tests used to test for differences in specific parameters (Byrne, 2001). In this approach, model fit is tested under two conditions,

one in which parameters of interest (e.g., the path from FRS thinnest friend to body dissatisfaction) are free to vary across groups (i.e., male vs. female), and one in which the parameters are constrained to be equal across group. When equality constraints lead to a worse fit to the data, the model is not the same across groups. Two hierarchical models were tested: one with just the paths from FRS self ratings to body evaluation measures constrained to be equal across gender and one in which FRS friend ratings were also constrained. Analyses were conducted in AMOS 19.

It is worth noting that the theoretical assumption underlying this study is that the nature of comparisons between self and friends on body size (i.e., perceiving oneself as heavier or thinner than friends) may contribute to negative thoughts or feelings about one's body, particularly for females. Drawing from this model, discrepancies between self and friend FRS ratings should predict subjective body evaluation measures. The model in Fig. 2 includes self and friend FRS ratings rather than discrepancy scores between self and friend ratings. Mathematically, the beta weights from this model are the same as they would be if discrepancy scores (i.e., the difference between self FRS and thinnest friend FRS) were included instead (Laird & Weems, 2011).

Study 2 results

Based on self-report, 34 % of adolescents were overweight or obese in this sample, with 12 % meeting the CDC criteria for obesity (CDC, 2011). Table 3 provides descriptive statistics for the sample and by gender for all variables of interest. Females chose significantly smaller figures when reporting their perceived body size in comparison to males, and also reported their thinnest friend to be significantly smaller. There were no significant differences in the average figure size of the heaviest friend by gender. There were no racial/ethnic differences in any of the variables of interest, with the exception of self-reported BMI, $F(3, 363) = 5.53, p = .001$. African-American and Latino youth had higher BMIs based on their self-reported height and weight.

Partial correlations controlling for race/ethnicity and racial makeup of friends were computed between self FRS and heaviest and thinnest friend FRS scores. For females, the correlations between self and thinnest friend ($r = .23, p < .01$), self and heaviest friend ($r = .33, p < .01$) and thinnest and heaviest friend ($r = .34, p < .01$) were all statistically significant. For males, the correlation between self and thinnest friend ($r = .08, p = .60$) was not significant, although correlations between self and heaviest friend ($r = .21, p < .05$) and thinnest and heaviest friend ($r = .32, p < .01$) were statistically significant. Although correlation values were larger for females than males, the magnitude of gender difference was not statistically significant. Self-reported BMI was associated with self FRS ratings for females ($r = .69, p < .001$) and males ($r = .67, p < .001$), but was not related to thinnest friend (males $r = -.07, p = .36$; females $r = -.04, p = .63$) or heaviest friend (males $r = .06, p = .38$; females $r = .14, p = .07$). Consistent with Study 1, adolescents tended to have close friends they perceived as relatively thin or heavy; however, the perceived size of their friends was not related to their self-reported BMI.

As described in the data analytic plan section, a multi-group nested SEM model was used next to test for gender differences and to calculate path coefficients for each group. In this model, FRS self rating, thinnest friend FRS rating and heaviest friend FRS rating were used as predictors of the three body evaluation measures. Figure 2 presents standardized beta weights and Table 4 presents unstandardized coefficients by gender and results from critical ratio z tests testing if coefficients are significantly different for males and females. The first model, in which paths from self FRS to weight evaluation measures were constrained to be equal across gender, provided a good fit to the data ($\chi^2(3) = 7.47, p = .06, CFI = .99, RMSEA = .06, 95\% CI = .00-.12, p = .28$). Adding additional gender constraints to paths from the FRS friend ratings (i.e., from thinnest/heaviest friend ratings to three weight evaluation measures) resulted in a significantly worse fitting model (Model $\chi^2(9) = 29.88, p < .01, CFI = .95, RMSEA = .08, 95\% CI = .05-.11$; Model 1–Model 2 differential $\chi^2(6) = 22.40, p < .001$). These results indicate that self FRS ratings are similarly predictive of the three weight evaluation measures across gender, but that the friend FRS ratings are not.

As shown in the Fig. 2, FRS self rating significantly predicted the weight evaluation measures for both males and females. As expected, individuals who rated themselves as larger on the FRS reported more negative body evaluation, weight dissatisfaction, and ED symptoms, regardless of gender. However, the FRS ratings of friends were significant predictors of weight evaluation measures only for females. Adolescent females who had a close friend they perceived as particularly thin reported more negative body evaluation, weight dissatisfaction, and ED symptoms. The rating giving to the heaviest friend was also predictive of negative body evaluation and ED symptoms among females but, contrary to expectation, adolescents with a friend they perceived as relatively heavy also reported more negative evaluation and ED symptoms.

Discussion

Close friendships play an important role in shaping adolescents' beliefs and behaviors. According to social comparison theory, having friends who are perceived as particularly thin or heavy may influence how adolescents evaluate their own body. Consistent with this possibility, we found that having close friends who were perceived as relatively thin or heavy was associated with how accurate adolescent females were in judging their own weight, and how negatively they felt about their body. As a result, the way in which adolescent females view their friends' bodies may have implications for both their physical and mental health.

In recent years, several studies have documented social clustering by weight among adolescents, as indicated by similarity in BMI within peer groups (de la Haye et al., 2011; Hruschka et al., 2011). The social clustering of weight may result from both selection processes (i.e., friends choose friends of similar weight; de la Haye et al., 2011) and contagion processes (i.e., friends become more like their friends over time; Simpkins et al., 2013). In these studies, evidence of social clustering by weight was based on BMI calculated by objective or self-reported weight. Findings from the current study provide some support that "weight clustering" is evident using perceptual measures as well. With one exception, figure ratings of self, thinnest friend, and heaviest friend were positively correlated for

females in both samples. In neither study, however, were figure ratings given to friends correlated with self-reported or measured BMI, which might be expected if peer groups tend to be similar in weight. The lack of association between BMI and perceptions of friends' body sizes may mean that different mechanisms (e.g., social contagion versus biased perception) underlie weight clustering that is evident in objective versus perceptual measures. Both may contribute to obesity risk, however, by impacting the actual or perceived size of social referents and norms among close friends. Research in which perceptual measures of friends are coupled with actual weight measurements of those friends can help clarify the nature of biases if they exist and shed light on the potential implications of actual and perceived social clustering by weight within peer groups.

Consistent with other studies that have used self-reported or actual weight of friends (e.g., Ali et al., 2011), results from Study 1 further indicate that the body size of friends may have an impact on how overweight adolescents evaluate their own body and weight. Specifically, we found that females who were overweight based on objective measures of BMI were less likely to accurately label themselves as overweight if they had a close friend they perceived as heavy. Although this study cannot address causality, one possible explanation is that adolescent females who are regularly exposed to referents they view as heavy may have a different basis for what they deem as normal weight and overweight. Indeed, overweight adolescents are more likely to overestimate the average weight of peers, suggesting their norms may have shifted (Perkins et al., 2014). Recognizing that one is overweight is a critical step to making behavioral changes aimed at losing weight; thus overweight individuals with heavy weight referents—whether that referent is actually heavy or just perceived that way—may not feel as much need to lose weight.

At the same time, there may be mental health implications for adolescent females with relatively thin friends. Although perceptions of friends' body sizes did not moderate the relationship between BMI and internalized weight bias, these perceptions did influence the relationship between perceptions of one's own body size and internalized weight bias. Across the sample, rating oneself as having a heavier figure size was associated with more internalized weight bias; however, the strength of this association depended on the perceived size of friends. Adolescent females who saw themselves as having a heavy figure, but had friends who were perceived as relatively thin, endorsed the most negative attitudes and beliefs about being overweight. Experimental research indicates that comparison to others who are "better off" (upward comparison) may have a greater impact than comparison to others who are "worse off" (downward comparison) (Wasilenko et al., 2007). For adolescent females, friends who are viewed as thinner may be seen as "better off" given weight stigma and prevailing images of female attractiveness. Consequently, having friends who are perceived as relatively thin may magnify the association between how large an adolescent perceives herself to be and how negatively she feels about her size.

The goal of Study 2 was to examine whether the perceived size of friends may be particularly relevant in understanding negative body evaluation in adolescent females compared to males. Not surprisingly, we found adolescents who perceived themselves as having larger figures also reported more negative body evaluation, weight dissatisfaction, and ED symptoms regardless of gender. As hypothesized, the perceived body sizes of friends

were predictive of these weight evaluation measures only for females. Consistent with Study 1, having a particularly thin close friend predicted more negative body evaluation, weight dissatisfaction, and ED symptoms among adolescent girls. As highlighted in the data analytic plan, because both self and friend ratings were included in predictive models, results would be the same if discrepancies between self and friends (i.e., difference scores reflecting how much thinner/heavier girls saw themselves relative to friends) were included instead of friend ratings. These findings are consistent with the idea that among adolescent girls it is not only their perceived body size that predicts how they feel about their body, but also how their body size compares to the size of their friends.

It is less clear why having a friend who was perceived as relatively heavy was also predictive of more negative appearance evaluation and ED symptoms. Perhaps in peer relationships in which at least one member is perceived as relatively large, there is more focus on weight in personal conversations or from outside peer comments. Overweight and obese adolescents are teased and criticized (Puhl et al., 2011); therefore, friend groups that include multiple females who are relatively large may experience more negative feedback from the larger peer context. Indeed, research indicates that being in close proximity to an overweight or obese person, even if one is not overweight, elicits negative judgment from others (Hebl & Mannix, 2003). As a result, females with heavy friends may get more negative feedback about their own weight due to proximity to an obese friend. However, within this sample, adolescents who reported having heavier friends did not report more weight-related teasing or more frequent conversations with friends about weight (Acker, 2013).

It is also plausible that having a friend group with more heterogeneity (i.e., a very thin and a very heavy close friend) leads adolescents to notice, think about, or be more critical of their own weight because their weight referents are so different. Greater heterogeneity may make differences between oneself and others more evident, and thus increase comparative processes. Indeed, in a recent daily diary study, Rancourt et al. (2015) found that comparisons to both heavier and thinner referents were predictive of more weight-control behaviors. Alternatively, because both thin and heavy people are stigmatized (Malloy et al., 2012), adolescents with both very thin and heavy friends may be exposed to more stigma than if their friend group is more homogeneous. Within this sample, however, the interaction between thinnest and heaviest friend was not predictive of subjective weight evaluation or weight-related social processes like teasing, which would be expected if it is heterogeneity in friends that is particularly likely to evoke negative social comparison processes (Acker, 2013).

Implications for intervention

During adolescence, it is particularly important to address the social context of obesity and ED risk factors. Adolescents use their friends as weight referents, and this social comparison is associated with inaccurate weight perception and negative weight related cognitions. Past interventions have been able to buffer the effects of downward weight related social comparison by facilitating non-appearance based comparison (Lew et al., 2007). In areas with disproportionately high rates of obesity, interventions should aim to encourage non-appearance based comparison that is health focused (e.g., physical strength or medically

healthy weight). By shifting adolescents' focus from peer comparison towards comparison to medical health standards they may be more likely to accurately assess their weight. In addition, although group weight management interventions are effective for some populations, adolescents may be particularly vulnerable to the negative aspects of group interventions (e.g., social comparison). High school health classes should use interventions focused on the individual's health goals versus group goals that may encourage social comparison.

Given that both obesity, eating disorders, and negative body image are major issues confronting adolescent girls, a challenge for practitioners is how to educate adolescents about accurate weight perception and medical weight standards without increasing their potential to feel negatively about her body and weight. One solution may be teaching adolescents about the influence of outside factors on weight, thus minimizing the individual burden (Budd & Hayman, 2008). Moreover, in interventions aimed at diverse adolescents, it is important that programs recognize there are cultural variations in body sizes, preferences, and attitudes towards obesity (Latner et al., 2005). Emotional maladjustment may be dependent on the discrepancy between an adolescent's weight and the perceived weight norms of the racial/ethnic group that she identifies with rather than general population norms (Lanza et al., 2013). Thus, it is particularly important that interventions with diverse adolescents incorporate messages about health rather than ideal sizes.

Study limitations and strengths

The primary limitations of both studies are the use of cross-sectional data and the reliance on perceptual measures of friends without actual weight measures. Because data were cross-sectional, it is possible that the relationship between how adolescents rated their friends' sizes and weight evaluation measures are reversed (e.g., body dissatisfaction could lead an adolescent to view her friends as particularly thin or heavy rather than perceptions of friends contributing to body dissatisfaction). Longitudinal research would allow for tests of whether perceptions of peers predict changes in adolescent's weight evaluation over time, and whether changes in peer groups (e.g., becoming close friends with someone particularly thin) leads to changes in these beliefs. Also, as indicated earlier, we did not have data on friends' actual weight and therefore do not know if perceptions of friends were accurate. Understanding the potential impact of the actual weight of friends and the perceived weight of friends on self-evaluation measures, as well as other weight-related behaviors and beliefs, is an important question for future research in this area. Both may play a distinct role. It may also be useful to better understand the extent to which adolescents use their closest friends versus broader peer group as weight referents. Finally, the weight evaluation measures we used focus on concerns that are more common among females. Thus, the gender differences found in Study 2 may have emerged because we were tapping gender-specific types of weight concerns rather than gender differences in the role of peers in self-evaluation. Research that uses a range of body evaluation measures (e.g., a focus on muscle tone) is needed with males and females.

The current study expands on prior research by focusing on potential peer influences in two diverse, low-income samples of adolescents. Although these studies cannot speak to

causality, our results suggest that the way adolescents perceive their friends' bodies may influence their subjective weight self-evaluation, particularly for females. Prevention and intervention programs that address negative aspects of social comparison may be important in preventing both obesity and eating disorder symptoms in adolescent females.

Acknowledgments

This study was conducted with support to the second author from National Institute of Health (R21HDO65185).

References

- Acker, JC. Evidence and implications of weight clustering among adolescents (unpublished master's thesis). Storrs, Connecticut: University of Connecticut; 2013.
- Aiken, LS., West, SG. Multiple regression: testing and interpreting interactions. Thousand Oaks, CA, USA: Sage Publications Inc; 1991.
- Ali MM, Amialchuk A, Renna F. Social network and weight misperception among adolescents. *Southern Economic Journal*. 2011; 77:827–842.
- Brown HI, Evans AE, Mirchandani GG, Kelder SH, Hoelscher DM. Observable weight distributions and children's individual weight assessment. *Obesity*. 2010; 18:202–205. [PubMed: 19543215]
- Budd GM, Hayman LL. Addressing the childhood obesity crisis: A call to action. *MCN The American Journal of Maternal/Child Nursing*. 2008; 33:111–120.
- Burke MA, Heiland FW, Nadler CM. From 'overweight' to 'about right': Evidence of a generational shift in body weight norms. *Obesity*. 2010; 18:1226–1234. [PubMed: 19875997]
- Byrne, B. Structural equation modeling with AMOS: Basic concepts, applications and programming. Mahwah, NJ: Lawrence Erlbaum Press; 2001.
- Cash, TF. The Multidimensional Body Self Relations Questionnaire user's manual. Norfolk, VA: Author; 1994.
- Cazzato V, Mian E, Serino A, Mele S, Urgesi C. Distinct contributions of extrastriate body area and temporoparietal junction in perceiving one's own and others' body. *Cognitive, Affective & Behavioral Neuroscience*. 2015; 15:211–228.
- Centers for Disease Control and Prevention. Questionnaires and item rationales. 2010. Retrieved from http://www.cdc.gov/healthyyouth/yrbs/questionnaire_rationale.htm
- Centers for Disease Control and Prevention. Body mass index. 2011. Retrieved from <http://www.cdc.gov/healthyweight/assessing/bmi/index.html>
- Clark AE, Loheac Y. "It wasn't me, it was them!" Social influence in risky behavior by adolescents. *Journal of Health Economics*. 2007; 26:763–784. [PubMed: 17188768]
- Cunningham SA, Vaquera E, Maturo CC, Narayan KV. Is there evidence that friends influence body weight? A systematic review of empirical research. *Social Science & Medicine*. 2012; 75:1175–1183. [PubMed: 22749656]
- de la Haye K, Robins G, Mohr P, Wilson C. Homophily and contagion as explanations for weight similarities among adolescent friends. *Journal of Adolescent Health*. 2011; 49:421–427. [PubMed: 21939874]
- Durso LE, Latner JD. Understanding self-directed stigma: Development of the weight bias internalization scale. *Obesity*. 2008; 16:S80–S86. [PubMed: 18978768]
- Festinger L. A theory of social comparison processes. *Human Relations*. 1954; 7:117–140.
- Fitzsimmons-Craft EE, Harney MB, Brownstone LM, Higgins MK, Bardone-Cone AM. Examining social physique anxiety and disordered eating in college women. The roles of social comparison and body surveillance. *Appetite*. 2012; 59:796–805. [PubMed: 22925847]
- Gardner, RM. Perceptual measures of body image for adolescents and adults. In: Cash, TF., Smolak, L., editors. *Body image: A handbook of science, practice, and prevention*. 2. New York, NY, USA: Guilford Press; 2011. p. 146-153.

- Hayes, AF. Introduction to mediation, moderation and conditional process analysis. A regression-based approach. New York: The Guilford Press; 2013.
- Hebl MR, Mannix LM. The weight of obesity in evaluating others: A mere proximity effect. *Personality and Social Psychology Bulletin*. 2003; 29:28–38. [PubMed: 15272957]
- Hruschka DJ, Brewis AA, Wutich A, Morin B. Shared norms and their explanation for the social clustering of obesity. *American Journal of Public Health*. 2011; 101:S295–S300. [PubMed: 21555656]
- Hyde JS, Mezulis AH, Abramson LY. The ABCs of depression: Integrating affective, biological, and cognitive models to explain the emergence of the gender difference in depression. *Psychological Review*. 2008; 115:291–313. [PubMed: 18426291]
- Jones D. Social comparison and body image: Attractiveness comparisons to models and peers among adolescent girls and boys. *Sex Roles*. 2001; 45:645–664.
- Khambalia A, Hardy LL, Bauman A. Accuracy of weight perception, lifestyle behaviours and psychological distress among overweight and obese adolescents. *Journal of Paediatrics and Child Health*. 2012; 48:220–227. [PubMed: 22417463]
- Laird R, Weems C. The equivalence of regression models using difference scores and models using separate scores for each informant: implications for the study of informant discrepancies. *Psychological Assessment*. 2011; 23:388–397. [PubMed: 21319905]
- Lanza H, Echols L, Graham S. Deviating from the norm: Body mass index (BMI) differences and psychosocial adjustment among early adolescent girls. *Journal of Pediatric Psychology*. 2013; 38:376–386. [PubMed: 23248348]
- Latner JD, Stunkard AJ, Wilson G. Stigmatized students: Age, sex, and ethnicity effects in the stigmatization of obesity. *Obesity Research*. 2005; 13:1226–1231. [PubMed: 16076992]
- Leahey TM, LaRose J, Fava JL, Wing RR. Social influences are associated with BMI and weight loss intentions in young adults. *Obesity*. 2011; 19:1157–1162. [PubMed: 21164501]
- Lerner, RM., Steinberg, L. *Handbook of adolescent psychology, Vol 2: Contextual influences on adolescent development*. 3. Hoboken, NJ, USA: Wiley; 2009.
- Lew A, Mann T, Myers H, Taylor S, Bower J. Thin-ideal media and women's body dissatisfaction: Prevention using downward social comparisons on non-appearance dimensions. *Sex Roles*. 2007; 57:543–556.
- Malloy TE, Lewis B, Kinney L, Murphy P. Explicit weight stereotypes are curvilinear: Biased judgments of thin and overweight targets. *European Eating Disorders Review*. 2012; 20:151–154. [PubMed: 21400635]
- Maximova KK, McGrath JJ, Barnett TT, O'Loughlin JJ, Paradis GG, Lambert MM. Do you see what I see? Weight status misperception and exposure to obesity among children and adolescents. *International Journal of Obesity*. 2008; 32:1008–1015. [PubMed: 18317474]
- Mueller AS, Pearson J, Muller C, Frank K, Turner A. Sizing up peers: Adolescent girls' weight control and social comparison in the school context. *Journal of Health and Social Behavior*. 2010; 51:64–78. [PubMed: 20420295]
- Myers TA, Crowther JH. Social comparison as a predictor of body dissatisfaction: A meta-analytic review. *Journal of Abnormal Psychology*. 2009; 118:683–698. [PubMed: 19899839]
- Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011–2012. *Journal of the American Medical Association*. 2010; 311:806–814.
- Perkins JM, Wesley Perkins HH, Craig DW. Misperception of peer weight norms and its association with overweight and underweight status among adolescents. *Prevention Science*. 2014; 16:70–79.
- Puhl RM, Luedicke J, Heuer C. Weight-based victimization toward overweight adolescents: Observations and reactions of peers. *Journal of School Health*. 2011; 81:696–703. [PubMed: 21972990]
- Rancourt D, Leahey TM, LaRose JG, Crowther JH. Effects of weight-focused social comparisons on diet and activity outcomes in overweight and obese young women. *Obesity*. 2015; 23:85–89. [PubMed: 25407550]
- Reynolds, W. *Adolescent psychopathology scale-short form: Professional manual*. Lutz, FL: Psychological Assessment Resources; 2000.

- Simpkins SD, Schaefer DR, Price CD, Vest AE. Adolescent friendships, BMI, and physical activity: Untangling selection and influence through longitudinal social network analysis. *Journal of Research on Adolescence*. 2013; 23:537–549.
- Stunkard, AJ., Sorensen, T., Schulsinger, F. Use of the Danish adoption register for the study of obesity and thinness. In: Kety, SS, Rowland, LP, Sidman, RL., Matthysse, SW., editors. *The genetics of neurological and psychiatric disorders*. New York: Raven; 1983. p. 115-120.
- Trasande L, Chatterjee S. The impact of obesity on health service utilization and costs in childhood. *Obesity*. 2009; 17:1749–1754. [PubMed: 19300433]
- Wasilenko K, Kulik J, Wanic R. Effects of social comparisons with peers on women's body satisfaction and exercise behavior. *International Journal of Eating Disorders*. 2007; 40:740–745. [PubMed: 17610256]
- Wood JV. Theory and research concerning social comparisons of personal attributes. *Psychological Bulletin*. 1989; 106:231–248.

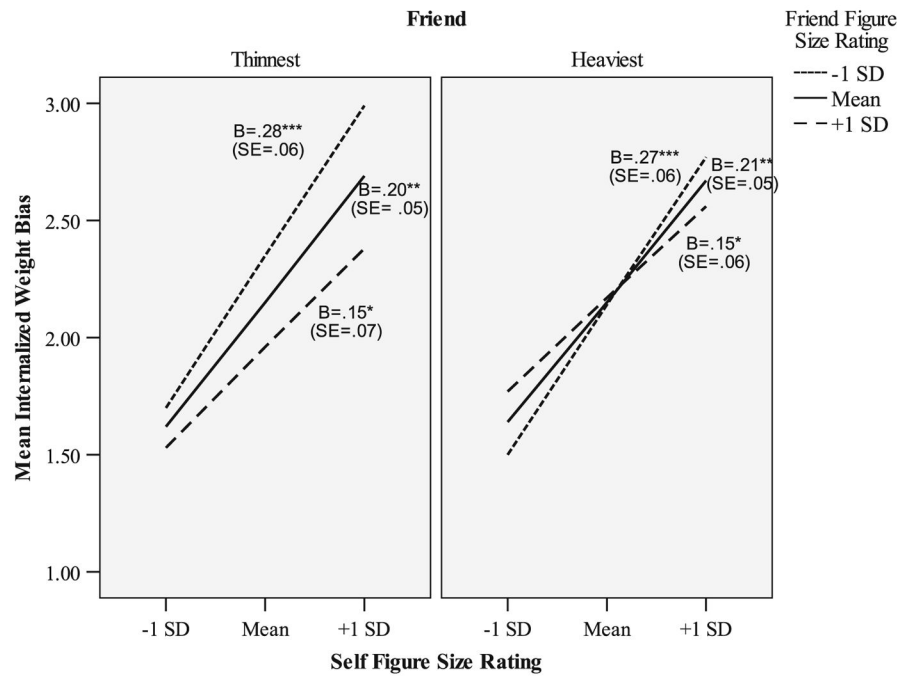


Fig. 1. Post hoc probing of interactions between self figure rating and thinnest and heaviest friend ratings on internalized weight bias

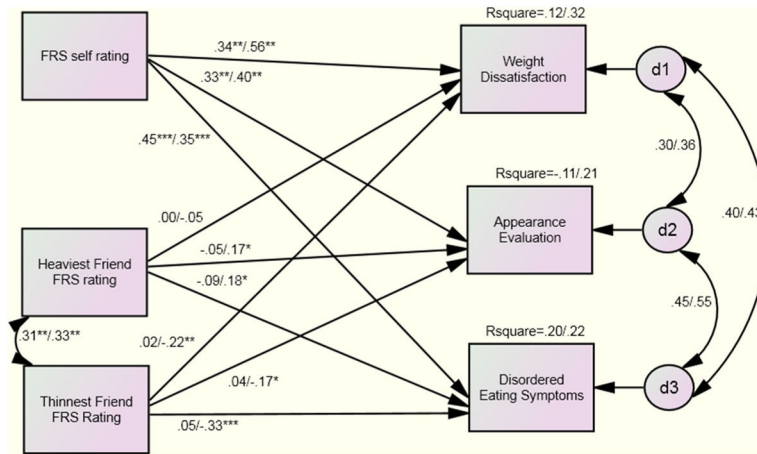


Fig. 2. Perceived size of friends predicting subjective weight evaluation measures for adolescent males (n = 196) and females (n = 172). Values before the slash are standardized estimates for males; values after the slash are standardized estimates for females. FRS self rating was correlated with friend FRS ratings in the model; however, correlation values are omitted for ease of visual presentation

Table 1

Regression predicting identifying oneself as overweight from BMI, perceived friend size, and interaction terms

Predictor	Spearman τ	Beta (SE)
BMI category	.60 **	5.28 (1.99) **
Self FRS rating	.51 **	.83 (.22) ***
Heaviest friend rating	-.17 **	.29 (.28)
Thinnest friend rating	-.10	-.22 (.26)
BMI \times heaviest friend interaction		-1.07 (.54) *
BMI \times thinnest friend interaction		.09 (.49)

The overall model was significant, χ^2 (N = 191, df = 9) = 127.84, $p < .001$

FRS figure rating scale

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 2

Regression predicting internalized weight bias from BMI, self FRS, friend FRS, and interaction terms

Predictor	Bivariate r	Beta (SE)
BMI	.49**	.04 (.02)
Self FRS rating	.54**	.21 (.05)**
Heaviest friend rating	-.08	.01 (.04)
Thinnest friend rating	-.19**	-.12 (.04)*
Self FRS* heaviest friend interaction		-.03 (.01)*
Self FRS* thinnest friend interaction		-.04 (.02)*

The overall model was significant $F(9|182) = 12.02, p < .001, R^2 = .36$

FRS figure rating scale

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 3

Characteristics of participants from Study 2 by gender

Characteristic	Total sample	Males	Females	Test of difference
Racial/ethnic minority	79.4 %	79.2 %	79.5 %	$\chi^2 = .00$, ns
BMI	23.02 (4.49)	22.91 (4.30)	23.14 (4.71)	$t = -.50$, ns
Weight dissatisfaction	2.57 (1.53)	2.36 (1.17)	2.81 (1.26)	$t = 4.00$, $p < .001$
Appearance evaluation	3.70 (.85)	3.82 (.89)	3.54 (.79)	$t = 3.32$, $p < .001$
Disordered eating	1.32 (.37)	1.19 (.28)	1.45 (.41)	$t = -7.27$, $p < .001$
FRS self figure rating	4.56 (1.30)	4.77 (1.27)	4.34 (1.30)	$t = 3.38$, $p = .001$
Heaviest friend FRS rating	5.56 (1.34)	5.63 (1.40)	5.48 (1.27)	$t = 1.17$, ns
Thinnest friend FRS rating	3.19 (1.11)	3.37 (1.08)	3.00 (1.10)	$t = 3.36$, $p < .001$

*
 $p < .05$;**
 $p < .01$;***
 $p < .001$

Table 4

Perceived size of friends as predictors of weight dissatisfaction, body dissatisfaction, and eating disorder symptoms

Predictor	Males (n = 196) B (SE)	Females (n = 172) B (SE)	Critical ratio z test of difference
Outcome = weight dissatisfaction			
Self FRS rating	.31 (.06)**	.55 (.07)***	2.63**
Heaviest friend FRS rating	.01 (.06)	.05 (.07)	.48, ns
Thinnest friend FRS rating	.02 (.08)	-.24 (.07)**	-2.42**
Outcome = negative body evaluation			
Self FRS rating	.21 (.04)**	.27 (.05)**	.91, ns
Heaviest friend FRS rating	-.03 (.04)	.12 (.05)*	2.25**
Thinnest friend FRS rating	.03 (.05)	-.13 (.06)*	-1.98*
Outcome = eating disorder symptoms			
Self FRS rating	.10 (.02)**	.11 (.02)***	.33, ns
Heaviest friend FRS rating	-.02 (.01)	.06 (.02)*	2.75**
Thinnest friend FRS rating	.01 (.02)	-.12 (.03)**	-3.98***

* $p < .05$;

** $p < .01$;

*** $p < .001$