

Weight-related teasing and body dissatisfaction in adolescents:

Moderated-mediation by self-perceived size and weight status

By

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Abstract

The current study was an evaluation of one possible mechanism by which adolescent experience of weight-related teasing (WRT) exerts influence on body dissatisfaction, as well as how that process may function differently across weight status. Namely, self-perceived size was examined as a potential mediator of the effect of WRT on body dissatisfaction, and weight status (i.e., healthy weight vs. overweight) was investigated as a potential moderator of this process. Participants were 135 seventh and eighth grade students recruited from six Midwestern middle schools. Findings revealed a significant indirect effect of WRT on body dissatisfaction while controlling for body mass index (BMI) percentile and sex. As hypothesized, the effect of weight-related teasing on body dissatisfaction was mediated by perceptions of body size. Controlling for actual weight and sex, early adolescents who scored higher on a measure of weight-related teasing were more likely to perceive their body size as larger, which was associated with greater body dissatisfaction. Results from the current study did not support weight status as a moderator of this process; however, due to sample size limitations, strong conclusions about the true effect of weight status could not be drawn. The identified mediational relationship is a first-step in understanding mechanisms by which WRT exerts influence on body dissatisfaction. Findings highlight the importance of one's self-perceptions of size, in addition to satisfaction with one's body. Implications for deterring the effects of WRT and/or improving body dissatisfaction via self-perceived size are discussed. Additionally, several areas for future research are identified.

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Weight-related teasing and body dissatisfaction in adolescents: Moderated-mediation
by self-perceived size and weight status

Body dissatisfaction, defined as the negative self-evaluation of one's shape and weight (Cash & Pruzinsky, 1990), is predictive of a number of poor mental health outcomes, including eating pathology, poor self-esteem, and depressive symptoms (e.g., Wertheim, Paxton, & Blaney, 2004a). Body dissatisfaction is positively associated with attempts to alter body size (McCabe & Ricciardelli, 2001) and is recognized as the strongest predictor of future eating pathology (e.g., Phelps, Johnston, & Augustyniak, 1999; Polivy & Herman, 2002). Further, once established, body dissatisfaction is a persistent phenomenon that increases with age (Bearman, Presnell, Martinez, & Stice, 2006) and grade (Jones, 2004) and is a stable characteristic across the lifespan (Tiggemann, 2004). These findings are concerning, given that prevalence rates suggest that body dissatisfaction has not only become the norm among adults in developed societies (Sarwer, Thompson, & Cash, 2005), but also affects a significant number of children and adolescents (Børresen & Rosenvinge, 2003; Ricciardelli & McCabe, 2001; Schur, Sanders, & Steiner, 2000).

Adolescence is recognized as a key developmental period in which to examine the etiology of body dissatisfaction (Davidson & McCabe, 2006; Feingold & Mazzella, 1998; Lunde, Frisén, & Hwang, 2007; Smolak, 2004; Tiggemann, 2006), given findings that body dissatisfaction increases for both boys and girls during this time period (Smolak, 2004). A confluence of developmental changes is thought to explain increases in body dissatisfaction during this period, including the experience of dramatic physical changes (e.g., the emergence of secondary sexual characteristics, change in body composition;

Patton & Viner, 2007), the development of new cognitive capacities (e.g., the ability to make social comparisons; Harter, 1990), and an increase in the importance placed on social influences (e.g., peer feedback; Berndt, 1998). These changes are believed to influence the emerging self-concept, including the evaluation of one's physical appearance (Davidson & McCabe, 2006; Harter, 1990). This results in a tendency for adolescents to evaluate themselves based on the standards of others and the feedback they receive (Harter, 1988). Various forms of social feedback have been found to influence adolescent body dissatisfaction, including messages from media promoting a thin ideal (Dittmar, 2009), parent emphasis on their own or their child's weight and shape (Helfert & Warschburger, 2011), comments from friends about weight or dieting (Shroff & Thompson, 2006), and peer teasing that targets one's weight and/or shape (Eisenberg, Neumark-Sztainer, & Story, 2003; Menzel, Schaefer, Burke, Mayhew, Brannick, & Thompson, 2010).

Weight-related teasing (WRT) is a specific form of peer victimization in which the content of teasing is focused on a child's weight or body size (Libbey, Story, Neumark-Sztainer, & Boutelle, 2008). Research indicates that the experience of WRT affects a variety of aspects of body image in children and adolescents, including confidence in physical appearance (Hayden-Wade, Stein, Ghaderi, Saelens, Zabinski, & Wilfley, 2005), dissatisfaction with specific body parts (Eisenberg et al., 2003; Thompson, Shroff, Herbozo, Cafri, Rodriguez, & Rodriguez, 2007), and discrepancy between ideal and perceived body size (Nelson, Jensen, & Steele, 2011). Further, Barker and Galambos (2003) found that, among several risk factors investigated, only appearance teasing was found to significantly predict both girls' and boys' body

dissatisfaction. In a recent meta-analysis, Menzel et al. (2010) found a moderate effect size (Cohen's $d = .39$) for the overall mean association between body dissatisfaction and WRT in a review of 51 studies. Further, Menzel et al. (2010) found that age was a significant moderator of this relation, such that WRT was a stronger predictor of body dissatisfaction in children and adolescents than in adults, highlighting the importance of examining the nature of this relationship prior to adulthood.

While the finding that WRT is a risk factor for body dissatisfaction in children and adolescents is well established in the literature (Menzel et al., 2010), less clear are the mechanisms (i.e., mediators) through which WRT affects change in body dissatisfaction. One possibility is that WRT influences body dissatisfaction through its effect on self-perceived body size. Indeed, general peer teasing has been shown to negatively impact how an individual feels about themselves globally (Hawker & Boulton, 2000), and, in particular, teasing that is aimed specifically at one's weight or shape is thought to influence how an individual perceives their body (Nelson et al., 2011). In the only investigation to examine the relation of WRT to self-perceived size, Nelson et al. (2011) found that WRT, but not general teasing, was a positive predictor of self-perceived size in preadolescents. This effect, however, was moderated by children's body mass index such that the relation of WRT to self-perceived size was stronger for children with higher BMI compared to children with lower BMI. It is unclear whether these findings would extend to adolescents; however, given the importance of peer feedback on self-concept formation during this developmental time period (Berndt, 1998; Harter, 1988), it is reasonable to speculate that the relation could be stronger in adolescents and possibly extend to those of healthy weight.

Self-perceived body size appears to be an important predictor of mental health outcomes (e.g., depression, self-esteem, suicidal ideation and attempts) and has received increased attention in the literature. In fact, there is a growing body of evidence to suggest that perception of body size may actually be a stronger predictor of adverse mental health outcomes than actual weight (Ali, Fang, & Rizzo, 2010; Dave & Rashad, 2009; Eaton, Lowry, Brener, Galuska, & Crosby, 2005; Kaplan, Busner, & Pollack, 1988; Whetstone, Morrissey, & Cummings, 2007). For example, Ali et al. (2010) found that, while controlling for actual weight, adolescents who perceived themselves as having a healthy weight scored higher on measures of self-esteem and lower on measures of depression than those adolescents who perceived themselves as “overweight” or “very overweight.” Importantly, actual weight status was not associated with any mental health outcome when controlling for self-perceptions of weight.

Despite evidence linking self-perceptions of body size to youth’s mental health, there is a paucity of research examining the relation of self-perceived body size to body dissatisfaction. Nelson et al. (2011) reported significant correlations between self-perceived size and body dissatisfaction in both healthy weight ($r = .51$) and overweight ($r = .66$) children. However, a limitation of this study was the reliance on a single instrument to measure both body dissatisfaction and self-perceived size (i.e., Collins’ figure rating scale; Collins, 1991). Self-perceived size was measured using children’s rating of actual size, while body dissatisfaction was computed by creating a discrepancy score between actual size (i.e., self-perceived size) and ideal body size. Because actual size is involved in the computation of body dissatisfaction, the correlation between these two constructions could be inflated. Similarly, Erling and Hwang (2004) found that 20%

of girls and 14% of boys perceived themselves as too fat, and that, among these children, only 31% of girls and 33% of boys were actually overweight. Despite this, the group of individuals who perceived themselves as overweight had approximately the same mean value of body dissatisfaction as the group of actually overweight children. However, Erling and Hwang (2004) are purely descriptive in their analyses, only reporting mean scores across groups. Thus, more research is needed to clarify the degree to which self-perceived size is related to body dissatisfaction.

In light of evidence linking WRT to self-perceived body size, as well as self-perceptions of size to a variety of negative mental health outcomes, it is hypothesized that self-perceived size is a mechanism through which WRT might exert its influence on body dissatisfaction (see Figure 1). Specifically, it is argued that WRT provides an adolescent with negative feedback regarding their weight, leading to negative perceptions about body shape and size, culminating in higher levels of body dissatisfaction.

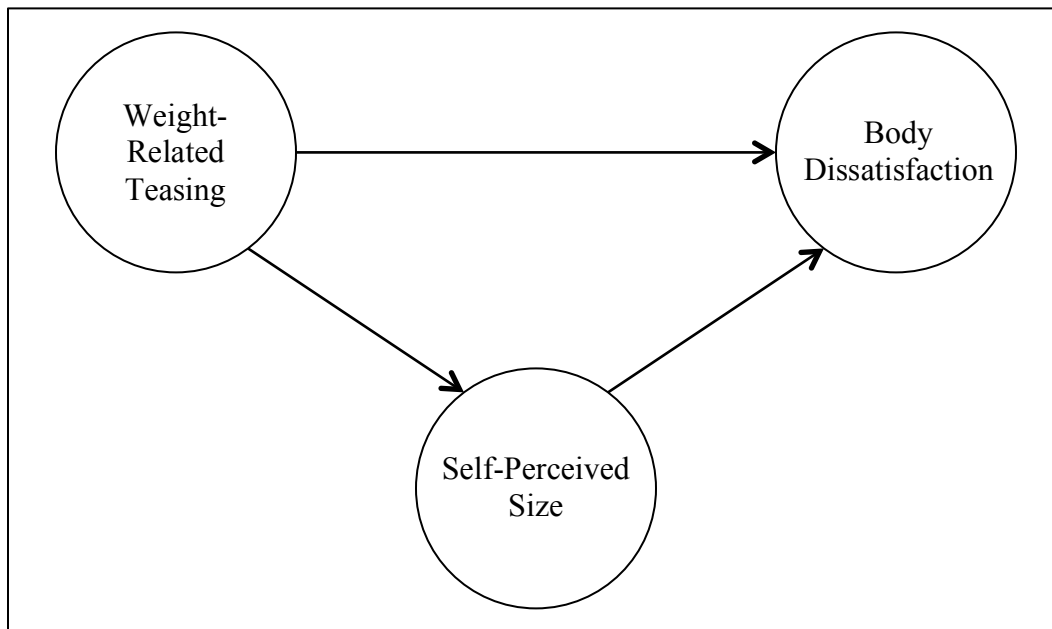


Figure 1. Proposed mediational model.

Currently, it is unclear whether the relation of WRT to body dissatisfaction is similar for healthy weight and overweight individuals. Thus, a second goal of the proposed study is to examine whether the proposed mediational model noted above will function similarly in healthy weight and overweight individuals. Three distinct lines of evidence regarding the impact of weight status on the constructs of interest in the proposed study (i.e., WRT, body dissatisfaction, and self-perceived size) suggest that weight status could be an important factor to consider. First, research indicates that overweight individuals are particularly vulnerable to the development of body dissatisfaction (Nelson et al., 2011; Sarwer, Wadden, & Foster, 1998; Thompson et al., 2007). Theory regarding the development of body dissatisfaction holds that individuals who live in societies where value is placed on a thin body size are at risk for developing dissatisfaction with their body (Wertheim et al., 2004a), and individuals whose body size represents a significant departure from society's thin ideal are thought to be at a greater risk for developing body dissatisfaction (e.g., Stice, 1994, 2002; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Wertheim et al., 2004). Indeed, research has found that body mass index (BMI) is the most reliable correlate of body dissatisfaction (e.g., McCabe & Ricciardelli, 2001; Wardle & Cooke, 2005) and that overweight individuals have significantly higher levels of body dissatisfaction than their normal weight peers (Hill & Williams, 1998; Sarwer et al., 1998).

Second, although there are healthy weight children who report experiencing WRT, it has been shown that overweight children experience significantly more WRT than their healthy weight peers and that the experience of WRT may be more impactful for overweight children (Hayden-Wade et al., 2005; Nelson et al., 2011). Hayden-Wade

et al. (2005) found WRT was “pervasive and frequent” among overweight children (p. 1387), with approximately three times as many overweight children reporting having experienced WRT than non-overweight children. Additionally, among those who experienced WRT, overweight children reported experiencing WRT more often and for a longer duration of time than non-overweight children (Hayden-Wade et al., 2005).

Third, and finally, given findings that WRT differentially impacted child-ratings of weight concern, confidence in social ability, and loneliness among overweight and non-overweight children, Hayden-Wade et al. (2005) speculated that WRT may be a qualitatively different experience for these two groups. As previously noted, Nelson et al. (2011) also found that WRT was more impactful for overweight children. They found that weight status moderated the relation of WRT to self-perceived size and body dissatisfaction such that the effects were stronger for overweight children. In light of these findings, it is possible that the associations among constructs in the proposed mediational model (WRT, self-perceived size, and body dissatisfaction) could vary as a function of children’s actual weight status.

The Present Study

Given the prevalent nature of body dissatisfaction among children and adolescents (Børresen & Rosenvinge, 2003; Ricciardelli & McCabe, 2001; Schur et al., 2000), as well as the adverse outcomes associated with body dissatisfaction (Wertheim et al., 2004a), it is important to gain a better understanding of those factors that might impact the development of this phenomena prior to adulthood. Weight-related teasing (WRT) is one construct that has consistently been found to precede and predict the development of body dissatisfaction, particularly in children and adolescents (Menzel et al., 2010).

However, less clear are mechanisms by which this relationship might occur. Thus, the current study aims to illuminate one pathway by which WRT might exert its influence on adolescent body dissatisfaction, namely self-perceived size. It is hypothesized that self-perceived size will mediate the relationship between WRT and body dissatisfaction in adolescents such that the experience of WRT is related to larger self-perceived size, which, in turn, is related to increased body dissatisfaction. In addition, previous findings indicate that actual weight status might play a significant role in the proposed mediational model. As such, the proposed study will also investigate whether the hypothesized model functions similarly across weight groups (i.e., healthy-weight and overweight). It is hypothesized that the model will function differently across weight groups, such that the indirect (i.e., mediated) effect will be stronger among overweight than healthy weight adolescents.

Methods

Participants

Data collection for the current study was a part of a larger project aimed at examining longitudinal relationships among child and adolescent physical activity and a number of psychosocial variables. Seventh and eighth grade students from a Midwestern school system who had previously participated in the first data collection of the larger project were recruited to participate during the spring of the 2012-2013 school year. Of the original 309 participants from the first time point of the larger project, 67 students agreed to participate in the three-year follow up. Given that this number of participants fell below projections of minimum sample size needed to analyze the predicted model, additional recruitment was conducted during the fall of the 2013-2014 school year. Study

participation was opened to all seventh grade students, none of who had been approached to participate in either the larger longitudinal study or the three-year follow up.

Approximately 600 consents were sent home to the seventh graders at three of the originally participating middle schools during this second wave of recruitment (one school declined to participate in the second wave of data collection). From this pool, 71 more students agreed to participate. Students in both waves of data collection were eligible to participate if they were enrolled in either the seventh or the eighth grade, if they spoke and read English, and if their parent or custodial caregiver provided informed consent for participation. All students meeting these criteria were deemed eligible regardless of weight status, sex, or ethnicity.

A total of 138 participants returned consent forms indicating parental consent. Two of these students chose not to participate, and data for one participant was excluded due to that participant's weight being classified as underweight. Thus, the final sample consisted of 135 participants. Mean age of participants was 12.68 years ($SD = 0.76$). The sample was evenly split between males and females (67 males, 68 females) and was predominantly Caucasian, with 74.1 % identifying as White/non-Hispanic, 5.9% Black/non-Hispanic, 5.9% Hispanic, 5.9% Asian, 1.5% American Indian, and 6.0% Other. Additionally, for the purposes of examining a multi-group structural equation model evaluating weight status as a moderator of the proposed mediational model, the sample was categorized into overweight and healthy weight groups. The healthy weight group was comprised of 93 participants with a Body Mass Index percentile (BMI percentile) between the 5th and 84.9th percentiles. Participants in this group had a mean BMI percentile of 52.85 ($SD = 24.22$). The overweight group was comprised of 29

participants with a BMI percentile between the 85th and 100th percentile. Participants in this group had a mean BMI percentile of 92.86 ($SD = 4.32$). Height and weight data were unable to be obtained for 13 participants due to absenteeism on data collection dates and/or follow-up dates.

Table 1

Demographic Characteristics

Demographic	Sample ($n = 135$)
Age	12.68 ($SD = 0.76$)
Male	49.6%
Female	50.4%
BMI percentile	62.36 ($SD = 27.26$)
Healthy weight	68.9%
Overweight	21.5%
Not available	9.6%
White, not Hispanic	74.1%
Black, not Hispanic	5.9%
Hispanic	5.9%
Asian	5.9%
American Indian	1.5%
Other	6.0%
Did not report	0.7%

Procedures

After obtaining project approval from the Institutional Review Board, the relevant Unified School District, and the school principals of the participating middle schools, parental consent forms were sent home during the 2012-2013 school year with all seventh and eighth grade students who participated in the first wave of data collection of the larger project, as well as with all seventh grade students during the 2013-2014 school

year for the second wave of additional recruitment. Students who returned consent forms with parental approval to participate were gathered as a group in the school cafeteria, school library, or a classroom. Students were informed about the purpose of the study, informed that they were not required to participate, and given the opportunity to provide verbal assent. As noted above, two students declined to participate. Survey packets coded with identification numbers were distributed to consented and assenting students. Participants were then instructed to complete the questionnaire packets. Research assistants were available to answer questions and facilitate packet completion. After completing their questionnaire packet, students were escorted into a private room to have their height and weight measured. On some occasions, due to time restrictions on data collection imposed by the school schedule, some students finished their packets and/or had their height and weight measured during a second follow-up date.

Measures

Body Mass Index. Body Mass Index (BMI) is considered an acceptable indirect measure of adiposity and is used to determine one's normal weight or overweight status (Barlow, 2007). BMI is expressed as body weight in kilograms divided by height in meters squared (kg/m^2). Because BMI does not increase linearly across sex and age throughout childhood, normative data are used to standardize individual scores before categorizing children as overweight. A BMI percentile score is used to classify children as underweight (i.e., <5th percentile), healthy weight (5th-84th percentile), overweight (85th-94th percentile), or obese (\geq 95th percentile), as recommended by the American Academy of Pediatrics (Barlow, 2007). In order to calculate BMI percentile, U.S. Center for Disease Control (2007) growth charts are used to plot each child's weight and height.

In the current study, graduate research assistants took two independent measurements of each participant's height and weight using a portable digital scale and stadiometer. These values were then averaged and used to compute a BMI percentile score using SAS software provided by the CDC (CDC, 2007). Participants were classified as healthy weight (5th-84th percentile) or overweight (\geq 85th percentile). Data from one child classified as underweight were excluded from analyses.

Body Dissatisfaction. Body dissatisfaction was measured using the Body Dissatisfaction Scale (BDS; Stice & Shaw, 1994). The BDS assesses discontent with nine aspects of the body (e.g., waist, hips, body build). Adolescents were asked to rate how satisfied they are with each body part on a 5-point scale ranging from 1 (extremely dissatisfied) to 5 (extremely satisfied). Responses were reverse-coded to reflect higher body dissatisfaction in higher scores. This scale has demonstrated good internal consistency ($\alpha = .94$), three-week test-retest reliability ($r = .90$), and predictive validity for eating disorder onset (Stice, Marti, & Durant, 2011). The reliability statistic in the current sample for the BDS is $\alpha = .94$.

Self-Perceived Body Size. Self-perception of body size was measured using the Contour Drawing Rating Scale (Thompson & Gray, 1995). This scale is a pictorial figure rating scale that depicts gender-specific pictures of bodies along a continuum from 1 (extremely thin) to 9 (very obese). Participants are asked to indicate the silhouette that looks most like them, as well as the body that looks most like the body they wish to have. Participant ratings of the picture that looks most like them will indicate self-perceived body size (Collins, 1991). Among adolescents, this measure has evidenced acceptable test-retest reliability ($r = .68-.82$), good convergent validity with other measures of body

dissatisfaction and body size (e.g., the Eating Disorder Inventory, Body Dissatisfaction Scale), and good discriminant validity with a non-body satisfaction measure (Wertheim, Paxton, & Tilgner, 2004b).

Weight-Related Teasing (WRT). WRT was assessed using the 6-item Weight Related Teasing (WRT) subscale of The Perceptions of Teasing Scale (POTS; Thompson, Cattarin, Fowler, & Fisher, 1995). This subscale asks children to rate the frequency with which they have experienced teasing about their weight (e.g., “*People made jokes about you being too heavy*”) on a five-point scale ranging from 1 (never) to 5 (very often). Additionally, if participants endorse having experienced teasing specific to an item, they are also asked to rate the extent to which they were upset by that experience on a five-point scale ranging from 1 (not upset) to 5 (very upset). Consistent with Thompson et al. (1995), WRT scores consisted of numerical ratings of frequency for weight-related items summed with associated ratings of distress. The scale has been demonstrated to have good internal consistency among young adults ($\alpha = 0.88$; Thompson et al., 1995), overweight pediatric samples ($\alpha = 0.88$; Stern et al., 2007), and community samples of children ($\alpha = 0.88$; Nelson et al., 2011). The reliability statistic in the current sample for the weight-related teasing subscale of the POTS is $\alpha = .88$.

Analytic Procedures

The proposed study aims were addressed using structural equation modeling (SEM) in Mplus version 7.1 (Muthén & Muthén, 1998-2012). SEM allows regression equations to be analyzed simultaneously in order to generate an estimated covariance matrix. The estimated covariance matrix can be compared to the covariance matrix of the observed data to determine closeness of fit, which can be evaluated through several

goodness-of-fit statistics. Specific to the proposed study, an SEM approach allowed for the evaluation of how well a process model linking the independent variable to the outcome variable through a proposed intervening pathway fits the observed data (Hayes, 2009). Evaluating model fit is a ‘gestalt’ process in which no one index of model fit can indicate good or bad fit. Rather, multiple indices are used to take an overall, holistic view of the model and how the proposed model fits the observed data. In the current investigation, the following goodness of fit indices were examined: (a) chi-square statistic (χ^2); (b) root mean square error of approximation (RMSEA); (c) non-normed fit index (NNFI); (d) comparative fit index (CFI); and (e) standardized root mean square residual (SRMR). Model fit was considered good if the CFI and NNFI were above .95, the RMSEA was below .07, and the SRMR was below .08 (Hooper, Coughlan, & Mullen, 2008). For multiple group comparisons to determine moderation, chi-square difference tests were considered significant at the $p < .05$ level.

Missing Data

For the current analyses, a total of 8 values were found to be missing from the data set, resulting in 0.004% missingness. Additionally, 13 participants were absent on the day data were collected on participant height and weight, resulting in missing BMI percentile scores. These participants were excluded from multiple group analyses, due to the fact that values for the grouping variable were missing for these participants. Full-information maximum likelihood (FIML) was used to account for the remaining small percentage of missing data.

Table 2

Descriptive Statistics for Measures

BDS Item	<i>M</i>	<i>SD</i>	POTS Item	<i>M</i>	<i>SD</i>
BDS 1	2.37	0.916	POTS 1	2.17	1.982
BDS 2	2.49	0.883	POTS 2	1.95	1.720
BDS 3	2.67	1.045	POTS 3	1.52	1.085
BDS 4	2.42	0.939	POTS 4	1.76	1.600
BDS 5	2.39	0.928	POTS 5	1.67	1.439
BDS 6	2.62	0.998	POTS 6	1.52	1.520
BDS 7	2.42	0.914			
BDS 8	2.45	0.881	SPS Item	<i>M</i>	<i>SD</i>
BDS 9	2.22	0.967	SPS	4.93	1.388

Results

Means and standard deviations of study variables are presented in Table 2.

Confirmatory Factor Analysis

A confirmatory factor analysis (CFA) was conducted to establish that the measurement model is accurately represented by the hypothesized latent constructs and that the measurement of these latent indicators is internally consistent. The latent structure of body dissatisfaction and weight-related teasing, as measured in this study, was identified using the full set of items for each measure (Stice & Shaw, 1994; Thompson et al., 1995). This step is not possible for the measure of self-perceived size used in the current investigation, given that it consists of a single indicator. In this instance, an assumption that the construct is measured without error is required. When specifying the measurement model, an item-to-construct balancing technique was used to create aggregate-level parceled indicators comprised of the average of individual items

Table 3

Descriptive Statistics for Parceled Measures

BDS	<i>M</i>	<i>SD</i>	POTS	<i>M</i>	<i>SD</i>
BDS Parcel 1	2.40	0.80	POTS Parcel 1	1.15	0.38
BDS Parcel 2	2.45	0.78	POTS Parcel 2	1.10	0.33
BDS Parcel 3	2.49	0.87	POTS Parcel 3	1.08	0.30

from the POTS and the BDS (Little, Cunningham, Shahar, & Widaman, 2002). Three parcels per measure were created for the POTS (i.e., two items per parcel) and BDS (i.e., three items per parcel). Parceling is a common method used when conducting CFA and SEM analyses, and benefits of the technique include reduction of sample error, reduction in correlated residuals and/or dual loadings of indicators, and greater parsimony (Little et al., 2002). The means and standard deviations of parceled indicators are presented in Table 3. The proposed measurement model demonstrated good model fit, confirming that the hypothesized model was closely fitted to the observed data, $\chi^2(12, n = 135) = 22.235$, $p = 0.04$, RMSEA = 0.08, CFI = 0.98, NNFI (TLI) = 0.97, SRMR = 0.03. Loading values for items and parcels in the measurement model are presented in Table 4.

Table 4

Unstandardized and Standardized Loading Values for Each Indicator

Indicator	Unstandardized Loading (<i>SE</i>)	Standardized Loading	R^2
WRT			
Parcel 1	1.52 (0.11)	0.90	0.81
Parcel 2	1.06 (0.08)	0.88	0.77
Parcel 3	1.28 (0.08)	0.99	0.99
Body Dissatisfaction			
Parcel 1	0.75 (0.05)	0.93	0.87
Parcel 2	0.71 (0.05)	0.92	0.85
Parcel 3	0.77 (0.06)	0.89	0.80

Table 5

Standardized Correlations Between Study Variables

	1.	2.	3.	4.	5.
1. WRT	--				
2. Self-Perceived Size	0.25**	--			
3. Body Dissatisfaction	0.20**	0.35**	--		
4. Sex	0.04	0.37**	0.11	--	
5. BMI percentile	0.24**	0.52**	0.26**	0.04	--

* $p < .05$, ** $p < .01$

Invariance Testing

In addition to a CFA, invariance of the measurement model was tested across both weight groups (i.e., healthy weight and overweight) and sex (i.e., male and female) to establish equivalence of measurement across groups. Three levels of invariance were tested: (a) configural invariance, to establish that the pattern of fixed and free parameters in the measurement model is equivalent across groups, (b) weak factorial invariance, to ensure that all factor loadings in the measurement model are equivalent across groups, and (c) strong factorial invariance, to ensure that the indicator means are equivalent across groups. The measurement model was found to be invariant across both sex and weight groups at all three levels, indicating that the measured constructs are the same across both boys and girls and across both healthy weight and overweight groups. Of note, the chi-square difference test for weak invariance across weight status was significant. However, ‘reasonableness’ tests of invariance indicated that it was acceptable to assume weak invariance across weight status. Specifically, RMSEA values for both the configural and weak models fell within the RMSEA confidence intervals of the other model. Additionally, the difference in CLI values between the two models was less than

Table 6

Chi-Squared and CFI Difference Values for Invariance Testing

Weight	χ^2 (df)	$\Delta \chi^2$ (Δ df)	<i>p</i>	CFI	Δ CFI
Configural Model	42.82 (24)			.974	
Weak Invariance	52.59 (28)	9.77 (4)	.04	.966	.008
Strong Invariance	58.41 (32)	5.82 (4)	.21	.964	.002

Sex	χ^2 (df)	$\Delta \chi^2$ (Δ df)	<i>p</i>	CLI	Δ CLI
Configural Model	40.01 (24)			.980	
Weak Invariance	45.95 (28)	5.94 (4)	.20	.978	.002
Strong Invariance	53.93 (32)	7.98 (4)	.09	.973	.005

.01. These ‘reasonableness’ tests indicate that, despite a significant chi-square difference test, it is reasonable to assume that there was not significant loss in model fit (Wu, Li, & Zumbo, 2007). See Table 6 for chi-squared and CFI difference values for invariance testing.

Multiple Group Analyses

A multiple group model was used to determine whether the hypothesized indirect effect functions the same in both healthy weight and overweight children. To do this, two models based on weight status (healthy weight, $n = 93$; overweight, $n = 29$) were simultaneously estimated, with an indirect effect defined in each group. The difference between these two indirect effects was defined in the specification of the model, producing a *z* score that can be used to determine whether or not the indirect effect differs across groups. Sex was included as a covariate in both groups to remove any effect of sex from the model. Overall, this model produced acceptable model fit: χ^2 (38, $n = 122$) = 65.56, $p < 0.01$, RMSEA = 0.11, CFI = 0.96, NNFI (TLI) = 0.95, SRMR = 0.06.

However, the produced difference score between the two indirect effects across weight groups was not significant: $z = 0.11$ ($p = 0.91$). As such, one cannot reject that the two indirect effects are equal. Given this, the proposed mediational model was estimated and significance of the indirect effect tested without differentiating by weight status.

Structural Equation Modeling

The proposed mediational model was then tested, examining self-perceived size as a mediator of the direct relationship between WRT and body dissatisfaction. Sex and BMI percentile were included as covariates; however, only the effects of sex and BMI percentile on self-perceived size were included in the final model, as the effect of each covariate on body dissatisfaction was non-significant. This model demonstrated good model fit: $\chi^2(24, n = 135) = 36.90, p = 0.05, RMSEA = 0.07, CFI = 0.97, NNFI (TLI) = 0.96, SRMR = 0.09$. Table 7 presents the unstandardized and standardized structural paths for final structural model. Weight-related teasing significantly predicted self-perceived size ($\beta = 0.22, p = .03$), and self-perceived size significantly predicted body dissatisfaction ($\beta = 0.21, p = .01$). In this mediational model, the direct effect from weight-related teasing to body dissatisfaction was not significant ($\beta = 0.17, p = .13$; see Figure 2).

Table 7

Structural Paths of Final Model

Structural Path	Unstandardized Loading (<i>SE</i>)	Standardized Loading
WRT x BD (c')	.17 (.11)	.16
WRT x SPS (a)	.22 (.10)	.16
SPS x BD (b)	.21 (.08)	.27
Indirect Effect (ab)	.05 (.03)	--
Sex x SPS	.98 (.20)	.36
BMI%ile x SPS	.02 (.00)	.47

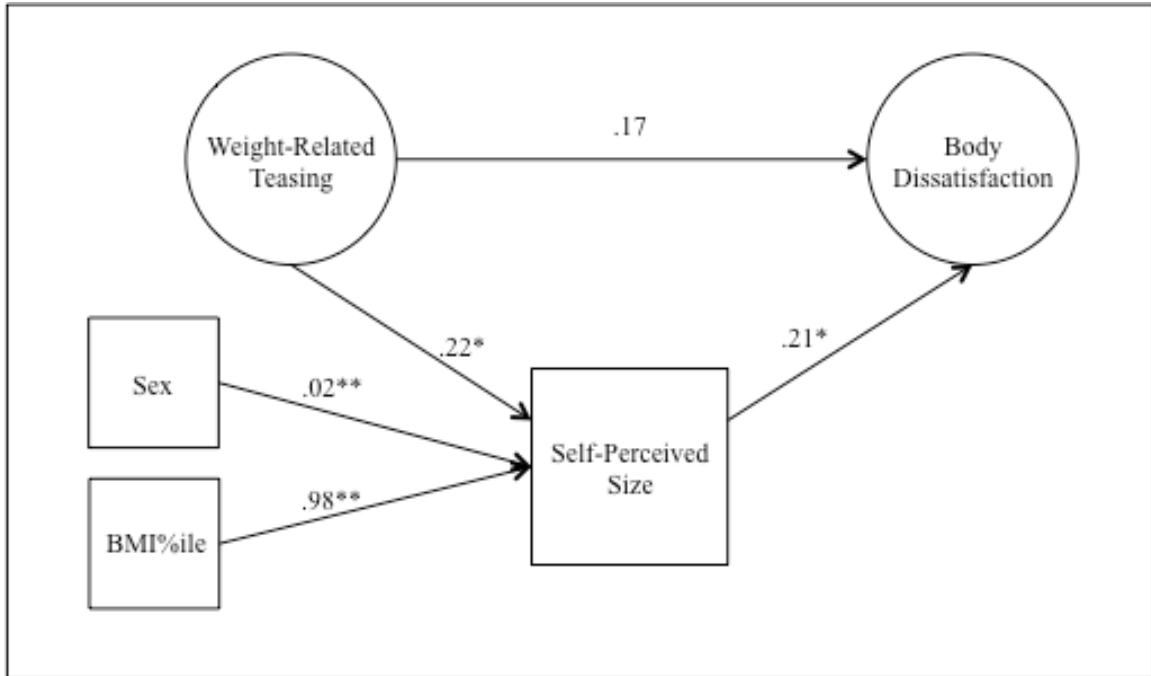


Figure 2. Final structural model, * $p < .05$, ** $p < .01$.

As recommended by Preacher and Hayes (2008a), the technique of resampling, or bootstrapping, was used to test for the significance of the hypothesized indirect effect. Bootstrapping is a non-parametric procedure “that involves repeatedly sampling from the data set and estimating the indirect effect in each resampled data set” (Preacher & Hayes, 2008a, p. 880). In other words, a set of possible data sets is compiled by repeatedly resampling from the observed data set, with replacement. It is recommended that the resampling procedure be repeated at least 1000 times, but ideally 5000 times (Hayes, 2009), in order to build an “empirical approximation of the sampling distribution” of the indirect effect (Preacher & Hayes, 2008a, p. 880). This empirical approximation of the sampling distribution of the indirect effect is a null distribution comprised of the indirect effect of interest calculated from each of the resampled data sets. This null distribution is then used to construct a bias corrected bootstrap confidence interval that will allow for the null hypothesis (i.e., no indirect effect) to be tested. If zero does *not* fall within the

constructed confidence interval, it can be concluded that the indirect effect is different from zero and is significant (Preacher & Hayes, 2008b). Bootstrapping has been shown to be one of the most valid and powerful methods for testing for indirect effects, as well as the most user- and interpretation-friendly method for doing so (Preacher & Hayes, 2008a). Per Preacher and Hayes (2008a), a resampling value of 5000 was specified in current analyses. The bootstrapped confidence interval of the proposed indirect effect from WRT to body dissatisfaction via self-perceived size did not include zero ($\beta = 0.05$, 95% CI = 0.01 – 0.12), indicating that the indirect effect is different from zero and is significant.

Discussion

The current study was an evaluation of one possible mechanism by which adolescent experience of weight-related teasing (WRT) exerts influence on body dissatisfaction, as well as how that process may function differently across weight status. Namely, self-perceived size was examined as a potential mediator of the effect of WRT on body dissatisfaction in early adolescent boys and girls. Additionally, weight status (i.e., healthy weight vs. overweight) was investigated as a potential moderator of this process. Findings from the current study revealed a significant indirect effect of WRT on body dissatisfaction. As hypothesized, the effect of WRT on body dissatisfaction was mediated by perceptions of body size. Early adolescents who scored higher on a measure of WRT were more likely to perceive their body size as larger, which was associated with greater body dissatisfaction. Results from the current study did not support adolescent weight status as a moderator of the mediational pathway identified. In other words, multiple group analyses indicated that the mediational pathway from WRT to body

dissatisfaction through self-perceived size was not significantly different among overweight and healthy weight adolescents.

Self-Perceptions of Size

Previous literature has indicated that self-perception of size is an important construct to consider when examining a number of mental health outcomes (e.g., depression, self-esteem, suicidal ideation and attempts; Ali et al., 2010; Dave & Rashad, 2009; Eaton et al., 2005; Kaplan et al., 1988; Whetstone et al., 2007). Moreover, distorted perceptions of body size and shape are one of the defining features of eating disorders (American Psychiatric Association, 2013). Research has found that body dissatisfaction is a risk factor for eating pathology (Stice, 2002), suggesting that self-perception of body size is an important precursor to subsequent maladaptive body image and eating-related behaviors. Despite this, there is a paucity of research examining the development and influence of self-perceptions of body size. Data from the current sample indicate that, when controlling for BMI percentile and sex, adolescents who experience increased levels of WRT from peers tend to perceive themselves as having a larger body shape, which in turn predicts increased levels of body dissatisfaction. Although some research has documented a direct association between WRT and body dissatisfaction in children (Hayden-Wade et al., 2005; Nelson et al., 2010), results from the current sample indicate that, when accounting for the effect of self-perceptions of body size, WRT does not account for unique variance in body dissatisfaction. Instead, it appears that WRT exerts influence on body dissatisfaction through an effect on perceptions of body size.

The current study provides initial evidence that the experience of being teased about one's weight affects internal, cognitive processes of early teens related to how they

perceive their bodies. Further, based on the items that make up the measure of WRT used in the current investigation, this appears to be specific to teasing about being overweight. The WRT subscale of the POTS (Thompson et al., 1995) includes items such as “*People called you names like ‘Fatso’*,” “*People pointed at you because you were overweight*,” and “*People made fun of you because you were heavy*.” The measure does not include any questions regarding teasing about other aspects of appearance, such as being too thin or attractiveness based on features other than weight (e.g., facial features, hair style, etc.). Further, analyses indicate that teasing specific to being overweight occurs in both healthy weight and overweight subsets of early adolescents and is related to increased perceptions of body size, regardless of weight. This is consistent with what is known about cognitive development and self-concept formation in early adolescence: middle school marks the transition from childhood to adolescence and is accompanied by dramatic physical changes, heavy emphasis on and attention to physical appearance, and the development of cognitive skills to integrate social feedback into the emerging self-concept (Blakemore & Choudhury, 2006; Harter, 1990). Results indicate that early adolescents of both healthy and overweight status receive negative feedback related to their weight, and, whether accurate or not, this information is being integrated into their perception of themselves, putting these teens at increased risk for body dissatisfaction.

While conclusions about the true causal nature of these variables are limited by this study’s cross-sectional and correlational nature, the findings do suggest that the developing self-perception of the early adolescent may be an individual variable that can be targeted for intervention to buffer the effects of WRT and/or reduce already-developed body dissatisfaction. Identifying, evaluating, and managing perception and cognition is

consistent with cognitive-behavioral therapy (CBT), a commonly used evidence-based intervention for internalizing problems in adolescents (Kendall, 2012). A major premise of CBT is changing and/or accepting perceptions that lead to distress (McGinn & Sanderson, 2001); as such, targeting self-perceptions of body size may be one place for intervention when working to deter the effect of WRT or improve an adolescent's satisfaction with their bodies.

Indeed, treatments for body image disturbance represented in the literature most often employ a cognitive-behavioral approach, and meta-analytic findings have demonstrated that the magnitude of the overall average effect size for CBT-based interventions targeting disturbed body image was large ($d_+ = 1.01$, 99% CI = 0.75-1.27; Jarry & Ip, 2005). Further, findings revealed that treatments that targeted the perceptual component of body image (i.e., body size estimation), in addition to the attitudinal (i.e., affect and satisfaction) and behavioral components (e.g., grooming, concealing, etc.), were more effective than those treatments addressing only attitudes and behavior (Jarry & Ip, 2005). The authors speculated that addressing perceptions about one's body might not only increase exposure to thinking about one's body shape, but may also result in greater awareness of maladaptive schematic content about one's body. In other words, addressing self-perceptions of size and body shape likely reduces anxiety related to one's body via increased exposure to thinking about one's body, in addition to providing a forum for identifying and exploring cognitive errors related to one's body (e.g., negative bias, dichotomous thinking, biased comparisons, etc.; Hilbert, Tuschen-Caffier, & Voegle, 2002). Increased exploration of perception and change in schematic content about the way one perceives their body may, then, result in greater reductions in distress

than if addressing only behavior and satisfaction (Jarry & Ip, 2005). Findings from the current study provide evidence that the perceptual component, or self-perception of size, facilitates the effect of negative weight-related feedback on body dissatisfaction. This suggests that addressing self-perceptions may facilitate change in satisfaction about one's body, which may explain, in part, findings that treatments addressing the perceptual component of body image disturbance (in addition to attitudes and behaviors) are more effective than those that only target an individual's attitudes about their bodies and body-related behaviors (Jarry & Ip, 2005).

In addition to the benefit that addressing self-perceived size adds to improving overall body image (Jarry & Ip, 2005), CBT to address disturbance in body image may extend to other maladaptive psychological and physical outcomes (Jarry & Berardi, 2004). Self-perceived size has been shown to be predictive of increased levels of depression, poorer self-esteem, and increased suicidal ideation and attempts (Ali et al., 2010; Dave & Rashad, 2009; Eaton et al., 2005; Kaplan et al., 1988; Whetstone et al., 2007), indicating that there are likely a host of maladaptive schematic themes that stem from distressing self-perceptions of size and may be improved with positive changes in perception of one's body. Additionally, Jarry and Ip (2005) found that, in addition to the large effect size for improving body image disturbance, CBT-based interventions specifically targeting body image showed a medium overall effect size for improvement on other psychological outcome variables (i.e., self-esteem, eating attitude and behavior, anxiety, depression), highlighting the known association between body image and psychological health (Davidson & McCabe, 2006). Thus, targeting self-perception of size in a psychotherapeutic setting is not only indicated for improving body dissatisfaction,

but also for improving other variables related to overall psychological functioning.

Finally, in addition to psychological health, addressing self-perceptions of size may also have positive impact on physical health, as recent longitudinal designs have shown that both weight labeling and perceptions of being overweight are predictive of future overweight. Hunger and Tomiyama (2014) found that being labeled “too fat” by any one or more individuals (e.g., parents, teachers, peers, doctors, etc.) at age 10 was a significant predictor of obesity at age 19, above and beyond baseline BMI, household income, parental education, race, and age at menarche. Hunger and Tomiyama (2014) conclude that the relationship between weight stigma and weight gain may begin early in life, and findings from the current study may provide insight into at least one pathway by which this happens: feedback specific to being overweight is related to increased self-perceived size, which is in turn related to body dissatisfaction and subsequent weight gain. Indeed, Cuypers, Kvaløy, Bratberg, Midthjell, Holmen, and Holmen (2012) found that, among normal weight teens, those who perceived themselves as overweight had a larger weight gain eleven years later than those who did not perceive themselves as overweight. This finding held regardless of age, physical activity, and eating habits at baseline and socioeconomic status and physical activity at follow up.

Results from the current study are consistent with these findings and suggest one possible pathway from negative weight-related feedback to problematic psychological (e.g., body dissatisfaction and associated distress) and physical (i.e., overweight and associated physical health problems) outcomes. Being labeled as “fat” or teased about being overweight may lead to maladaptive changes in self-perceived size, which may lead to increased body dissatisfaction. Previous literature has indicated that body

dissatisfaction leads to dieting and/or disordered eating (Stice, 2002), which, in turn, is predictive of weight gain in adolescents (Neumark-Sztainer, Wall, Guo, Story, Haines, & Eisenberg, 2006). In other words, negative feedback about being overweight may be one factor that puts children at risk for developing actual overweight through a number of mechanisms, including self-perception, body dissatisfaction, and disordered eating. As such, addressing self-perception of size may not only improve distress related to body dissatisfaction, but also have a positive effect on other negative psychological and physical outcomes.

Effects of Weight

While it was hypothesized that the proposed indirect effect would be moderated by weight status, with a stronger effect for overweight compared to health weight adolescents, findings did not support this conclusion. However, this finding should be interpreted with caution due to sample size limitations; the overweight group was comprised of only 29 individuals. A post-hoc Monte Carlo simulation using unstandardized estimates obtained from the multiple group analysis was conducted to examine power to detect a significant difference between the indirect effects in each weight status group. However, the generated difference score between the indirect effects of the two weight status groups was essentially zero ($est. = .005$). It is possible that the estimates of the indirect effects obtained by multiple group analyses are unreliable and, thus, the difference in the effects is not trustworthy. It is also possible that weight status did not moderate the indirect path, resulting in similar estimates across groups. Multiple group analyses will need replication with a larger sample size before conclusions can be drawn about whether the effect of WRT on self-perceptions of size and subsequent body

dissatisfaction is conditional on weight status.

Despite this limitation, analyses did yield some information regarding the impact of weight on processes examined. Previous literature has shown that perception of body size is a stronger predictor than actual weight of a number of adverse mental health outcomes (Ali et al., 2010; Dave & Rashad, 2009; Eaton et al., 2005; Kaplan et al., 1988; Whetstone et al., 2007). Analyses from the current study are consistent with this finding. Not only was self-perception of size a stronger predictor of body dissatisfaction than BMI percentile, BMI percentile was not a significant predictor of body dissatisfaction when accounting for self-perceived size. Additionally, self-perceived size was a significant mediator of the relationship between WRT and body dissatisfaction, even after accounting for the effect of BMI percentile on self-perceived size. This finding indicates that weight-focused teasing is experienced by and detrimental to children of healthy weight, a group that may not be intuitively viewed as at risk for negative outcomes related to the experience of WRT.

Body image literature has long considered negative body image, even in healthy weight individuals, a “normative discontent” (Cash & Henry, 1995, Littleton, 2008). Findings from the current study that healthy weight adolescents are receiving feedback about their body size being too big and are experiencing increased self-perceptions in size and body dissatisfaction support the notion that distress about body weight and/or size extends beyond those who experience actual overweight. Indeed, recent research has shown that a sizeable number of healthy weight individuals see themselves as overweight. For example, Cuypers et al. (2012) found that, in their healthy weight sample of adolescents, approximately 15% of participants perceived themselves as overweight.

Similarly, Van Vliet, Rasanen, Gustafsson, and Nelson (2014) found that, among the 35% of participants who rated themselves as overweight, only 6% were overweight based on BMI score. It may be that overweight perception is one mechanism by which body dissatisfaction develops in healthy weight individuals, and findings from the current study might suggest negative feedback about being overweight, even when untrue, is one way in which this develops.

Future Research

The experience of WRT in early adolescence may contribute to a distortion of body perception, which is associated with higher levels of body dissatisfaction and other associated negative outcomes. Additional research is needed to further understand these implications and to begin to explore possible areas for intervention prior to the development of maladaptive self-perceptions and body image. First, better measurement of self-perceived size is needed. A single pictorial indicator for self-perception of size was used in the current study (Thompson & Gray, 1995), requiring an assumption that the construct was measured without error. Although a goal of study design and construct measurement is to minimize error, it is a reasonable assumption that some amount of measurement error exists when quantifying non-numerical constructs. While SEM allows for this error to be mathematically accounted for through the creation of latent variables, multiple indicators of that latent variable are required. The development of a more explicit, multidimensional measure with multiple indicators will improve the measurement of self-perceived size by allowing for a person's 'true' perception of size to be more effectively parsed out from both measurement and random error.

Perhaps the pictorial item used in the current study (Thompson & Gray, 1995),

combined with methods used to measure body size perception in recent publications, would create a more multidimensional measure of self-perceived size. For example, Khambalia, Hardy, and Bauman (2012) measured perceived weight status by asking adolescents if they considered themselves “too thin,” “about the right size,” or “too fat.” Similarly, Van Vliet and colleagues (2014) and Cuypers and colleagues (2012) both asked adolescents to rate their perception of their bodies on a 5-point Likert scale. Van Vliet and colleagues (2014) used the prompt “Do you think your body is...” and a scale that ranged from “far too thin” to “far too fat.” Cuypers and colleagues (2012) used the prompt “How do you consider yourself?” The five options available were “very fat,” “chubby,” “about the same as others,” “thin,” and “very thin.” While a pictorial rating of perceived size may assess a perception of how one visualizes his or her size, this additional type of item would assess whether the participant classifies that size as discrepant from the “right size” or different from typical. Additional dimensions of perceived size may also be considered, such as asking participants to guess their weight, BMI percentile, or weight classification (i.e., overweight, healthy weight, or underweight).

Beyond a more dimensional measurement of perceived size, a valid tool for measuring the degree to which a person’s self-perceived size is distorted from their actual size is needed. Specific to the current study, determining the degree to which WRT leads to distortion in perceptions of size will be influential in further understanding the implications that WRT has on the internal cognitive processes of adolescents and subsequent outcomes. While this study was able to demonstrate that self-perceived size was a significant mediator of the direct effect between WRT and body dissatisfaction, it

could not speak to the accuracy of those perceptions. It may be that greater distortion between actual and perceived size influences body dissatisfaction more strongly than larger perceived size alone. A method for determining “distortedness” between selection of a pictorial body size and actual body size has not yet been validated; however, recent literature has used other methods to create a proxy for “distortedness.” For example, recent literature has used actual BMI percentile categorizations (i.e., overweight/obese, healthy weight, underweight) to determine if participants were accurate in classifying their weight when asked on a Likert scale what level of thinness or fatness they perceive themselves to be (Cuypers et al., 2012; Khambalia et al., 2012; Van Villet et al., 2014). In these studies, participant body weight perception was classified as either accurate or inaccurate (Cuypers et al., 2012; Khambalia et al., 2012; Van Villet et al., 2014).

Additional research is also needed to better understand the causal nature and developmental progression of the mediational pathways established in this study. Data from the current study were collected at only one time point, limiting the ability to draw causal inferences among the variables. Future studies are needed to test the proposed mediational pathway using a longitudinal design with adequate time spacing between variables to better understand the directional nature of the relationships among variables. Future longitudinal research designs should also investigate the age at which these processes begin. Early adolescence is a key developmental period in which to examine the etiology of body dissatisfaction, given that body dissatisfaction increases for both boys and girls during this time period (Smolak, 2004). However, it is known that children as young as 7 years of age experience dissatisfaction with their bodies (Ricciardelli & McCabe, 2001). This, coupled with the fact that WRT does occur in elementary-aged

children (Hayden-Wade et al., 2005; Nelson et al., 2011), indicates that the processes identified in the current study may begin earlier than middle school.

Finally, the result that weight status did not moderate the indirect effect found in the current study needs to be replicated in a larger sample. Poor return rate on the 900 consent forms distributed resulted in a sample size of 135 participants, only 29 of whom were classified as overweight. As such, strong conclusions about the moderating effect of weight status cannot be made using the current sample. It will be important that the results of the current study be replicated in other samples before results can be drawn about the effects of weight on the process model in question.

Limitations

Data from the current study were limited in the following ways. First, given that data were cross-sectional in nature, conclusions about longitudinal relations among variables cannot be made. Second, self-perceived size was measured using a single item, which required making the assumption that the construct was measured without error. While previous studies evaluating self-perception have also used only one item to assess self-perception (Cuyppers et al., 2012; Khambalia et al., 2012; Van Villet et al., 2014), it is possible that a multi-item measure would produce a more robust assessment of self-perceived size. Third, as previously discussed, multiple group analyses were limited by a small sample size in the overweight group, limiting conclusions that can be drawn about the moderating effect of weight status on the mediational pathway between WRT, self-perceived size, and body dissatisfaction. Finally, although participants in the current study were from a Midwestern school district generally representative of individuals in similarly sized, suburban areas, a poor return rate for consent forms (i.e., 135 returns

from approximately 900 distributed consent forms) may have led to identification of a select group of children defined by characteristics that may make it more likely that they would choose to participate in a research study about physical activity, as well as demonstrate the capability of successfully obtaining parental consent. It may be that the identification of the larger study as one about physical activity and health may have contributed to the low consent rate, potentially resulting in participants who were more likely to be of healthy weight. This, then, would have contributed to the relatively small number of overweight children in the sample, limiting generalizability of our findings to the overall population of adolescents. It will be important that the results of the current study be replicated in other samples before results be generalized to the population of early adolescents.

Conclusions

Findings from the current study indicate that increased levels of WRT from peers are associated with larger self-perceptions of body size, which in turn is associated with increased levels of body dissatisfaction, regardless of BMI percentile and sex. The identified mediational relationship is a first-step in understanding mechanisms by which WRT exerts influence on body dissatisfaction. Further, data showed that self-perceived size was more influential on body dissatisfaction than actual BMI percentile. While conclusions from the current data cannot be drawn about the degree to which the experience of WRT distorts or changes self-perceived size, future research should look to: 1) develop a more explicit, multidimensional measure of self-perceived size in order to better understand the cognitive processes that are impacted by WRT, 2) examine the degree to which WRT distorts one's self-perceptions of size from actual size, and 3)

employ longitudinal designs to examine the causal effect of WRT on self-perception of size and body dissatisfaction and identify the age at which these processes begin. Further, the moderating role of weight status on the mediational process identified should be re-examined in a larger sample.

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