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BMI and Disordered Eating in Urban, African American, Adolescent Girls: The Mediating Role of Body Dissatisfaction

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Abstract

Objective—This study examined the mediating role of body dissatisfaction between body mass index (BMI) and subsequent disordered eating (e.g. dieting and restricting/purging) among early adolescent African American girls.

Study Design—Participants included 701 African American girls in 6th and 7th grades in urban schools serving low-income communities, mean age 12.15 ($SD=0.72$) years. Participants were assessed at baseline and approximately 6 months later. Objectively measured height and weight were used to calculate BMI z-score. Participants completed questionnaires on body size dissatisfaction and recent dieting and restricting/purging behaviors.

Results—At baseline, 51.5% of participants were overweight/obese, and 60.4% expressed body dissatisfaction and a desire to be smaller. Path analytic analyses revealed change in body dissatisfaction significantly mediated the relation between initial BMI z-score and increases in dieting behaviors ($B = 0.924$, $SE=0.280$, $p=.001$) but not restricting/purging behaviors ($p=.05$).

Conclusions—Body dissatisfaction explains some associations between excess body weight and subsequent disordered eating symptoms among early adolescent, African American girls. Body dissatisfaction, identified by screening, may be an indicator of further negative consequences, including disordered eating behaviors.

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Keywords

disordered eating; African American adolescents; body dissatisfaction; overweight; obesity; early adolescent girls

Introduction

Clinical eating pathology has been estimated to affect one in eight young women, and even subclinical disordered eating is associated with functional impairment and distress (Stice, Becker, & Yokum, 2013). Unhealthy eating attitudes and disordered eating behaviors are relatively widespread, with a national survey reporting that 21.8% of girls engaged in disordered eating behaviors within the last 30 days (Pisetsky, May Chao, Dierker, May, & Striegel-Moore, 2008). Disordered eating behaviors and obesity are recognized predictors of clinically diagnosable eating disorders (Russell-Mayhew, McVey, Bardick, & Ireland, 2012).

Driven by a desire to be thinner, overweight girls engage in more disordered eating behaviors (e.g., fasting or skipping meals or vomiting) than their normal weight peers (Olvera et al., 2015; Tanofsky-Kraff et al., 2004). They may refuse to eat for periods of time and may have an intense fear of gaining weight (Olvera et al., 2015; Tanofsky-Kraff et al., 2004). Also, they may engage in binge eating episodes (defined as eating a larger amount of food than most people eat in a discrete period of time), feeling embarrassed or disgusted by the amount of food eaten, and feeling out of control (American Psychiatric Association, 2013). Bucchianeri and colleagues found that, for females, body dissatisfaction increased between middle and high school, and increased further during the transition to young adulthood (Bucchianeri, Arikian, Hannan, Eisenberg, & Neumark-Sztainer, 2013), suggesting that early adolescence is a critical time period to intervene and prevent future consequences of body dissatisfaction. In the United States, the prevalence of overweight/obesity is high, particularly among adolescent African-American girls (42.5%) (Ogden, Carroll, Kit, & Flegal, 2014; Ogden et al., 2016). This evidence taken together suggests that the high prevalence of overweight/obesity among African American girls may put them at risk for both body dissatisfaction and disordered eating (Austin et al., 2011).

Historically, most studies of disordered eating (e.g., dieting, restricting/purging symptoms) and body dissatisfaction (e.g., the inconsistency between perceived and ideal body size) (Silberstein, Striegel-Moore, Timko, & Rodin, 1988) were conducted among middle to upper-class White girls (DeLeel, Hughes, Miller, Hipwell, & Theodore, 2009; Grabe & Hyde, 2006). The prevailing view in American popular culture and the psychological literature is that African American girls experience less body dissatisfaction than White girls (Bucchianeri et al., 2016; MASTRIA, 2002; Smolak & Striegel-Moore, 2001). However, stereotypes suggesting that minority adolescents are buffered from the negative consequences of body dissatisfaction may preclude ethnic-minority youth from seeking eating disordered treatment or participating in research (MASTRIA, 2002). Much of what is known about body dissatisfaction is based largely on cross sectional, college age, majority White samples (Grabe & Hyde, 2006). Therefore, there is a need to examine body dissatisfaction longitudinally specifically among African American youth.

One longitudinal study found that that BMI was differentially related to subsequent body dissatisfaction among African American youth, but did not examine effects specifically among African American girls due to limited sample size (Sutter, Nishina, & Adams, 2015). Furthermore, in a longitudinal sample of White Spanish youth, body dissatisfaction mediated the relation between gender and later disordered eating, with girls showing a significantly stronger relation between body dissatisfaction and disordered eating than boys (Ferreiro, Seoane, & Senra, 2014). BMI was not considered in this study.

Longitudinal studies that examine the mechanisms linking body size (measured objectively), body dissatisfaction, and disordered eating are needed urgently among early adolescent African American girls to determine whether the associations reported among White girls generalize to girls of other races or ethnicities (Bucchianeri et al., 2016; Witherspoon, Latta, Wang, & Black, 2013). To address this gap, we tested the hypothesis that association between baseline BMI and disordered eating behaviors 6 months later is mediated by body dissatisfaction among a sample of African American, early adolescent girls.

Material and Methods

Participants, Design, and Procedures

The current study is a secondary analysis of data from a study designed to test an intervention. Participants in the current analysis were 701 African American middle school girls participating in a multi-level, school-based program to promote health and prevent obesity conducted with 6th and 7th grade girls in 22 schools in a large urban public school system. School inclusion criteria were >75% of students eligible for free and reduced priced meals (FARMs) and >70% of students African American. Adolescent girls in grade 6 or 7 with no chronic illness or health condition that would interfere with participation in a physical education class were recruited to participate through mailings or in-person during lunch shifts and at school-sponsored events. A total of 1,076 students (out of a total pool of 1,804) were screened and eligible, and 789 students were randomized to participate in: 1) a small-group health promotion intervention focused on healthy nutrition and physical habits (intervention) or 2) an intervention on stress reduction (control). Of the 789 students randomized, 701 were African American.

Students were evaluated at baseline (Time 1) and at the conclusion of the interventions (6 months following baseline, Time 2) during the fall and spring semesters. Data collection occurred in multiple waves between the years 2009–2013. At each evaluation, height and weight were measured, and participants completed questionnaires regarding physical activity, diet, eating behaviors, and psychological well-being. Assessments were conducted after school using audio enhanced computer-administered questionnaires. Informed consent (caregiver) and assent (youth) were obtained from all participants prior to the start of the study. This study was approved by Institutional Review Boards at both the university and the public school system where the study took place.

Measures

Weight status—Body Mass Index (BMI) was calculated from weight and height, measured twice by trained staff using standardized procedures. If weight or height differed, a third measure was taken and the two closest measures were averaged. Weight was measured in kilograms to the nearest tenth using standard scales (TANITA 300GS, Tanita Corp., Tokyo, Japan). Height was measured by a portable stadiometer (Shorr Productions, Olney, Maryland) in centimeters to the nearest tenth. BMI-for-age percentiles and z-scores were based on sex-specific- CDC 2000 growth standards (Kuczmarski et al., 2002). Weight status was defined as: underweight (BMI-for-age < 5th percentile, normal: BMI-for-age < 85th percentile; overweight: BMI-for-age 85th and <95th percentile; obese: BMI-for-age 95th percentile (Ogden et al., 2016).

Body dissatisfaction—Body dissatisfaction was measured using culturally adapted, age- and sex-specific, 9-point silhouette scale (Pulvers et al., 2004; Yepes, Viswanathan, Bovet, & Maurer, 2015). Participants responded to two questions: (1) “Select the body size that looks most like you?” (perceived body size); (2) “Select the body size that you would like to be” (ideal body size). Body size dissatisfaction was calculated as the difference between the perceived and the ideal silhouettes. Answers were then dichotomized into wanting to be at least one size smaller categorized as “dissatisfied” and not wanting to be smaller categorized as “not-dissatisfied.”

Disordered eating—The Children’s version of the Eating Attitudes Test (ChEAT) (Maloney, McGuire, & Daniels, 1988) is a 26-item scale rated on a scale from 1 (always) to 6 (never) that assesses 4 subscales: dieting, restricting/purging, food preoccupation, and oral control (Smolak & Levine, 1994). Scores are recoded so that higher scores indicate more disordered eating symptoms. This measure has been used to assess disordered eating among African American girls ages 9 and older (DeLeel et al., 2009), with good reliability (Cronbach’s alpha=0.87) (Smolak & Levine, 1994) and has shown adequate reliability among African American girls (alpha = .74) (Vander Wal & Thomas, 2004). For the current study, mean scores on the dieting (Cronbach’s alpha=0.78) and restricting/purging (Cronbach’s alpha=0.72) subscales were examined. Subscale includes questions such as “I have been dieting” and “I think a lot about wanting to be thinner.” The restriction/purging scale is comprised of questions including “I stay away from eating when I am hungry” and “I have the urge to vomit or throw up after eating” and is thought to represent a closely connected cycle of restriction and purging (Smolak & Levine, 1994).

Data Analysis

To test the hypothesis that body dissatisfaction mediates the association between BMI and subsequent disordered eating, a unified path analysis was conducted in Mplus 8.0 (Muthén & Muthén, 2012). BMI z-score at Time 1, body dissatisfaction at Time 2 (controlling for Time 1 body dissatisfaction) and disordered eating symptoms (dieting and restricting/purging subscales) at Time 2 (controlling for baseline rates), were used in the model to ensure temporal sequence. Probit regression was conducted for the outcome of body dissatisfaction and censored-normal linear regression for disordered eating symptoms. Regressions predicting disordered eating at Time 2 included interventions status, and Time 1

disordered eating symptoms as covariates. In regressions predicting body dissatisfaction, intervention and Time 1 body dissatisfaction were included as covariates. The significance of the indirect effect was determined with Sobel's test (Sobel, 1982). Model fit was assessed with Chi-square test of model fit ($p > .05$), the root mean square error (RMSEA) and the weighted root mean residual (WRMR). RMSEA values below 0.5 and WRMR values below 0.9 are indicative of good model fit (MacCallum, Browne, & Sugawara, 1996; Muthén & Muthén, 2012). In recognition of the varying racial views of body dissatisfaction (Bucchianeri et al., 2016), only African American girls were included in the current analyses ($n = 701$). Variance-adjusted weighted least squares (WLSMV) estimation was used for adjustments to the standard errors for non-normality. Finally, 11.8% of data were missing, and missing data imputation was conducted using HotDeck (Myers, 2011). Significance was set at $p < 0.05$.

Results

Sample Description

Participants were a mean age of 12.15 years at baseline. Sample means are presented in Table 1. On the ChEAT, 38.5% of the sample endorsed fear of being overweight, and 14% endorsed staying away from eating when hungry. Other endorsements included: 3.2% vomit after eating, 6.8% feel very guilty after eating, 6.9% like the stomach to be empty, 3.2% urge to vomit after eating, and 9.4% stay away from foods like bread, potatoes, and rice. MANOVA results revealed that intervention condition was not related to variables of interest (i.e., restricting/purging behaviors, body dissatisfaction, dieting behaviors, BMI z-score) in the current study $F(21,1638)=1.23, p=.21$.

Initial Correlations

Correlations are presented in Table 2. BMI z-score, body dissatisfaction, dieting behaviors and restricting/purging behaviors were all significantly correlated across both time periods. Age was not significantly related to any variables of interest.

Mediation model

Dieting behaviors—A unified path analytic mediation model was conducted predicting dieting behaviors. The path model provided a good fit for the data $\chi^2(5)= 5.77, p=0.33$ (RMSEA=0.015, WRMR=0.506). Individual path estimates are presented in Figure 1. There was a significant association between BMI z-score at baseline and subsequent body dissatisfaction at Time 2 (path a: $B=0.620, SE=0.066, p<.001$). There was a significant association between body dissatisfaction and dieting behaviors at Time 2 (controlling for baseline dieting) (dieting path b: $B=1.491, SE=0.426, p<.001$). There was a significant association between body dissatisfaction and restricting/purging behaviors at Time 2 (controlling for baseline restricting/purging) (restricting/purging path b: $B=0.875, SE=0.442, p=.048$). A test of the indirect effect ($a \times b$) was significant for dieting behaviors ($B =0.924, SE=0.280, p=.001$), indicating that body dissatisfaction significantly mediated the relation between BMI z-score at Time 1 and subsequent increases in dieting behaviors at Time 2. The indirect effect for restricting/purging was not significant ($B =0.543, SE=0.281, p=.053$).

Discussion

This study examined body dissatisfaction as a mechanism linking body size (BMI z-score) to subsequent disordered eating behaviors among early adolescent, African American girls. The indirect effect of BMI z-score through body dissatisfaction was supported on subsequent dieting behaviors, but not on subsequent restricting/purging behaviors.

Results concerning dieting are in contrast to research by Epperson et al. (2014) which found that body image mediated the association between body size and dieting for White, but *not* African American 5th graders. However, a majority of studies concerning disordered eating among school age children (including Epperson et al. (2014)) use cross-sectional data which implies high risk of bias and no consideration of temporal relationships (Larsen, Strandberg-Larsen, Micali, & Andersen, 2015). The current study meets temporal assumptions by utilizing longitudinal data and adjusting for Time 1 variables, thereby strengthening the case for a mediational relation (Maxwell & Cole, 2007).

The lack of support for a mediated relation between BMI and subsequent restricting/purging behavior through body dissatisfaction may be at least partially attributed to the low rate of restricted/purging (3.2), which is less than rates from other samples (Evans, Tovée, Boothroyd, & Drewett, 2013) and to omitted variables in the model, such as negative affect. Stice (Stice, 2001) proposes a dual-pathway model of eating pathology whereby the *interaction* between body dissatisfaction and negative affect predicts purging symptoms. Future studies should include measures of mood and affect to explore this relationship among African American youth.

A larger body size has been shown to be more acceptable among African American girls, compared to White girls (e.g., Padgett & Biro, 2003). However, the current study finds body dissatisfaction is associated with BMI z-score among African American girls. Furthermore, increase in body dissatisfaction was associated with increases in disordered eating behaviors over 6 months. These findings are in line with recent research showing that BMI is linked with elevated body size dissatisfaction in children across race and ethnicity (Olvera et al., 2015), and may reflect national awareness and campaigns to prevent excess body weight, together with high rates of obesity among African American girls (Ogden et al., 2014; Ogden et al., 2016). Along with increases in overall obesity rates, there has been an increase in extreme obesity (BMI >99th percentile) among African American females (12.7%; Ogden et al., 2016). This change in conjunction with evidence from the current study may suggest that African American girls experience body size dissatisfaction and disordered eating more frequently than previously reported. Recently, Lebow, Sim, and Kransdorf (2015) suggested that adolescents with a history of overweight or obesity represent a substantial portion of treatment-seeking adolescents with restrictive eating disorders. Overweight youth may be at particular risk for disordered eating problems that go untreated due to disbelief from others that they are truly restricting their intake and may even be praised for unhealthy weight loss (Neumark-Sztainer, 2015). Regardless of weight status, sustainable healthy eating and physical activity patterns, should be encouraged and supported, whereas “going on a diet” should be discouraged (Neumark-Sztainer, 2015).

The finding that increases in body dissatisfaction mediate the link between BMI and increases in dieting behaviors among early adolescent girls represents an opportunity to prevent disordered eating by intervening early to build positive body image. This strategy is particularly relevant, given that body dissatisfaction appears to increase with age (Bucchianeri et al., 2013). Positive body image may be a protective factor against disordered eating for African American youth. Sutter, Nishina, and Adams (2015) found that only when African American youth were dissatisfied with their body did their self-worth decrease, regardless of objective weight. Findings from the present study, in conjunction with emerging literature (Bucchianeri et al., 2013; Sutter et al., 2015) highlight the associations between body dissatisfaction and disordered eating, and underscore the importance of addressing body dissatisfaction among all youth, regardless of body size or race/ethnicity. Interventions to address body dissatisfaction have been shown to be effective (Hart, Cornell, Damiano, & Paxton, 2015).

Several limitations should be considered when interpreting results from the current study. The current study examined disordered eating behaviors, not the presence of a formally diagnosed eating disorder. Unhealthy dieting behaviors were self-reported, which may lead to either under or over-reporting of actual behavior. Adolescents may distort the frequency of weight control behaviors symptoms due to the sensitive nature of the questions. However, examination of within-person change and the use of computer-administered questionnaires in a private location ideally minimized this risk. The body dissatisfaction measure used did not allow for the assessment of severity of body dissatisfaction or degree of distress. Body image is a multidimensional construct comprised of cognitive-affective, perceptual, and behavioral domains. Body dissatisfaction reflects the cognitive-affective component of the broader body image construct (Karazsia, Murnen, & Tylka, 2017) including perceived pressure for thinness and thin-ideal internalization (Stice & Shaw, 2002). Future research should utilize multimethod techniques to comprehensively assess the predictors and consequences of body dissatisfaction. Lastly, the current study utilized data from a larger intervention. Although intervention did not focus on weight or body size, and final models adjusted for intervention, it is impossible to preclude the possibility of indirect effects.

Strengths of the current study include the use of objectively measured BMI. Previous work has used self-reported weight (Lebow et al., 2015), which underestimates BMI (Himes, Hannan, Wall, & Neumark-Sztainer, 2005). Additionally, this study used longitudinal data to test a path analysis with a relatively large sample of understudied youth. This approach addresses a call for such path analyses put forth by Goldschmidt and colleagues (Goldschmidt, Aspen, Sinton, Tanofsky-Kraff, & Wilfley, 2008) as well as the call from Padgett (Padgett & Biro, 2003) for longitudinal studies that examine relations between body dissatisfaction and BMI in African American girls.

In light of the current results, practitioners might be encouraged to screen youth for body dissatisfaction which may be an indicator of further negative consequences including disordered eating behaviors. The false notion that African American youth are accepting of excess weight may reduce health care practitioners' willingness to inquire on such topics, leading to deleterious long-term health consequences (Allen et al., 2016). Given national health objectives to reduce rates of obesity, effective providers and health policy

professionals should strive to understand attitudes and behaviors related to body weight, image and healthy lifestyles and intervene with youth for health promotion and behavior change.

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Highlights

- Overweight is linked to disordered eating behaviors and body dissatisfaction
- African American girls are at high risk for overweight
- Body dissatisfaction mediated the relation between weight and disordered dieting
- Body dissatisfaction did not mediate the relation between weight and purging behavior

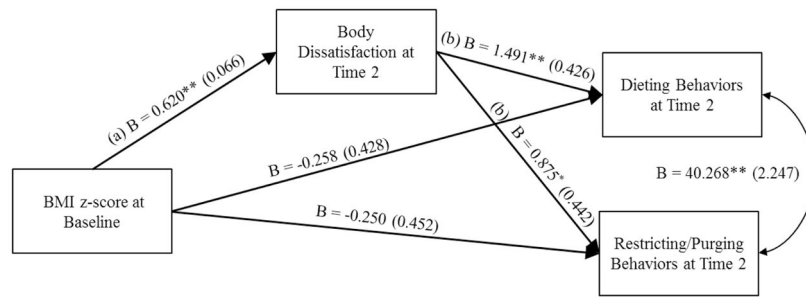


Figure 1. Body dissatisfaction as a mediator of the relationship between BMI z-score and dieting and restricting/purging behaviors. (n = 701)

Note: Unstandardized B weights and (standard errors) are presented along each path.

* $p = .048$ ** $p < .01$

All Time 2 variables control for baseline estimates

‘a’ and ‘b’ paths are identified by the corresponding lowercase letters in brackets.

Table 1

Sample Characteristics

	Time 1 <i>M (SD)/%</i>	Time 2 <i>M (SD)/%</i>
Age (years)	12.15 (0.72)	
Body Mass Index z-score	1.02 (1.03)	
Under weight (< 5 th)	1%	
Normal (5 th to <85 th)	47.4%	
Overweight (85 th to <95 th %)	19.8%	
Obese (95 th and above)	31.7%	
Dieting Behaviors	5.42 (5.98)	6.18 (6.79)
Restricting/Purging Behaviors	1.51 (3.05)	2.12 (4.22)
Body Dissatisfaction (% wants to be smaller)	60.4%	58.6%

Time 1=Baseline

Time 2=Post-intervention follow-up

Table 2

Correlations between the study variables of interest

	1.	2.	3.	4.	5.	6.	7.
1. Dieting Behaviors Time 2	-						
2. Restricting/Purging Behaviors Time 2	.813**	-					
3. Dieting Behaviors Time 1	.498**	.369**	-				
4. Restricting/Purging Behaviors Time 1	.407**	.415**	.795**	-			
5. Body Dissatisfaction Time / 1	.222**	.079	.323**	.218**	-		
6. Body Dissatisfaction Time / 2	.228**	.097*	.226**	.162**	.560**	-	
7. BMI z-score	.235**	.079	.335**	.244**	.604**	.603**	-
8. Age	.000	-.030	-.019	-.027	-.020	-.011	-.030

* $p < .05$,

** $p < .01$

† Dummy coded in reference to "satisfied/does not want to be smaller"