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The Relation between Adiposity and Anxiety in Youth: Analysis of Peer Victimization, Teasing, Sociocultural Influences, and Internalization of Appearance Ideals as Explanatory Variables

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The Relation between Adiposity and Anxiety in Youth: Analysis of Peer Victimization, Teasing, Sociocultural Influences, and Internalization of Appearance Ideals as Explanatory Variables

by

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Table of Contents

List of Tables

List of Figures

Abstract

The purpose of the current study was to examine putative mediators and moderators in the association between adiposity and anxiety in a sample of overweight and obese youth. In addition, anxiety was examined as a potential moderator between adiposity and health-related quality of life (HRQOL). Participants were youth (N = 137) between 8 and 17 years old (M = 13.09, SD = 2.61) and their legal caregivers recruited from four medical clinics affiliated with the University of South Florida. Youth were primarily overweight (28.5%) or obese (64.2%) and ethnically diverse. Data were analyzed by path analysis. Weight-related teasing significantly mediated the association between adiposity and child reported anxiety, but competency-related teasing and peer victimization were not significant mediators. Internalization of appearance ideals significantly moderated the association between adiposity and anxiety by child report; however, no significant moderations were found for parent report. Additionally, sociocultural pressures to meet appearance ideals were not significant moderators by child or parent report. Notably, anxiety significantly moderated the association between adiposity and social functioning by child report, with those experiencing greater anxiety evidencing poorer social quality of life. However, anxiety did not moderate the association between adiposity and other domains of HRQOL by parent or child report. Given the significant increase in pediatric overweight and obesity in recent decades, it is particularly important to understand the psychosocial implications of excess adiposity in youth. Clinical and research implications are discussed focusing on the mechanisms between adiposity and anxiety and suggested clinical interventions to address said mechanisms.

Introduction

The prevalence of childhood obesity in the United States has consistently risen over the past several decades (Ogden et al., 2006). Among children aged 6-11 years, the percentage of children who were obese (defined as a body mass index (BMI) equal to or greater than the 95th percentiles for age and sex) increased from 4.0% during the 1971-1974 National Health and Nutrition Examination Survey administration to 17.7% during the 2011-2012 administration (Ogden, Flegal, Carroll, & Johnson, 2002; Ogden, Carroll, Kit, & Flegal, 2014). During the same period, obesity increased from 6.1% to 20.5% among adolescents aged 12-19 years (Ogden et al., 2002; Ogden et al., 2014). When overweight (BMI ≥ 85%) is included, current prevalence reaches a staggering 34.2% and 34.5% for children aged 6-11 and 12-19 years, respectively (Ogden et al., 2014).

Efforts have been made to pinpoint the reasons for such increases in overweight and obesity. Energy imbalance (i.e., greater energy intake than energy expenditure) leads to overweight and obesity (Institute of Medicine (U.S.). Panel on Dietary Reference Intakes for Electrolytes and Water, 2005), and there is a strong heritability factor to obesity (Allison et al., 1996; Maes, Neale, & Eaves, 1997; Sorensen, Price, Stunkard, & Schulsinger, 1989; Stunkard, Foch, & Hrubec, 1986; Stunkard, Harris, Pedersen, & McClearn, 1990). Yet, such rapid changes in weight cannot be solely attributed to changes in genetic makeup, which take generations to evolve. Instead, societal changes and individual health behaviors significantly contribute to this imbalance. More families are eating meals outside the home, and portion sizes have steadily increased (Ebbeling, Pawlak, & Ludwig, 2002; Nestle, 2003; Zoumas-Morse, Rock, Sobo, &

Neuhouser, 2001). There is a plethora of easy access, inexpensive, high-calorie, high-fat foods (Brownell & Horgen, 2004). In addition, children are less physically active than they were three decades ago and engage in more sedentary activities such as watching television and playing video games (Brownell & Horgen, 2004; French, Story, & Jeffery, 2001). Children also sleep less, which has been associated with weight gain (Cappuccio et al., 2008). The aggregate of these trends, among others, has led to the explosion of increased weight in the pediatric population. Unfortunately, the adverse consequences of child overweight and obesity are many.

There is a well-established link between pediatric obesity and risk for short- and long-term medical problems. In the short-term, overweight children are at greater risk for complications affecting their endocrine, cardiovascular, orthopedic and pulmonary systems (Must & Strauss, 1999; Yanovski, 2001). An increasing proportion of children are developing type II diabetes, which had been primarily in adult populations (Fagot-Campagna et al., 2000). Overweight children are also prone to respiratory ailments such as asthma and sleep apnea, musculo-skeletal problems (e.g., joint pain), and cardiovascular disease risks (e.g., high blood pressure, high cholesterol) (Figueroa-Munoz, Chinn, & Rona, 2001; Freedman, Dietz, Srinivasan, & Berenson, 1999; Redline et al., 1999; Stovitz, Pardee, Vazquez, Duval, & Schwimmer, 2008). In the long-term, obese children are more likely to become obese adults than non-obese children (Field, Cook, & Gillman, 2005; Freedman et al., 2005; Serdula et al., 1993), and obesity-related comorbidities in adulthood are more numerous than in childhood and may be exacerbated by obesity in childhood (Dietz, 1998).

Pediatric obesity has been linked to adverse psychosocial outcomes as well. There are well-established links between pediatric obesity and depression (Mustillo et al., 2003; Pine, Goldstein, Wolk, & Weissman, 2001; Rofey et al., 2009). Obese children are more likely to

suffer weight bias, teasing, and stigmatization from family members, peers, and teachers (Edmunds, 2008; Neumark-Sztainer, Story, & Harris, 1999; Puhl & Latner, 2007; Storch et al., 2007; Tang-Peronard & Heitmann, 2008; van den Berg, Neumark-Sztainer, Eisenberg, & Haines, 2008; Young-Hyman et al., 2006). In addition, the self-esteem of obese children tends to be lower than their non-obese peers (Britz et al., 2000; Erermis et al., 2004; French, Story, & Perry, 1995; Pierce & Wardle, 1993; Sheslow, Hassink, Wallace, & DeLancey, 1993; Strauss, 2000; Wallace, Sheslow, & Hassink, 1993).

Overall, much more is known about the associations between overweight/obesity and psychological functioning than 20 years ago when one of the first meta-analyses was conducted on the psychological correlates of obesity (Friedman & Brownell, 1995). Nevertheless, the link between overweight/obesity and anxiety warrants additional attention as the association is still somewhat unclear; results from extant research between obesity and anxiety are often inconsistent. However, a recent meta-analysis shed some light on this association. From 78 effect sizes, the association between adiposity and anxiety in youth was found to be statistically significant, but small in magnitude (r = .08). Sex and age were significant moderators with girls evidencing a higher summary effect size than boys, and children evidencing a higher effect size than adolescents (Burke & Storch, 2014). The authors suggested the investigation of other variables that may affect the association, including peer victimization and teasing. Therefore, the goal of the current study is to further elucidate the relations between overweight/obesity and anxiety in children and adolescents.

There are several plausible mechanisms that may link anxiety and obesity, and four of these mechanisms will be discussed in brief. First, anxiety could exacerbate weight gain over time (Anderson, Cohen, Naumova, & Must, 2006) by affecting eating behaviors or physical

activity (Rofey et al., 2009). Anxiety is associated with emotional eating and loss of control eating (Goossens, Braet, Van Vlierberghe, & Mels, 2009), the latter which puts children at risk for weight gain (Tanofsky-Kraff et al., 2009). It follows then, that higher levels of anxiety and adiposity are evident in children with loss of control eating episodes (Morgan et al., 2002). Some posit that anxiety could lead to a decrease in physical activity (Rofey et al., 2009). Considering physical activity is associated with better health outcomes and lower adiposity, anxiety that leads to not engaging in such activity could lead to weight gain. Second, taking certain psychiatric medications for alleviation of anxiety-related symptoms may increase the risk for weight-related side effects (Rofey et al., 2009). Psychotropic medications associated with weight gain in children include antipsychotics, anticonvulsants, and antidepressants (Maayan & Citrome, 2010). Antidepressents are often prescribed for children with anxiety (Miller, 2003; Strawn, Sakolsky, & Rynn, 2012), and the amount of weight gain for this class of medication varies depending on type of antidepressant (Fava, 2000). Third, social or biological risk factors may influence both anxiety and weight (Rofey et al., 2009). For instance, low socioeconomic status is a risk factor for overweight and obesity (Goodman, 1999; Strauss & Knight, 1999) as well as for anxiety (Johnson, Cohen, Dohrenwend, Link, & Brook, 1999), and there are strong genetic components to both weight status (Allison et al., 1996; Maes et al., 1997; Sorensen et al., 1989; Stunkard et al., 1986; Stunkard et al., 1990) and anxiety (Arnold & Taillefer, 2011). Fourth, there may be mediating or moderating variables that influence the association, and it is possible that the inconsistent results for obesity and anxiety in children may be attributable to mechanisms that have yet to be studied (e.g., peer victimization) that would help explain the association between the two. For instance, obesity may predict peer victimization and teasing, which may then cause anxiety.

In the effort to better understand the association between adiposity and anxiety, the influence of mediating and moderating variables will be examined in this research. In particular, issues related to weight bias such as peer victimization and teasing will be investigated as mediators to explain the association between adiposity and anxiety, and social pressures to meet appearance ideals and internalization of appearance ideals will be investigated as moderators between adiposity and anxiety. In addition, health-related quality of life will be examined as an indicator of overall well-being. Before discussing the hypothesized mechanisms, the current literature on the relations between overweight/obesity and anxiety will be reviewed.

Overweight/Obesity and Anxiety

As with most psychopathology that occurs across the developmental spectrum, the association between anxiety and obesity has been studied more often in adults than in children; results have been equivocal for prospective studies, but more consistent for cross-sectional studies. Recently, the unidirectional association between obesity and anxiety disorders in adults was examined in a systematic review of prospective studies and a meta-analysis of cross-sectional studies (Gariepy, Nitka, & Schmitz, 2010); studies were included if obesity was the predictor variable and anxiety the outcome variable. There was a positive association between weight and anxiety disorders across included cross-sectional studies analyzed using meta-analytic methods. Across 13 studies, the pooled odds ratio of the association between an anxiety disorder and obesity was 1.40, 95% CI [1.23, 1.57], and the association held for both men (OR = 1.3) and women (OR = 1.4). When studies included adequate controls for confounding demographic, health, and/or lifestyle variables, the association was smaller (OR = 1.2) compared to when they did not (OR = 1.5). Importantly, however, the association was still significant for both.

Of the two prospective studies that were identified, results were mixed (Gariepy et al., 2010). The first used cutoff scores of nonspecific anxiety symptoms from the Hospital Anxiety and Depression Rating Scale (Zigmond & Snaith, 1983), and obesity had a significant positive effect on anxiety disorders in men (OR = 1.50, 95% CI [1.23, 1.83]) but not women (OR = 0.99, 95% CI [0.85, 1.15]) (Bjerkeset, Romundstad, Evans, & Gunnell, 2008). The second examined generalized anxiety disorder (GAD) assessed by the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (American Psychiatric Association, 1994) criteria (Kasen, Cohen, Chen, & Must, 2008). The women-only study showed a significant positive effect of obesity on anxiety disorders (OR = 6.27, 95% CI [1.39, 28.16]). Overall, obesity in adulthood did not consistently predict anxiety; a definitive causal link was not established.

As with adults, prospective studies beginning in childhood have not identified a clear causal link between obesity and anxiety. Consistent with Kasen et al. (2008), adolescent obesity significantly predicted development of anxiety disorders into adulthood for females (HR = 3.8, 95% CI [1.3, 11.3]) but not for adolescent males (HR = 0.7, 95% CI [0.2, 2.9]) (Anderson, Cohen, Naumova, Jacques, & Must, 2007). In contrast, when child and adolescent obesity were examined prospectively as a predictor of the development of anxiety disorders, they were not associated with anxiety disorders, adjusting for age, sex, income, and other psychiatric disorders (Mustillo et al., 2003). The Mustillo et al. (2003) study occurred over an eight-year period, and the study sample consisted of over 900 white, rural children aged 9-16 years. The Anderson et al. (2007) study covered a longer duration of time, which may account for some of the differences. Baseline data were collected when participants were 9-18 years old, and data were collected for a total of four waves, until participants were 28-40 years old (Anderson et al., 2007).

The Anderson et al. (2007) sample was also used to identify whether the relation held in the opposite direction, that is, if anxiety in childhood predicted obesity in adulthood. Anxiety disorders in childhood were examined prospectively as a predictor of BMI differences and BMI change over time (i.e., weight trajectory) (Anderson et al., 2006). Body Mass Index *z*-scores were significantly higher for females with anxiety disorders, and although the magnitude of the difference was small, it was consistent over time. No significant association was found for males. Importantly, although this was a longitudinal study, a definitive temporal association between weight and anxiety could not be established because of measurement methodology. Still, this prospective relationship was echoed when anxiety disorders were analyzed prospectively as predictors of weight change in non-obese children (Rofey et al., 2009). Childhood anxiety was associated with increased BMI percentile over three years in a sample of children aged 8-18 years; the BMI of those with anxiety disorders was 11.6 percentage points higher compared to controls (Rofey et al., 2009). Overall, prospective studies indicate anxiety disorders in childhood and adolescence are associated with some weight gain over time (Anderson et al., 2006; Rofey et al., 2009); however, results are mixed regarding whether childhood obesity predicts anxiety (Anderson et al., 2007; Mustillo et al., 2003).

In contrast to the adult literature (e.g., Gariepy et al., 2010 for review), existing studies in children show an inconsistent cross-sectional relation between obesity and anxiety (Rofey, Black, Phillips, Blake, & Olson, 2010). Some show an association (Britz et al., 2000; Buddeberg-Fischer, Klaghofer, & Reed, 1999), while others do not (Britz et al., 2000; Erermis et al., 2004; Lamertz, Jacobi, Yassouridis, Arnold, & Henkel, 2002; Tanofsky-Kraff et al., 2004). One possible reason for that difference relates to sample characteristics. Clinical samples (i.e., children seeking weight loss treatment) have more severe cases of obesity and represent separate

types of obese individuals who are prone to more severe behavior problems compared to obese children in the general population (Zametkin, Zoon, Klein, & Munson, 2004). Support for this was found in a sample of severely obese 15-21-year-olds in treatment for weight loss who were compared to obese controls and normal weight controls in a study assessing lifetime prevalence of anxiety disorders (Britz et al., 2000). In this cross-sectional study, lifetime prevalence of anxiety disorders in the obese clinical sample was significantly higher than for those in the obese and non-obese control groups. Prevalence was higher for social anxiety, PTSD, and specific phobia, as well as for a composite of all anxiety disorders (including those that could not be tested individually due to low levels of endorsement across groups) (Britz et al., 2000). There were no significant differences between control groups. One might attribute these differences to the difference between clinical and non-clinical samples. However, the treatment-seeking obese participants were significantly heavier (BMI $M = 42.4$, $SD = 7.1$) than the obese controls (BMI $M = 29.8$, $SD = 3.2$), and the authors point out that it is not clear if the higher prevalence of anxiety disorders was due to their treatment-seeking behavior or to the extreme obesity of the clinical group.

Others comparing clinical and non-clinical samples of obese children and adolescents have found opposing results. A clinical sample of obese adolescents aged 12-16 years was compared to a non-clinical obese group and a non-obese group, and there were no significant differences between groups on rates of anxiety disorders (Erermis et al., 2004). Similarly, there were no significant differences in anxiety disorder prevalence or anxiety symptomology between a group of overweight children and adolescents referred for weight treatment and a non-referred overweight group (Goossens et al., 2009; Van Vlierberghe, Braet, Goossens, & Mels, 2009). As with Britz et al. (2000), the clinical samples were significantly heavier than the non-clinical

samples (Goossens et al., 2009; Van Vlierberghe et al., 2009), and though no significant differences were found for anxiety, differences were found for other diagnoses (e.g., mood disorder, eating disorder) (Goossens et al., 2009; Van Vlierberghe et al., 2009).

Overall, as hypothesized with adults (Stunkard & Wadden, 1992), non-clinical obese children and adolescents generally have similar levels of anxiety disorders and symptomology compared to their healthy non-obese peers. Whether treatment-seeking obese children and adolescents experience higher levels of anxiety disorders and symptomology than either of these groups is still somewhat unclear. Medical treatment alone is not the key difference, as treatment-seeking obese youth vary in anxiety levels from other children seeking medical treatment. For example, when compared to a clinical sample of non-obese children undergoing treatment for diabetes, the clinical sample of obese children scored significantly higher on trait anxiety, which supports the hypothesis that other factors than treatment alone may be responsible for treatment seeking youths' greater levels of anxiety (Vila et al., 2004). Importantly, the relation still held after age, sex, and socioeconomic status were covaried (Vila et al., 2004).

In general, 27-32% of obese treatment-seeking children have at least one DSM-IV anxiety disorder (Eddy et al., 2007; Erermis et al., 2004; Vila et al., 2004). Treatment-seeking children with extreme obesity have even greater prevalence of anxiety disorders at 40% (Britz et al., 2000). Across studies, for treatment-seeking obese youth with an anxiety diagnosis, social anxiety (Britz et al., 2000; Eddy et al., 2007; Vila et al., 2004) and generalized anxiety disorder (Eddy et al., 2007; Vila et al., 2004) were the most prevalent.

The conflicting results regarding anxiety in treatment-seeking obese children and adolescents have led some to propose that the mechanisms that moderate and mediate the association with anxiety have not been adequately examined. Yet, understanding what factors

might influence this relationship is important as psychopathology is related to poor outcomes in weight-loss treatments (Epstein, Wisniewski, & Weng, 1994). In addition, identifying risk factors for anxiety may lead to additional components during treatment that could result in better emotional and health outcomes and improvements in general well-being. Therefore, another purpose of the current study is to identify factors that can be addressed during treatment to ameliorate the levels of anxiety experienced by these children and improve health-related quality of life. Social influences such as peer victimization, teasing, and sociocultural pressures for appearance ideals as well as internalization of those appearance ideals may be the mechanisms by which obesity and anxiety are linked, and the theoretical rationale for these mechanisms are discussed in greater detail below.

Peer Victimization

Peer victimization is the experience of overt (e.g., hitting, pushing, threatening) and/or relational (e.g., ignoring, gossiping, excluding, spreading rumors) acts of aggression by an individual or peer group (Crick & Bigbee, 1998; Hawker & Boulton, 2000). It is estimated that between 17-30% of children and adolescents experience chronic peer victimization (Crick & Bigbee, 1998; Hawker & Boulton, 2000), and the impact of peer victimization across populations (Storch & Ledley, 2005) and specifically within obese pediatric populations (Gray, Kahhan, & Janicke, 2009; Storch et al., 2007) has been highlighted. Children with medical conditions are common targets of peer victimization given the often conspicuous nature of their conditions that set them apart from their peers (Storch & Masia-Warner, 2004), and considering overweight and obesity are unconcealed conditions that are highly stigmatized in society (Puhl & Latner, 2007), it stands to reason that children in this category are especially susceptible as targets of peer victimization. It is well-established that peer victimization is associated with significant

psychosocial distress including anxiety, depression, and loneliness (Hawker & Boulton, 2000; Juvonen, Graham, & Schuster, 2003; Storch et al., 2007) and global and social self-worth (Hawker & Boulton, 2000). Together, one might expect that obesity would lead to peer victimization that would then lead to anxiety.

Teasing

Teasing has been defined in several different ways and is sometimes confounded with peer victimization (Keltner, Capps, Kring, Young, & Heerey, 2001), although the two are distinct constructs. Keltner et al. (2001) defined teasing as "an intentional provocation accompanied by playful off-record markers that together comment on something relevant to the target" (p. 234). This definition differentiates teasing from peer victimization, in which there is no use of off-record markers (Keltner et al., 2001). Although teasing can be done in the spirit of play, weight-related teasing often uses minimal off-record markers, therefore teasing in this regard is more likely to perceived by the target individual as literal, direct, and hostile (Keltner et al., 2001).

The negative consequences from weight-related teasing are many and include higher levels of depression (Madowitz, Knatz, Maginot, Crow, & Boutelle, 2012), decreased self-efficacy (Losekam, Goetzky, Kraeling, Rief, & Hilbert, 2010), decreased academic performance (Gunnarsdottir, Njardvik, Olafsdottir, Craighead, & Bjarnason, 2012; Krukowski et al., 2009), decreased body dissatisfaction (McCormack et al., 2011), and unhealthy weight control behaviors (Madowitz et al., 2012). In a recent meta-analysis, a moderate effect size was found for weight-related teasing and body dissatisfaction (r = .39), dietary restraint (r = .35), and bulimic behaviors (r = .36) (Menzel et al., 2010), all of which are risk factors for weight-related disorders (Stice, 2002; Stice, Marti, Rohde, & Shaw, 2011). Overall, overweight and obese youth

are more than twice as likely to be teased as their non-obese peers (Hayden-Wade et al., 2005; Neumark-Sztainer et al., 2002). Given the negative impact of weight-related teasing and the evidence of the association between teasing and anxiety (McCabe, Antony, Summerfeldt, Liss, & Swinson, 2003; McCabe, Miller, Laugesen, Antony, & Young, 2010; Storch et al., 2004), it follows that weight-related teasing could be a risk factor for anxiety.

Teasing regarding general competency is also relevant as children who are teased about their abilities and intellect are more likely to be anxious than those who are not teased in this regard. Considering overweight and obese youth are viewed as intellectually inferior and generally less competent by their peers (Brylinsky & Moore, 1994; Greenleaf, Chambliss, Rhea, Martin, & Morrow, 2006), it follows that they may experience relatively high levels of such teasing, which would lead to increased levels of anxiety.

Sociocultural Influences and Internalization of Appearance Ideals

There are substantial sociocultural influences to achieve appearance ideals. These influences emanate from the media, peers, and family and contribute to an internalization of beauty ideals (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). For women, the cultural ideal of beauty is represented by a thin physique (Thompson et al., 1999), while for males the ideal is a lean, muscular physique (Pope, Olivardia, & Phillips, 2000; Thompson & Cafri, 2007). The ideal is not unique to adults; children and adolescents understand and experience the ideal, even at the level of their toys. For instance, girls are exposed to unrealistic beauty ideals from dolls such as Barbie (Norton, Olds, Olive, & Dank, 1996), and boys, through super-muscular superheroes and action figures (Pope, Olivardia, Gruber, & Borowiecki, 1999). The internalization of such ideals often leads to dieting and eating pathology in attempts to meet the ideal, as well as overall negative affect for a lack of meeting the ideal (see Stice 2002 for a

review). This phenomenon occurs in people across the weight spectrum, yet the actual discrepancy from this ideal and reality is largest for those who are overweight or obese. Given this, sociocultural influences to meet appearance ideals and internalizing appearance ideals may moderate the association between adiposity and anxiety. For instance, peers are very influential during childhood and adolescence (Berndt & Ladd, 1989; Prinstein & Dodge, 2008), and exposure to appearance-related conversations that involve making disparaging statements about weight (e.g., "fat talk") teach children to be highly evaluative of their appearance (Nichter, 2000). This, in turn, leads to an internalization of appearance ideals, which is associated with negative affect (Thompson & Stice, 2001). Therefore, one may expect that overweight and obese children who perceive more societal pressure (i.e., from the media, peers, and family) and internalize appearance ideals are more likely to experience anxiety.

Health-Related Quality of Life

Health is a broad construct referring to physical, mental, and social well-being (World Health Organization, 1948), and health-related quality of life (HRQOL) focuses on these domains as associated with a specific disorder or health-related issue. Health-related quality of life is based on an individual's subjective evaluation and can be assessed only via self-report; however reports by others can serve as proxies (Fayers & Machin, 2000). Health-related quality of life is important within the study of obesity as it allows for a broad survey of the psychosocial impact of obesity (Kolotkin, Haaz, & Fontaine, 2009). Ideally, it can be used to tailor treatment to an individual patient's life circumstances and challenges, however in aggregate, it allows for the identification of possible areas to intervene in the development of treatment protocols (Kolotkin et al., 2009).

With one known exception (Ingerski, Janicke, & Silverstein, 2007), most have found that higher weight status is associated with lower HRQOL. In a nationally representative sample of adolescents, BMI was related to general and physical health, and obese adolescents reported significantly more functional limitation and worse health than their peers (Swallen, Reither, Haas, & Meier, 2005). Obese youth in treatment for weight loss had significantly worse HRQOL (including physical, emotional, social, school, and psychosocial functioning) relative to published norms on healthy youth (Zeller & Modi, 2006), and even after adjusting for age, race, sex, and chronic health conditions, obese children had lower HRQOL compared to normal weight children (Friedlander, Larkin, Rosen, Palermo, & Redline, 2003). Obese children have impaired HRQOL compared to healthy children, and, perhaps as a testament to the severity of the condition, similar HRQOL to youth diagnosed with cancer (Schwimmer, Burwinkle, & Varni, 2003). As peer victimization (Wilkins-Shurmer et al., 2003) and teasing (Jensen & Steele, 2012) have each independently been associated with poorer HRQOL, it is possible that they may have additive effects in obese youth who already experience lower HRQOL via purportedly higher levels of anxiety.

Aims and Hypotheses

The current study has two principle aims. The primary aim of this study is to examine the association between overweight/obesity and anxiety in children and adolescents by investigating a number of theoretically relevant variables, namely peer victimization and teasing as mediating variables, and sociocultural influences to meet appearance ideals and internalization of appearance ideals as moderating variables. The secondary aim of this study is to examine whether anxiety moderates the association between adiposity and HRQOL. In addition to these principle aims, an exploratory aim of the current study is to investigate which anxiety domains

(i.e., social anxiety, generalized anxiety, etc.) best fit the hypothesized model. All aims and hypotheses will be examined using path analysis. The theoretical model for the principle aims is presented in Figure 1A; however, the mediation and moderation portions of the model will be tested separately. The theoretical models for the exploratory aim are identical to that presented in Figure 1A; however, each anxiety domain will be entered in place of the composite anxiety variable resulting in five separate models. Therefore, there will be individual models for social anxiety, generalized anxiety, separation anxiety, panic disorder, and school avoidance.

Hypotheses for the principle aims are as follows:

1a. Adiposity will be indirectly related to anxiety through peer victimization.

Overweight and obese children are more likely to be victimized by their peers than their normal weight counterparts (Gray et al., 2009), and peer victimization is associated with higher levels of anxiety (Storch et al., 2007). Therefore, it follows that having a higher BMI may lead to peer victimization, which would in turn lead to greater anxiety.

1b. Adiposity will be indirectly related to anxiety through teasing.

Children who are teased for weight and appearance reasons experience greater levels of anxiety than those who are not. Although weight- and appearance-related teasing are not solely experienced by children who are above normal weight, they are more likely to be (McCormack et al., 2011), and therefore would experience higher levels of anxiety as a result.

1c. Sociocultural influences and internalization of appearance ideals will moderate the association between adiposity and anxiety.

Children who feel pressure to achieve sociocultural appearance ideals from family, peers, or the media and internalize these appearance ideals experience body dissatisfaction and

negative affect (Keery, van den Berg, & Thompson, 2004; Shroff & Thompson, 2006). Given this, sociocultural influences and internalization of appearance ideals may moderate the association between adiposity and anxiety where those who perceive such pressures and internalize the ideals experience greater levels of anxiety than those who do not.

The hypothesis for the secondary aim is as follows:

2. Anxiety will moderate the association between adiposity and HRQOL.

Overweight and obese children's HRQOL is generally worse than their normal weight peers (Friedlander et al., 2003; Zeller & Modi, 2006) and on par with children with chronic medical conditions (Schwimmer et al., 2003). It is expected that the association between adiposity and HRQOL will be negative, given children with extreme obesity experience lower HRQOL than their obese peers and obese children experience lower HRQOL than their overweight peers (Varni, Limbers, & Burwinkle, 2007). However, anxiety is also associated with lower HRQOL (Olatunji, Cisler, & Tolin, 2007), and anxiety exerts adverse effects on HRQOL in persons with medical disorders including epilepsy, gastro-esophageal reflux disease, and cancer, among others (Irvine, 2004; Johnson, Jones, Seidenberg, & Hermann, 2004; Schwartz & Drotar, 2006). Therefore, anxiety likely adversely affects HRQOL in overweight and obese children and adolescents.

The hypothesis for the exploratory aim follows:

1. Model fit will be best for social anxiety.

The most prevalent anxiety disorders in youth in treatment for weight loss are social anxiety and generalized anxiety (Britz et al., 2000; Eddy et al., 2007; Vila et al., 2004);

therefore it is likely that the proposed mechanisms will best explain these associations. However, given the social aspects of peer victimization, teasing, and sociocultural influences, the model is likely to explain the association between adiposity and social anxiety best.

Method

Participants

Participants included 137 children and adolescents (56.9% girls) recruited from four clinics associated with the University of South Florida's departments of Adolescent Medicine, Medicine Pediatrics, and Internal Medicine Pediatric Healthy Weight Clinic (HWC). The HWC is a treatment facility for children and adults with eating disorder and weight concerns, and participants (29.9%) were recruited during their initial appointment for weight management concerns. The participants recruited from Adolescent Medicine (52.6%) and Medicine Pediatrics (17.5%) were attending well-child visits or other non-weight-related doctor appointments. Youth participants ranged in age from 8 to 17 years (M = 13.09, SD = 2.61) and were primarily overweight (28.5%) or obese (64.2%). BMI percentile and BMI z-score ranged from 73.04 to 99.83 (M = 94.99, SD = 5.46) and 0.61 to 2.93 (M = 1.90, SD = 0.55), respectively. The sample was relatively diverse with 38.7% Caucasian, 32.1% African-American, 19.0% Hispanic, 8.8% Multi-Ethnic, and 1.5% Asian participants. The majority of parents and caregivers completed the parent packets (92.7%). Mothers were the most frequent reporters (78.7%), followed by other legal guardians (e.g., grandmothers; 10.2%), fathers (6.3%), and both parents (4.7%). Youth primarily lived with their single parent mothers (37.8%) or both biological parents (30.7%). Family income was under $20,000 for 26.4% of participants, between $20,001 to $40,000 for 38.8%, between $40,001 to $60,000 for 12.4%, and above $60,001 for 22.3%.

Procedures

The study was approved by the University of South Florida institutional review board. A questionnaire packet was provided to participants during regular office visits, and surveys were completed in the waiting room or clinic room. Prior to any data collection, children provided written assent, and a parent provided written consent for participation in the study. Following completion of the questionnaire, participants were provided with a debriefing form containing relevant contact and study information and referral information to anxiety clinics and psychologists and psychiatrists in the Tampa Bay area. A member of the research team recorded participant height, weight, and BMI when it was obtained during the office visit. No compensation was provided for participation in the study.

Measures

Body Mass Index (BMI). Body mass index was used as a measure of adiposity and was calculated from objectively measured weight and height (kilograms/meters^2). Height and weight were measured as part of the intake process at the clinic, and body mass index standardized and converted to percentiles based on the Centers for Disease Control norms for age and sex (Kuczmarski et al., 2002). As 27% of the sample was at the 99th percentile and above, BMI *z*-score based on the Centers for Disease Control norms for age and sex was used in all analyses to alleviate range restriction.

Screen for Childhood Anxiety Related Emotional Disorders - Parent and Child Versions (SCARED). The SCARED (Birmaher et al., 1999; Birmaher et al., 1997)) assesses childhood anxiety symptoms, specifically related to general anxiety disorder (GAD), separation anxiety disorder, panic disorder, and social anxiety disorder, and a related construct - school avoidance - by child and parent self-report. Multiple informants (i.e., parent and child) were

assessed to account for known discrepancies in parent and child reporting of psychological symptomology (Rothen et al., 2009). The SCARED has 41 items that assess symptom severity for the past three months and parallel DSM-IV (American Psychiatric Association, 2000) classification criteria. The scale is a Likert-type scale ranging from 0 to 2 (0: "not true or hardly ever true," 1: "sometimes true," and 2: "true or often true."). The SCARED was developed with children ages 9-19 years (Birmaher et al., 1999; Birmaher et al., 1997) and validated with children ages 8-19 years (Birmaher et al., 1999; Birmaher et al., 1997; Muris, Merckelbach, Mayer, et al., 1998; Muris, Merckelbach, van Brakel, Mayer, & van Dongen, 1998). It has demonstrated sound internal consistency (Birmaher et al., 1999; Birmaher et al., 1997; Muris et al., 1998), test-retest reliability (Birmaher et al., 1997), concurrent validity (Muris et al., 1998; Monga et al., 2000), and divergent validity (Muris, Merckelbach, van Brakel, et al., 1998; Monga et al., 2000). In the current study, Cronbach's alpha for the child and parent report total scale was .92 and .93 respectively. All child report subscales demonstrated acceptable reliability (.78 -.83) with the exception of school avoidance (.46). Internal consistency for parent reported subscales ranged from .69 to .86. Given the low reliability for the school avoidance subscale, it was removed from further analyses.

Personal Experiences Checklist (PECK). The PECK (Hunt, Peters, & Rapee, 2012) assesses overt and relational aggressive bullying behaviors and is designed for use in children 8 years and older and has been validated in adolescents through 16 years of age (Hunt, Peters, & Rapee, 2012). The 32-item scale reduces to four factors: relational-verbal bullying (e.g., "Other kids say mean things about me behind my back"), cyber bullying (e.g., "Other kids send me nasty emails"), physical bullying (e.g., "Other kids hit me"), and bullying based on culture (e.g., "Other kids make fun of my language."). Items are rated on the frequency of victimization over

the past month at school. Responses are on a 5-point Likert-type scale ranging from 1: "Never" to 5: "Every day." Internal consistency ranges from good to excellent (Cronbach's α range = .78 - .91) and test-retest reliability is adequate (range r = .61 – .86). Concurrent and convergent validity are also good for the overall measure and subscales, with the exception of cyber-bullying, for which validity is more variable (Hunt et al., 2012). For the purposes of this study, subscales relating to relational-verbal bullying, cyber bullying, and physical bullying will be used in the analysis. Cronbach's alpha for the total scale was .94 in this sample, and all subscales demonstrated acceptable reliability (.80 - .92).

Perception of Teasing Scale (POTS). The POTS (Thompson, Cattarin, Fowler, & Fisher, 1995) is an 11-item scale that assesses perception of teasing related to two areas, weight-related teasing and general competency. Sample items for each are "People called you names like fatso" and "People teased you because you didn't get a joke." Each item has a question related to frequency of teasing (i.e., "For each question rate how often you think you were teased.") and reaction to teasing (i.e., "How upset were you?"). Responses are on a 5-point Likert-type scale ranging from 1: "Never" to 5: "Very Often" for frequency and 1: "Not upset" to 5: "Very Upset" for reaction. The scale was initially developed and validated in college-aged women (Thompson et al., 1995). Internal consistency was excellent for general weight (Cronbach's α = .94) and good for general competency (Cronbach's α = .78) (Thompson et al., 1995). Convergent validity was adequate (Thompson et al., 1995). The POTS was recently validated in preadolescent boys and girls (Jensen & Steele, 2010). The two-factor structure (i.e., a weight-related teasing factor and general competency factor) was confirmed, measurement invariance by sex substantiated, and construct validity established with attitudes towards physical activity (Jensen & Steele, 2010). Although the POTS has not been formally validated in

adolescent populations, it has been used extensively with adolescents (e.g., Eddy et al., 2007; Stern et al., 2007). In the current study, Cronbach's alpha for both subscales was acceptable (.82 - .92).

Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4). The SATAQ-4 (Schaefer et al., 2015) is a 22-item measure that assesses internalization of cultural body ideals and perceived sociocultural appearance-related pressures. It is based on a 5-point Likert-type scale ranging from 1: "Definitely disagree" to 5: "Definitely agree." Total scale reliability was excellent (Cronbach's $\alpha = .90$) in samples of female undergraduates (Schaefer et al., 2015). Convergent validity for the total scale, established among measures of eating pathology, appearance evaluation, and self-esteem, was also acceptable (Schaefer et al., 2015). Although this scale has not yet been validated in persons 16 and younger, there is evidence for strong psychometric properties from the previous version (i.e., the SATAQ-3; Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004) in this age group. In a large sample of adolescents, internal consistency was very good, and convergent validity with measures of eating pathology was acceptable (Wilksch & Wade, 2012). The authors suggested a shortened version of the measure for this age group (Wilksch & Wade, 2012), which was accomplished in the SATAQ-4. For the current study, Cronbach's alpha for the total scale was .91. Internal consistency for the subscales ranged from .76 - .94.

Pediatric Quality of Life Inventory, Version 4.0 – Parent and Child Versions (PedsQL). The PedsQL (Varni, Seid, & Rode, 1999; Varni, Burwinkle, Seid, & Skarr, 2003) was designed to assess HRQOL in four domains (physical, emotional, social, and school) for parents with children between 2 to 18 years old and for children between 5 to 18 years old. Empirical analyses indicated five distinct factors including physical functioning, emotional

functioning, social functioning, school functioning, and school missing (i.e., missing school for medical reasons) (Limbers, Newman, & Varni, 2008; Varni, Seid, & Kurtin, 2001). There are different forms by age group, and for the purposes of this study, the versions for children 8-12 years and adolescents 13-18 years were used with both informants. The scale consists of 23 items and uses a 5-point Likert-type scale (0: "never a problem" to 4: "almost always a problem"). All items are reverse scored and transformed so the total scale score ranges from 0 to 100, with higher scores indicating better HRQOL. Reliability for the total scale is excellent for both child (α = .88) and parent (α = .90) report. Validity has been established with comparisons of healthy versus chronically ill samples of children and correlations between morbidity and the PedsQL scales (Varni et al., 2007). In the current study, Cronbach's alpha for the total scale was .92 for child report and .93 for parent report. Internal consistency for the subscales ranged from .79 - .81 for child report and .83 - .89 for parent report.

Children's Depression Inventory 2, Self-Report (Short) Version (CDI 2:SR[S]). The CDI 2:SR[S] (Kovacs, 2010) is a screening tool designed to assess symptoms of depression in the past two weeks in children between 7 and 17 years old. The scale consists of 12 items with three responses each, and higher scores indicate more depressive symptomology. The CDI 2:SR[S] was normed with a sample of 1,100 children ages 7-17, and reported psychometric properties are excellent including internal consistency of .87, one-week test-retest reliability of .84, and good concurrent validity with measures of anxiety and self-esteem (Kovacs, 2010). The total score is comparable to the total score produced by the full-length version (Kovacs, 2010). For the current study, Cronbach's alpha was .77.

Demographics Questionnaire. Parents were given a questionnaire to complete indicating the child's race/ethnicity, age, and sex. The demographics questionnaire also included

information on family income, psychiatric and medical medications, and parent psychological history.

Statistical Analyses

Path analysis using full information maximum likelihood estimation (FIML) was used to examine all hypotheses and was conducted using MPlus (Muthén & Muthén, 2012). With path analysis, theoretical associations among observed variables (i.e., indicator variables) are established by solving simultaneous regression equations, and variables are assessed as single indicators in the model (Schumacker & Lomax, 2010). The anxiety variable for the principle aims was a composite of the anxiety subscale scores, where available, by both parent and child report.

One limitation of path analysis is it does not account for measurement error in the observed variables (Wolfle, 1979). To address this limitation, internal consistency was analyzed for each measure, and confirmatory factor analyses (CFAs) were run for each of the single indicator variables (excluding BMI *z*-score) a priori to analyze model fit. If necessary, the model was adjusted to minimize measurement error. For the CFA and the path analyses, multiple fit indices were examined to evaluate overall model fit. The chi-square test of fit was examined first, and a non-significant result indicates good model fit. Nevertheless, the chi-square test is very sensitive to sample size. Given this, good model fit was also determined by the following indices for continuous data: Comparative Fit Index (CFI; Bentler, 1990) values of .95 or higher, Root Mean Square Error of Approximation (RMSEA; Steiger, 1990) values less than .05, and Standardized Root Mean Square Residual (SRMR) values of .05 or less. Acceptable model fit was indicated by values of .90, .08, and .08, respectively. The estimation method used for ordinal data was weighted least squares means and variance adjusted (WLSMV), and the CFI and

RMSEA were examined to assess model fit with the same criteria as continuous data. All other statistical analyses (e.g., examination of model assumptions, descriptive statistics, exploration of significant interaction effects, etc.) were conducted using SPSS Versions 21.0 and 22.0. If there was a significant correlation between family income (a proxy for socioeconomic status) and the model variables, family income would be tested in the model as a covariate. In addition, with acceptable model fit for primary and secondary aims, multigroup analyses were planned for sex and age to determine whether the model held equally for boys and girls and for older and younger children.

As suggested during the proposal, exploratory models testing child- and parent-reports separately were conducted. Also as suggested, adiposity was analyzed in the primary aim models as a categorical variable. Lastly, depression, which is often comorbid with anxiety, was added to the primary models as an outcome variable. The difference in model fit between the original model and the model with depression as an additional outcome was tested with the Akaike Information Criteria (AIC). The model with the lowest AIC is considered the better fitting model (Kline, 2011).

Results

Measurement Models

Measurement models from child and parent report were reviewed for areas of misfit and modified when conceptually appropriate. All CFAs from child report demonstrated acceptable to good model fit. The SCARED-Parent did not demonstrate acceptable fit (χ^2 (623, N = 125) = 933.25, $p < .001$; CFI = 0.86; RMSEA = .06 [90% CI: .06, .07]), and the PedsQL-Parent Proxy demonstrated mixed fit (χ^2 (220, N = 124) = 429.43, $p < .001$; CFI = 0.95; RMSEA = .09 [90% CI: .08, .10]). The parent measures were therefore analyzed using item-to-total correlations to identify whether particular items loaded poorly on to their respective subscales. Two items on the SCARED-Parent panic subscale by parent report demonstrated low item to total correlations (i.e., Item 27: "When my child gets frightened, he/she feels like he/she is choking" item to total correlation = .15; Item 38: "When my child gets frightened, he/she feels dizzy" item to total correlation = .10). These items were removed from the scale. The SCARED-Parent report was then re-evaluated using CFA, and it demonstrated acceptable fit (χ^2 (554, N = 125) = 688.37, $p < .001$; CFI = 0.94; RMSEA = .04 [90% CI: .03, .05]). All items on the PedsQL-Parent Proxy demonstrated acceptable item-to-total correlations; therefore, the measure was analyzed with exploratory factor analysis using principal axis factoring and direct oblimin rotation. The number of factors to extract was determined by parallel analysis and an examination of the scree plot. Items that loaded less than .32 onto any factor were eliminated from the scales, as they signal poor fit (Tabachnick & Fidell, 2007). Items that cross-loaded at .32 or higher on two or more scales (Cotello & Osborne, 2005) were also eliminated. The two items from the school missing

subscale from the PedsQL-Parent Proxy were eliminated through the data modification process. Items 1 and 5 from the PedsQL-Parent Proxy social functioning subscale were also removed. A CFA was conducted on the revised PedsQL-Parent Proxy, and it demonstrated acceptable fit (χ^2 (146, N = 124) = 261.54, $p < .001$; CFI = 0.97; RMSEA = .08 [90% CI: .06, .10]). As parent and child report on the SCARED and PedsQL resulted in different factor structures, a composite variable could not be established. Given this, the models for the primary aims were analyzed with two outcomes (i.e., parent- and child-reported anxiety), and the model for the secondary aim was analyzed separately by reporter. Parameters are reported as standardized values for all path models.

Peer Victimization and Teasing as Mediators of Adiposity and Anxiety

Peer victimization and teasing were expected to mediate the association between adiposity and anxiety (hypotheses 1a and 1b). The correlations between several of the PECK and POTS subscales were large (i.e., equal to or greater than .50; see Table 1A for zero-order correlations between child study variables); therefore, the subscales with large correlations were entered as correlates in the model. Adiposity was not significantly correlated with the PECK total score, PECK subscale scores, or the POTS competency-related teasing scores. However, the POTS weight-related teasing scores were positively and significantly correlated with adiposity, and the association was small to moderate in size. As family income was not significantly correlated with most study outcome variables, income was not included as a covariate in the analyses.

The model fit analyzing the mediation effects of peer victimization and teasing on adiposity and anxiety was poor (χ^2 (4, $N = 137$) = 39.35, $p < .001$; CFI = 0.93; RMSEA = .25 [90% CI: .19, .33]; SRMR = .14). Figure 2A shows the path diagram with all path coefficients;

Figure 3A shows only significant pathways. The direct pathway from adiposity (i.e., BMI *z*-score) to the POTS weight-related teasing subscale was significant, and weight-related teasing was significantly related to the SCARED-Child total score, but not the SCARED-Parent total score. The mediation effect was partial, as the specific indirect effect between adiposity and the SCARED-Child total score remained significant ($\beta = 0.08$, $t = 2.09$, $p < .05$). The PECK verbal and cyber bullying subscale scores were unrelated to adiposity, but were significantly related to both SCARED-Child and SCARED-Parent total scores. As the model fit was only acceptable for the CFI and the majority of the endogenous variables were unrelated to adiposity, the hypothesized model was not supported by the data. Given this, the multigroup analyses by sex and by age group were not performed, as good overall model fit is a prerequisite for subgroup analyses. The model was tested with adiposity as a categorical variable based on BMI percentiles to divide youth into overweight and obese groups. Model fit was virtually equivalent to model fit with adiposity as a continuous variable, χ^2 (4, $N = 137$) = 40.80, $p < .001$; CFI = 0.92; RMSEA = .26 [90% CI: .19, .33]; SRMR = .15. The model was then tested using adiposity as a continuous variable and the CDI 2:SR[S] as an additional outcome variable (see Figure 8A). Model fit was still poor (χ^2 (5, $N = 137$) = 39.24, $p < .001$; CFI = 0.94; RMSEA = .22 [90% CI: .16, .29]; SRMR = .14), and the addition of the depression variable did not result in a better model (AIC with CDI 2:SR[S] = 6271.51; AIC without CDI 2:SR[S] = 5590.60). Of note, the POTS weight-related teasing subscale remained a significant moderator for the SCARED-Child total score. Overall, however, hypothesis 1a and 1b were not supported.

The mediation models were examined in an exploratory manner using individual SCARED-Child and SCARED-Parent subscale scores as outcomes, and it was expected that social anxiety would evidence the best model fit (exploratory hypothesis 1). Zero-order

correlations indicated that adiposity was significantly and positively associated with the SCARED-Child social anxiety score; however the remaining anxiety subscales were not significantly correlated with adiposity. Consistent with the results from the primary analysis, across all anxiety subscales, model fit was acceptable only for the CFI (CFI = .92). All other fit indices indicated poor model fit (RMSEA = .26; SRMR = .14). As the first half of the model remained unchanged, adiposity remained significantly associated with the POTS weight-related teasing subscale but not the POTS competency-related teasing subscale or any of the PECK subscales. The models differed in their associations between anxiety type and individual PECK and POTS subscales (see Figures 4A through 7A for significant pathways by anxiety type). Given the general poor model fit, no subsequent multigroup analyses were performed. The exploratory hypothesis was not supported; models had similar fit across anxiety types.

Sociocultural Pressures and Internalization of Cultural Appearance Ideals as Moderators of Adiposity and Anxiety

Sociocultural pressures and internalization of cultural appearance ideals were hypothesized to moderate the association between adiposity and anxiety (hypothesis 1c). Zero-order correlations reveal that adiposity was not significantly correlated with the SATAQ internalization of appearance ideals subscale scores (see Table 1A). However, the SATAQ family, peers, and media pressures subscale scores were positively and significantly correlated with adiposity and were generally medium in size.

The path model testing hypothesis 1c was just-identified, meaning all parameters were used, and the parameter estimates of the model exactly reproduce the correlation matrix. Model fit indices reflected this: χ^2 (0, N = 137) = 0.00, p < .001; CFI = 1.00; RMSEA = .00 [90% CI: .00, .00]; SRMR = .00. The SATAQ pressures and internalization subscale scores were not

significant moderators of adiposity and the SCARED-Parent total score. However, for the SCARED-Child total score, internalization of the thin (β = .23, t = 2.35, p < .05) and muscular (β = -.17, t = -2.00, p < .05) ideals significantly moderated the association between adiposity and anxiety. BMI z-score and the SATAQ thin and muscular internalization subscale scores were centered at their respective means (i.e., 1.90, 2.70, and 2.76), and a simple slopes test was employed to better understand the interaction between adiposity and each internalization construct on the SCARED-Child total score using the unstandardized coefficients and a standard deviation above and below the internalization mean. The results are plotted in Figures 9A and 10A. Children at lower adiposities reported similar amounts anxiety symptoms regardless of the amount they internalized the respective appearance ideal. However, the relation between adiposity and internalization was discrepant at higher adiposities. Youth who reported higher levels of thin ideal internalization (i.e., 1 *SD* above the mean) were more anxious than youth who reported lower levels of thin ideal internalization (i.e., 1 *SD* below the mean). For the muscular ideal, youth who reported higher levels of the muscular ideal were less anxious than those who reported lower levels of the muscular ideal. Because the models were just-identified, traditional model fit could not be assessed; however the model accounted for 24.4% of the variance in SCARED-Child total score and 7.5% of the variance in SCARED-Parent total score. When analyzed separately by sex, the interaction effects were maintained for boys ($\beta_{BmizxThin}$ = .29, t = 2.27, p < .05; $\beta_{BmizxMuscle}$ = -.27, t = -2.21, p < .05), but were no longer significant for girls ($\beta_{BmizxThin}$ = .02, t = 0.11, p = .92; $\beta_{BmizxMuscle}$ = -.03, t = -0.26, p = .79). When analyzed by age group, the interaction effects were maintained for children ($\beta_{BmizxThin}$ = .40, t = 2.71, p < .01; $\beta_{BmizxMuscle}$ = -.39, t = -2.50, p < .05), but were no longer significant for adolescents ($\beta_{BmizxThin}$ = .04, t = 0.30, p = .76; $\beta_{BmizxMuscle}$ = -.06, t = -0.59, p = .56).

Each anxiety subscale was examined in an exploratory manner to detect possible moderating effects by type of anxiety endorsed (exploratory hypothesis 1). The interactions between adiposity and the SATAQ thin ideal internalization subscale scores ($\beta = .27$, $t = 3.02$, $p < .01$) and the muscular ideal internalization subscale scores ($\beta = -.16$, $t = -2.10$, $p < .05$) were significant for the SCARED-Child GAD subscale. The interaction between adiposity and the SATAQ thin ideal internalization subscale scores ($\beta = .28$, $t = 2.84$, $p < .01$) was also significant for the SCARED-Child social anxiety subscale. There were no significant moderating effects of sociocultural pressures or internalization of appearance ideals for the SCARED-Child panic and separation anxiety subscales. There were no significant interactions for the SCARED-Parent subscales. The just-identification of the models precluded traditional assessment of model fit; however, the model accounted for 32.8% of the variance in SCARED-Child generalized anxiety, compared to 22.3% for social anxiety, 16.6% for separation anxiety, and 9.5% for panic. For the SCARED-Parent subscales, the variance accounted for ranged from 7.5-7.6% for each subscale. Taken together, the exploratory hypothesis that the model fit would be best for social anxiety was not supported.

Anxiety as a Moderator of Adiposity and Health-Related Quality of Life

Anxiety was hypothesized to moderate the association between adiposity and each PedsQL factor (i.e., physical functioning, emotional functioning, social functioning, and school functioning; hypothesis 2) separately by youth and parent report. The PedsQL school missing factor was also examined for youth report. Zero-order correlations revealed significant medium-sized negative associations between adiposity and the PedsQL-Child physical and social functioning aspects of well-being. The PedsQL-Child emotional functioning, school functioning,

and school missing subscale scores were not significantly associated with adiposity; the associations were negative and small in magnitude.

As with the previous moderation model, the model was just-identified, and model fit indices reflected this for both parent and youth report (χ^2 (0, N = 137 for child; 125 for parent) = 0.00, $p < .001$; CFI = 1.00; RMSEA = .00 [90% CI: .00, .00]; SRMR = .00). The interaction effect was not significant for any PedsQL-Parent Proxy subscale. For the PedsQL-Child subscales, the interaction effect was significant only for the outcome of social functioning (β = -.83, t = -2.79, $p < .01$). The interaction term was not significant for the remaining PedsQL-Child factors.

To further explore the interaction between adiposity and the SCARED-Child total score on the PedsQL-Child social functioning subscale scores, BMI *z*-score and the SCARED-Child total score were centered at their respective means (i.e., 1.90 and 21.88, respectively). A simple slopes test was employed to better understand the interaction between adiposity and the SCARED-Child total score on the PedsQL-Child social functioning subscale score using the unstandardized coefficients and a standard deviation above and below the anxiety mean. The results are plotted in Figure 11A and show that the relation between adiposity and social functioning was much stronger at higher levels of anxiety (i.e., 1 *SD* above the mean) than for lower levels of anxiety (i.e., 1 *SD* below the mean) where the association was minimal. As with the previous moderation model, just identification precluded assessment of model fit. However, the model accounted for 42.1% of the variance in the total sample's PedsQL-Child social functioning scores.

Given the significant moderating effect of the SCARED-Child total score on adiposity and the PedsQL social functioning subscale score, regression analyses were examined to see if

the interactions remained significant for boys and girls and for children and adolescents. The results for boys (β = -.62, t = -1.43, p = .15) and girls (β = -.87, t = -1.96, p = .05) were not significant. The results for children (β = -.95, t = -2.03, p < .05) were significant, but were not for adolescents (β = -.66, t = -1.68, p = .09).

Discussion

The purpose of this study was to allow for greater understanding of the association between adiposity and anxiety in overweight and obese children and adolescents. Knowing factors that are associated with anxiety in this population will help focus treatment by addressing issues that may hamper progress and further decrease health-related quality of life. It was hypothesized that peer victimization and teasing would mediate the association between adiposity and anxiety (Hypotheses 1a and 1b). Perceived pressures from sociocultural agents to meet cultural appearance ideals and internalization of appearance ideals were hypothesized to moderate the association (Hypothesis 1c).

Consistent with the literature, peer victimization was positively associated with anxiety (Craig, 1998; Storch et al., 2007); however, the hypothesis (1a) that adiposity would be indirectly related to anxiety through peer victimization was not supported. There may be several reasons for this unexpected finding. First, the zero-order correlations between adiposity and peer victimization scores in the sample were small in magnitude and not significant. Second, assessment of peer victimization was obtained by youth self-report, and it is possible that additional reporters (e.g., parents, teachers, peers) or in vivo observations would have provided different assessment of peer victimization. Third, it is possible that range restriction related to adiposity (i.e., without underweight or normal weight youth) may have hampered the association, and therefore limited the possibility of mediation. However, it is also possible that a significant mediational pathway was not found because the null hypothesis is true. Nevertheless, the impact of peer victimization is still salient. Overweight and obese youth who are victimized report more

depression, anxiety, and loneliness symptoms than their peers (Storch et al., 2007) and, for fear of additional victimization, engage in less physical activity to avoid socially and physically compromising situations (Faith, Leone, Ayers, Moonseong, & Pietrobelli, 2002; Storch et al., 2007). Unfortunately, this hampers social engagement, but also limits engagement in physical activity that is beneficial for both physical and emotional health.

Competency-related teasing was not significantly related to adiposity in this sample, and contrary to the proposed hypothesis (1b), adiposity was not related to anxiety through competency-related teasing. However, consistent with the proposed hypothesis, adiposity was indirectly related to anxiety through weight-related teasing, which challenges the previous suggestion that adiposity range restriction possibly hampered significant mediation effects. When youth are teased about their weight, they may become more aware of their appearance as well as others (negative) evaluation of them, making them more anxious. The increased anxiety would be particularly salient for weight-related teasing as youth may feel they are being judged poorly from sight alone, which could ostensibly occur at any time they are in the presence of others, possibly leading to more anxiety. In addition, competency-related teasing and peer victimization are likely to be perpetrated by peers, whereas weight-related teasing likely has a more varied list of potential sources. It may be that the greater variety of groups that may engage in weight-related teasing (e.g., peers, family, teachers, and others) makes the frequency of weight-related teasing greater, allowing it to stand out as a link to anxiety. Indeed, further investigation is warranted regarding the sources of weight-related teasing to best target intervention. The measure used in this study does not address the source of the teasing, although weight-related teasing and more broadly, weight stigmatization, occur from several targets (Neumark-Sztainer & Haines, 2004; Neumark-Sztainer et al., 1999; Puhl, 2011). Campaigns for

greater awareness and change of weight bias exist (e.g., Puhl, 2011), but will likely be slow to change behaviors as change would need to occur on a societal level. A more immediate impact may be possible if specific sources are identified. For example, behaviors like weight-related teasing could be directly targeted via family or peer based interventions (Haines & Neumark-Sztainer, 2009), which is particularly important given the myriad of negative outcomes associated with weight-related teasing (Gunnarsdottir et al., 2012; Krukowski et al., 2009; Losekam, et al., 2010; Madowitz et al., 2012; McCormack et al., 2011; Menzel et al., 2010). There are extremely effective treatments for anxiety (Silverman, Pina, & Viswesvaran, 2008; Walkup et al., 2008), but if some of the maintaining factors (e.g., weight-related teasing) are not addressed, treatment may be less effective. Therefore, another important avenue of research includes developing and researching effective ways for youth to manage issues such as weight-related teasing. A qualitative study emphasized students desire for such coping and defense strategies (Haines & Neumark-Sztainer, 2007), but such interventions are still needed. This is particularly important as ongoing weight-related teasing in adolescence has a detrimental effect on emotional health and well-being into adulthood (Eisenberg, Neumark-Sztainer, Haines, & Wall, 2006). If individuals have effective strategies to combat the effects of weight-related teasing, it may lead to better psychosocial outcomes long-term.

With the exception of the muscular ideal, the zero-order correlations between internalization of appearance ideals and sociocultural pressures with anxiety were positive and small to medium large in magnitude. This is consistent with literature stating these factors are associated with negative affect stemming from the desire and/or pressure to meet cultural appearance ideals and the general inability for most to meet that ideal (Keery, van den Berg, & Thompson, 2004; Shroff & Thompson, 2006; Stice 2002). Nevertheless, the hypothesis (1c) that

sociocultural influences and internalization of appearance ideals would moderate the association between obesity and total anxiety was only partially supported by child report. Thin ideal internalization and muscular ideal internalization were significant moderators, but analysis by subgroup revealed the moderation held only for boys versus girls, and children versus adolescents. The non-significant results for girls are surprising, given girls tend to experience more pressure and internalization than boys (Knauss, Paxton, & Alsaker, 2007). However, with the ubiquitous pressures for females of all sizes, it is possible that it may make it difficult to detect a moderating effect of adiposity with anxiety. The muscular ideal is more relevant for males (Pope et al., 2000; Thompson & Cafri, 2007), but for boys at larger BMIs, the focus is on becoming thinner versus becoming muscular (Holt & Ricciardelli, 2002; Ricciardelli, McCabe, Holt, & Finemore, 2003). Therefore, it follows that boys who are at higher adiposity would experience more anxiety if they internalized the thin ideal than those who did not. Yet, the pattern of results from the muscular ideal is less expected. For boys of lower adiposity, internalization of the muscular ideal had no differential effect on anxiety. However, for boys at higher adiposities, those with more internalization of the muscular ideal evidenced lower anxiety than those with less internalization. It is possible that boys who have internalized the muscular ideal and have bigger body sizes (regardless of musculature) may consider themselves closer to the ideal; that is, perhaps boys do not differentiate between being big and being athletic. Therefore, being bigger, regardless of body type, might be seen as a very positive attribute. In terms of the significant interaction of thin ideal internalization and adiposity in children but not adolescents, it may be the effects of internalization ideals are more ingrained across weight categories for adolescents, whereas for children, thin ideal internalization may be more pronounced particularly for those at higher adiposity. Certainly, internalization of appearance

ideals is evident at young ages (Sands & Wardle, 2003), but there may be greater variability in exposures to internalizing agents (e.g., media) at younger ages.

The pressures subscale scores evidenced significant, positive, medium correlations with adiposity. This highlights the greater pressure youth perceive at higher adiposity to meet appearance ideals, and helps explains the increased body dissatisfaction and negative affect as a result of not meeting the ideal (Harrison, 2001). That sociocultural pressures were not significant moderators was unexpected, but interactions are generally difficult to detect in non-experimental studies due to less control over study variables and error in measurement that is multiplied when calculating the product of two variables (McClelland & Judd, 1993). In addition, adiposity was not a significant correlate of total anxiety, therefore finding a significant interaction was less viable. However, it is also possible that the effects of pressures were outweighed by the internalization factors considering the path analysis simultaneously controlled for all other variables. Given sociocultural pressures lead to internalization of appearance ideals (Thompson et al., 1999), it may be that the more proximal outcome (i.e., internalization) would stand as more predictive than the distal one (i.e., sociocultural pressures).

Analysis by Anxiety Type

Model fit for the primary aims was examined independently for different types of anxiety symptomology in an exploratory manner, and it was hypothesized that social anxiety would evidence the best model fit. Indeed, the correlation between social anxiety and adiposity was larger in magnitude than the other types of anxiety (r = .19 versus .06 (panic), .10 (GAD), and .13 (separation anxiety)). This is consistent with the trend revealed in the meta-analysis on adiposity and anxiety that indicated social anxiety may be the primary anxiety domain to target in relation to youth at higher weight statuses (Burke & Storch, 2014). It is also consistent with

findings showing that social anxiety is one of the primary anxiety diagnoses affecting obese youth seeking weight-loss treatment (Britz et al., 2000; Eddy et al., 2007; Vila et al., 2004). However, the correlation between social anxiety and adiposity was still small in size, and model fit was similar across anxiety subscales for the mediation analysis and better for generalized anxiety for the moderation analysis. Therefore, the hypothesis that social anxiety would best fit the models was generally not supported. Nevertheless, the two moderating analyses that yielded significant interactions were related to social anxiety and generalized anxiety, consistent with previous analyses with obese youth (Britz et al., 2000; Eddy et al., 2007; Vila et al., 2004). Overweight and obese youth experience weight bias, peer victimization, and teasing (e.g., Puhl, 2007), which are all relevant to the social domain. These interactions may therefore increase anxiety in social interactions, leading to increased social anxiety symptoms. For generalized anxiety, one needs to consider that overweight and obesity are medically-relevant health concerns. Youth may be aware of the dangerous medical ramifications of overweight and obesity from their health care provider, school, or perhaps by recent media efforts to highlight obesity trends. This may increase worries about one's health; and as a significant amount of obese children have a least one obese parent (Svensson et al., 2011), this knowledge may increase their worry about their parent's and family's health as well. Additional studies are needed to determine whether the results replicate related to social and generalized anxiety; however, these data point to potential targets for intervention. Interventions focused on youth with high levels of thin ideal internalization may consider adding elements to address social anxiety (e.g., exposures, social skills development, etc.), particularly with youth at the higher ends of the weight spectrum. However, for universal prevention programs focusing on thin ideal internalization, a focus on social anxiety may be less relevant. To address generalized anxiety, it would behoove

healthcare providers, schools, parents, and media outlets to focus on improved health via healthy lifestyle changes versus focusing on the negative outcomes associated with overweight and obesity in youth.

Anxiety, Adiposity, and Health-Related Quality of Life

As expected, the association between adiposity and HRQOL was negative and small to moderate in size indicating youth at higher adiposity experience worse HRQOL. This is consistent with research showing poorer quality life at higher weight statuses (Friedlander et al., 2003; Varni et al., 2007; Zeller & Modi, 2006). Therefore, even among overweight and obese children, there are differences in overall well-being at the higher ends of the weight spectrum (Varni, Limbers, & Burwinkle, 2007). The distinction is important as the percentage of extremely obese youth is rising (Skinner & Skelton, 2014) and are, therefore, likely to experience overall poorer HRQOL. Yet, the proposed hypothesis (2a) that anxiety moderated the association between adiposity and HRQOL was supported only by child report of social functioning, although there was a trend toward significance by parent report as well. While children experience poorer HRQOL at higher adiposity, those who have higher levels of anxiety are even more negatively affected in terms of social functioning. Difficulties with peers may hamper social development, leading to a feedback loop with more social difficulties over time. This highlights the importance of weight management interventions to address anxiety, as anxiety may hamper engagement in physical activity (Rofey et al., 2009), a critical component of weight management and overall health. Although the interactions by sex were not significant, the magnitude of the effect for girls was similar to that of the combined group. The decrease in sample size likely resulted in an underpowered analysis by subgroup. The results were significant for children versus adolescents, however. Younger children may be becoming more

aware of their potentially different social functioning compared to their peers, particularly for those at higher weight statuses. It may be that this trend is well-understood by adolescence, and therefore influences older children less than younger children.

Limitations

The findings from this study must be considered within the context of its limitations. The method of data collection was restricted to questionnaires, and results may be influenced by common method variance. In addition, information was provided primarily by self-report, which could lead to response bias. Along these lines, each construct was assessed with a single measure. Although additional measures would have increased the time burden on participants, multiple measures are encouraged to more fully capture constructs of interest. Notably, there are several plausible mechanisms in which anxiety and obesity may be related (e.g., genetics) that are not addressed in the current study and are meaningful topics for future research.

Although sample size was adequate for the main analyses, significant findings for subgroup analyses were limited because of relatively small sample sizes. In addition, current treatment for anxiety by medication and/or psychotherapy was not taken into consideration, and this would likely influence results if a sizeable portion of youth met this criterion. Other sample characteristics may have influenced results as well. For example, although beneficial for the purposes of generalizability, the inclusion of both treatment-seeking and non-treatment seeking youth may have attenuated the association between relevant outcome variables and adiposity, and this is an avenue for future research. Given the sample was restricted to primarily overweight and obese youth, BMI range is restricted, which may have attenuated results. However, BMI *z*-score was utilized in the analyses to capitalize on the range available. Lastly, causal inferences

cannot be made based on the cross-sectional design, but the information gained will ideally lead to prospective studies on the proposed topics.

Conclusion

The extant literature highlighting the association between adiposity and anxiety is often equivocal, and the current study provides additional information on mechanisms that may influence the association between adiposity and anxiety in an ethnically diverse sample of overweight and obese youth. The small association between adiposity and anxiety in this sample is consistent with findings from a recent meta-analysis on adiposity and anxiety that focused on youth across the weight spectrum (Burke & Storch, 2014). As adiposity was not significantly related to many of the model variables in this sample, it is not surprising that many of the hypothesized models were not supported as a key element with the expectation of a significant relation between adiposity, anxiety, and relevant variables. Nevertheless, there are important research and clinical implications.

Research implications of the current study are several. First, the current study provides evidence that the association between adiposity and anxiety is generally small, therefore may be more difficult to detect. However, it points to social anxiety and generalized anxiety as areas that might be most relevant to the study of adiposity and anxiety in overweight and obese youth. Second, these data provide preliminary evidence that weight-related teasing (versus competency-related teasing and peer victimization) may be a key area to investigate in the association between adiposity and anxiety. Replication studies are needed, and it would be beneficial to expand the sample population to include youth from normal and underweight groups to determine if the mediation is maintained across broader weight categories. Third, these findings highlight the importance of obtaining information from multiple informants to gather a more

complete picture of underlying phenomenon given parent and child report provided slightly different results. Fourth, it provides avenues for future research including 1) investigating developmental trajectories in changes of internalization of appearance ideals and social functioning as they relate to anxiety symptomology, and 2) better understanding the association between appearance ideals in overweight and obese boys, particularly given the impact perceptions of weight status and health may have on engagement in health-related behaviors (e.g., physical activity).

In terms of clinical implications, understanding the ways in which adiposity and anxiety are related paves the way for more effective psychosocial interventions. First, weight-related teasing exerts a significant and positive indirect effect on adiposity and anxiety. Given this, efforts to reduce the psychological impact of adiposity in youth would benefit from ascertaining the primary source(s) of the teasing and providing education and intervention to effect change. Simultaneously, arming overweight and obese youth with strategies and techniques to combat weight-related teasing would prove beneficial as the issue of weight-related teasing, and weight bias more generally, are not likely to abate given the general social acceptance of such practices. Second, secondary or tertiary interventions focused on reducing thin ideal internalization in youth may consider the importance of adding elements to address social anxiety (e.g., social exposures, cognitive restructuring), particularly when the intervention targets those at the higher end of the weight spectrum. Finally, the current study highlights the detrimental role of higher anxiety on social functioning in children and adolescents who already experience lower health-related quality of life compared to their peers. Utilizing evidence-based treatments to target anxiety in overweight and obese youth will effect change not only in anxiety, but overall quality of life.

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Appendix: Tables and Figures

Appendix A: Table 1A

Table 1A. *Zero-order Correlations between Family Income, BMI z-score, and Youth Reported Variables*

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Income	--															
2. BMI *z*-score	-.01	--														
3. SCARED Total	-.13	.14	--													
4. SCARED Panic	-.11	.06	.83***	--												
5. SCARED GAD	-.19*	.10	.81***	.55***	--											
6. SCARED SepAnx	-.02	.13	.81***	.61***	.52***	--										
7. SCARED Social	-.06	.19*	.75***	.45***	.54***	.54***	--									
8. SCARED School	-.14	.07	.62***	.47***	.44***	.46***	.38***	--								
9. PECK Total	-.15	.03	.45***	.36***	.39***	.35***	.31***	.38***	--							
10. PECK Verbal	-.17*	.02	.49***	.39***	.43***	.37***	.31***	.43***	.95***	--						
11. PECK Cyber	-.13	.00	.24**	.29**	.26**	.12	.12	.23**	.82***	.70***	--					
12. PECK Physical	-.12	.12	.37***	.29***	.26**	.35***	.28***	.28**	.83***	.68***	.63***	--				
13. PECK Culture	-.00	-.12	.26**	.18*	.20*	.18*	.29***	.15	.64***	.54***	.45***	.45***	--			
14. SATAQ Thin	-.12	.15	.28***	.17*	.36***	.16	.19*	.23**	.35***	.38***	.23**	.23**	.18*	--		
15. SATAQ Muscle	-.08	.00	-.01	.07	.06	-.05	-.16	.00	.28**	.23**	.13	.21*	.10	.51***	--	
16. SATAQ Family	-.05	.39***	.33***	.22*	.37***	.28***	.20*	.20*	.35***	.39***	.15	.27**	.23**	.47***	.32***	--

Table 1A

Continued

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17. SATAQ Peers	-.03	.30***	.33***	.25**	.31***	.27**	.23**	.18*	.35***	.43***	.16	.20*	.15	.37***	.23**	.53***
18. SATAQ Media	-.09	.25**	.34***	.23**	.44***	.16	.24**	.18*	.23**	.31***	.15	.03	.16	.41***	.13	.54***
19. POTS WT	-.12	.24**	.49***	.37***	.44***	.37***	.35***	.38***	.66***	.73***	.50***	.44***	.28**	.45***	.19*	.47***
20. POTS CT	-.11	.02	.35***	.30***	.30***	.19*	.24**	.38***	.63***	.69***	.37***	.51***	.22*	.36**	.29***	.37***
21. PEDSQL Total	.14	-.22*	-.74***	-.60***	-.58***	-.56***	-.57***	-.61***	-.55***	-.58***	-.31***	-.47***	-.29***	-.35***	.01	-.40***
22. PEDSQL Physical	.12	-.26**	-.61***	-.52***	-.43***	-.48***	-.47***	-.51***	-.44***	-.44***	-.26***	-.41***	-.26***	-.32***	.02	-.30***
23. PEDSQL Emotional	.08	-.12	-.76***	-.62***	-.68***	-.59***	-.49***	-.50***	-.44***	-.48***	-.22*	-.36***	-.27***	-.30***	-.04	-.45***
24. PEDSQL Social	.16	-.27**	-.60***	-.40***	-.52***	-.46***	-.51***	-.47***	-.59***	-.66***	-.28**	-.49***	-.26**	-.34***	-.01	-.46***
25. PEDSQL School Functioning	.05	-.04	-.41***	-.35***	-.30***	-.26***	-.33***	-.44***	-.31***	-.32***	-.24**	-.24**	-.12	-.19*	.06	-.10
26. PEDSQL School Missing	.13	-.06	-.46***	-.38***	-.25**	-.35***	-.42***	-.47***	-.33***	-.32***	-.21*	-.29***	-.22*	-.15	.04	-.15
27. CDI-2 SF	.02	.06	.55***	.43***	.48***	.35***	.41***	.51***	.36***	.42***	.23**	.20*	.18*	.34***	.02	.32***

Table 1A

Continued

Variables	17	18	19	20	21	22	23	24	25	26	27
1. Income	-.03	-.0-	-.12	-.11	.14	.12	.08	.16	.05	.13	.02
2. BMI *z*-score	.30***	.25**	.24**	.02	-.22*	-.26**	-.12	-.27**	-.04	-.06	.06
3. SCARED Total	.33***	.34***	.49***	.35***	-.74***	-.61***	-.76***	-.60***	-.41***	-.46***	.55***
4. SCARED Panic	.25**	.23**	.37***	.30***	-.60***	-.52***	-.62***	-.40***	-.35***	-.38***	.43***
5. SCARED GAD	.31***	.44***	.44***	.30***	-.58***	-.43***	-.68***	-.52***	-.30***	-.25**	.48***
6. SCARED SepAnx	.27**	.16	.37***	.19*	-.56***	-.48***	-.59***	-.46***	-.26***	-.35***	.35***
7. SCARED Social	.23**	.24**	.35***	.24**	-.57***	-.47***	-.49***	-.51***	-.33***	-.42***	.41***
8. SCARED School	.18*	.18*	.38***	.38***	-.61***	-.51***	-.50***	-.47***	-.44***	-.47***	.51***
9. PECK Total	.35***	.23**	.66***	.63***	-.55***	-.44***	-.44***	-.59***	-.31***	-.33***	.36***
10. PECK Verbal	.43***	.31***	.73***	.69***	-.58***	-.44***	-.48***	-.66***	-.32***	-.32***	.42***
11. PECK Cyber	.16	.15	.50***	.37***	-.31***	-.26**	-.22*	-.28**	-.24**	-.21*	.23**
12. PECK Physical	.20*	.03	.44***	.51***	-.47***	-.41***	-.36***	-.49***	-.24***	-.29***	.20*
13. PECK Culture	.15	.16	.28**	.22*	-.29***	-.26**	-.27**	-.26**	-.12	-.22*	.18*
14. SATAQ Thin	.37***	.41***	.45***	.36***	-.35***	-.32***	-.30***	-.34***	-.19*	-.15	.34***
15. SATAQ Muscle	.23**	.13	.19*	.29***	.01	.02	-.04	-.01	.06	.04	.02
16. SATAQ Family	.53***	.54***	.47***	.37***	-.40***	-.30***	-.45***	-.46***	-.10	-.15	.31***

Table 1A

Continued

Variables	17	18	19	20	21	22	23	24	25	26	27
17. SATAQ Peers	--										
18. SATAQ Media	.58***	--									
19. POTS WT	.58***	.44***	--								
20. POTS CT	.39***	.24**	.62***	--							
21. PedsQL Total	-.39***	-.39***	-.55***	-.49***	--						
22. PedsQL Physical	-.31***	-.34***	-.45***	-.41***	.87***	--					
23. PedsQL Emotional	-.38***	-.44***	-.47***	-.33***	.82***	.62***	--				
24. PedsQL Social	-.45***	-.35***	-.62***	-.56***	.82***	.61***	.62***	--			
25. PedsQL School Functioning	-.08	-.14	-.24**	-.29***	.71***	.52***	.47***	.49***	--		
26. PedsQL School Missing	-.25**	-.16	-.33***	-.30***	.65***	.53***	.42***	.46***	.42***	--	
27. CDI-2 SF	.24**	.36***	.43***	.34***	-.67***	-.54***	-.63***	-.51***	-.53***	-.43***	--

Note: BMI = Body Mass Index; SCARED = Screen for Child Anxiety and Related Emotional Disorders; GAD = Generalized Anxiety; SepAnx = Separation Anxiety; PECK = Personal Experiences Checklist; SATAQ = Sociocultural Attitudes Towards Appearance Questionnaire; POTS = Perception of Teasing Scale; WT = Weight Teasing; CT = Competency Teasing; PedsQL = Pediatric Quality of Life; CDI-2 SF = Children's Depression Inventory-2 Short Form.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Appendix B: Figure 1A

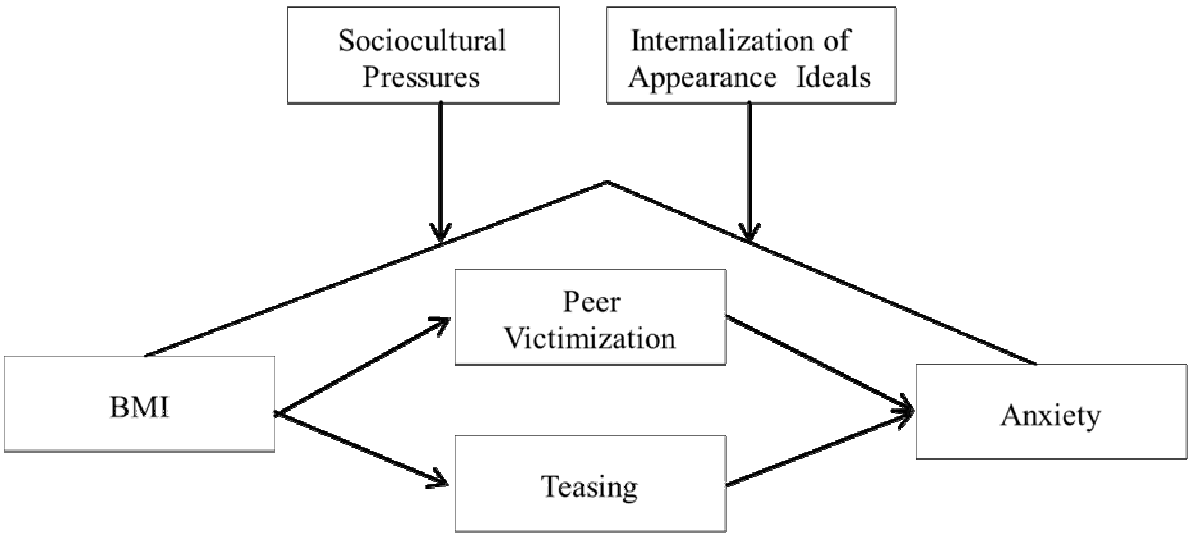

Figure 1A. Theoretical path model testing the meditation effects of peer victimization and teasing on anxiety and the moderation effects of sociocultural pressures of appearance ideals and internalization of appearance ideals on anxiety.

Appendix C: Figure 2A

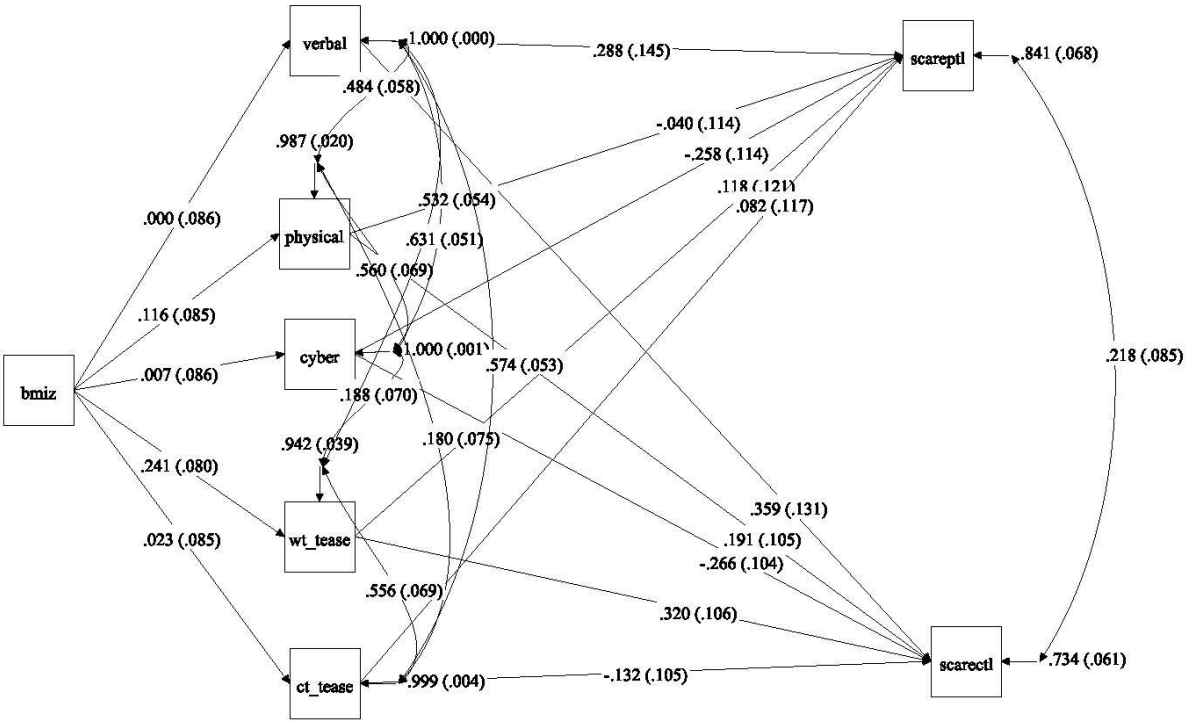

Figure 2A. Path model testing the direct and indirect effects of peer victimization and teasing on adiposity and total anxiety by child and parent report. Standardized solution presented. BMIz = BMI *z*-score; Verbal = Personal Experiences Checklist verbal subscale; Physical = Personal Experiences Checklist physical subscale; Cyber = Personal Experiences Checklist cyber-bullying subscale; Wt_tease = Perception of Teasing Scale weight related teasing subscale; Ct_tease = Perception of Teasing Scale competency related teasing subscale; Scareptl = Screen for Childhood Anxiety Related Emotional Disorders-Parent total scale; Scarectl = Screen for Childhood Anxiety Related Emotional Disorders-Child total scale.

Appendix D: Figure 3A

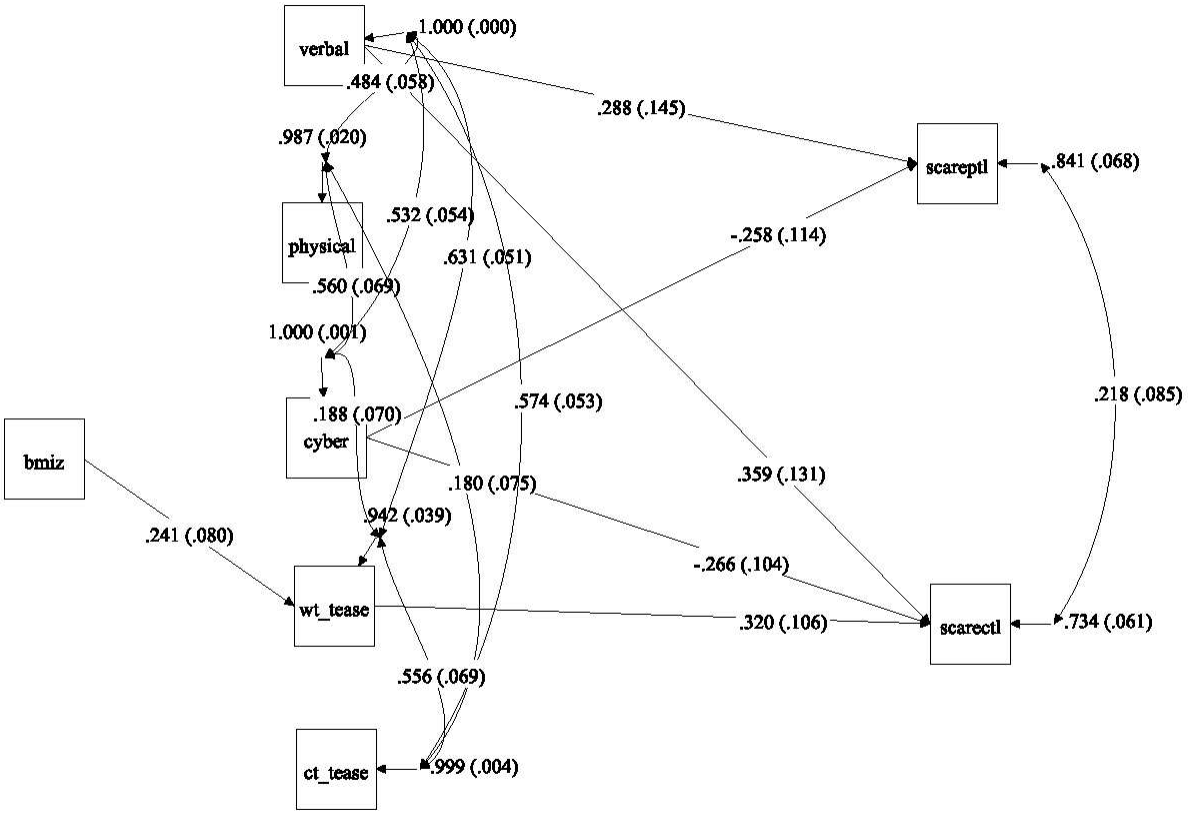

Figure 3A. Path model demonstrating the significant direct and indirect effects of peer victimization and teasing on adiposity and total anxiety by child and parent report. Standardized solution presented. BMIz = BMI *z*-score; Verbal = Personal Experiences Checklist verbal subscale; Physical = Personal Experiences Checklist physical subscale; Cyber = Personal Experiences Checklist cyber-bullying subscale; Wt_tease = Perception of Teasing Scale weight related teasing subscale; Ct_tease = Perception of Teasing Scale competency related teasing subscale; Scareptl = Screen for Childhood Anxiety Related Emotional Disorders-Parent total scale; Scarectl = Screen for Childhood Anxiety Related Emotional Disorders-Child total scale.

Appendix E: Figure 4A

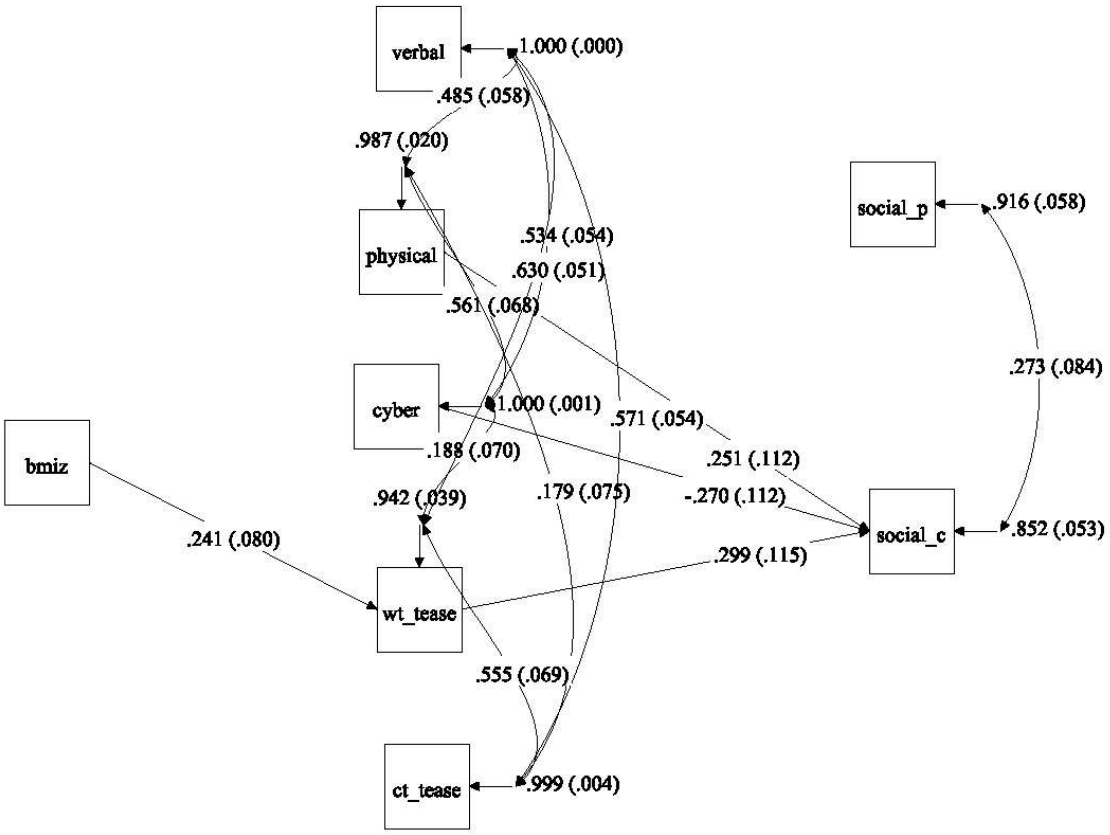

Figure 4A. Path model demonstrating the significant direct and indirect effects of peer victimization and teasing on adiposity and social anxiety by child and parent report. Standardized solution presented. BMIz = BMI *z*-score; Verbal = Personal Experiences Checklist verbal subscale; Physical = Personal Experiences Checklist physical subscale; Cyber = Personal Experiences Checklist cyber-bullying subscale; Wt_tease = Perception of Teasing Scale weight related teasing subscale; Ct_tease = Perception of Teasing Scale competency related teasing subscale; Social_p = Screen for Childhood Anxiety Related Emotional Disorders-Parent social anxiety scale; Social_c = Screen for Childhood Anxiety Related Emotional Disorders-Child social anxiety scale.

Appendix F: Figure 5A

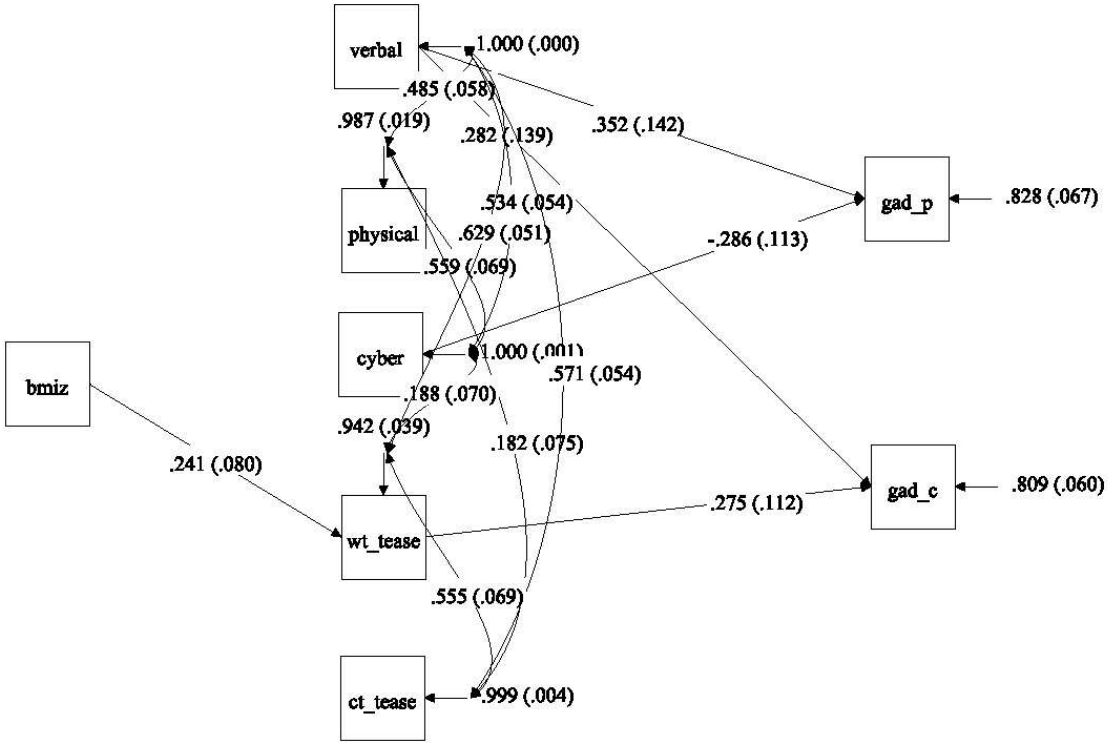

Figure 5A. Path model demonstrating the significant direct and indirect effects of peer victimization and teasing on adiposity and generalized anxiety by child and parent report. Standardized solution presented. BMIz = BMI *z*-score; Verbal = Personal Experiences Checklist verbal subscale; Physical = Personal Experiences Checklist physical subscale; Cyber = Personal Experiences Checklist cyber-bullying subscale; Wt_tease = Perception of Teasing Scale weight related teasing subscale; Ct_tease = Perception of Teasing Scale competency related teasing subscale; Gad_p = Screen for Childhood Anxiety Related Emotional Disorders-Parent generalized anxiety disorder scale; Gad_c = Screen for Childhood Anxiety Related Emotional Disorders-Child generalized anxiety disorder scale.

Appendix G: Figure 6A

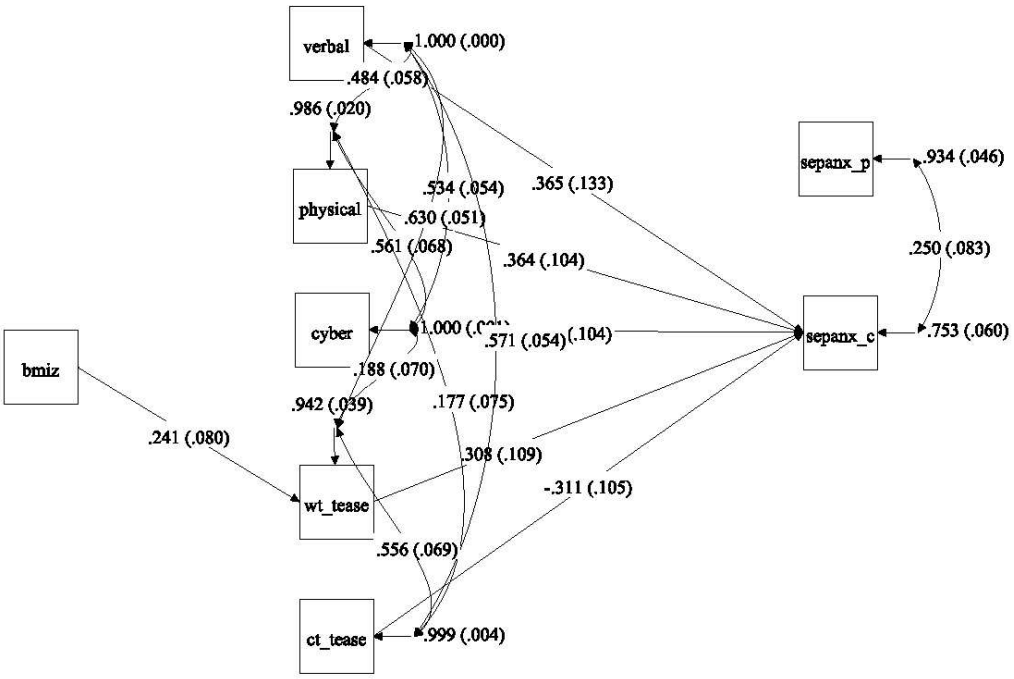

Figure 6A. Path model demonstrating the significant direct and indirect effects of peer victimization and teasing on adiposity and separation anxiety by child and parent report. Standardized solution presented. BMIz = BMI *z*-score; Verbal = Personal Experiences Checklist verbal subscale; Physical = Personal Experiences Checklist physical subscale; Cyber = Personal Experiences Checklist cyber-bullying subscale; Wt_tease = Perception of Teasing Scale weight related teasing subscale; Ct_tease = Perception of Teasing Scale competency related teasing subscale; Sepanx_p = Screen for Childhood Anxiety Related Emotional Disorders-Parent separation anxiety scale; Sepanx_c = Screen for Childhood Anxiety Related Emotional Disorders-Child separation anxiety scale.

Appendix H: Figure 7A

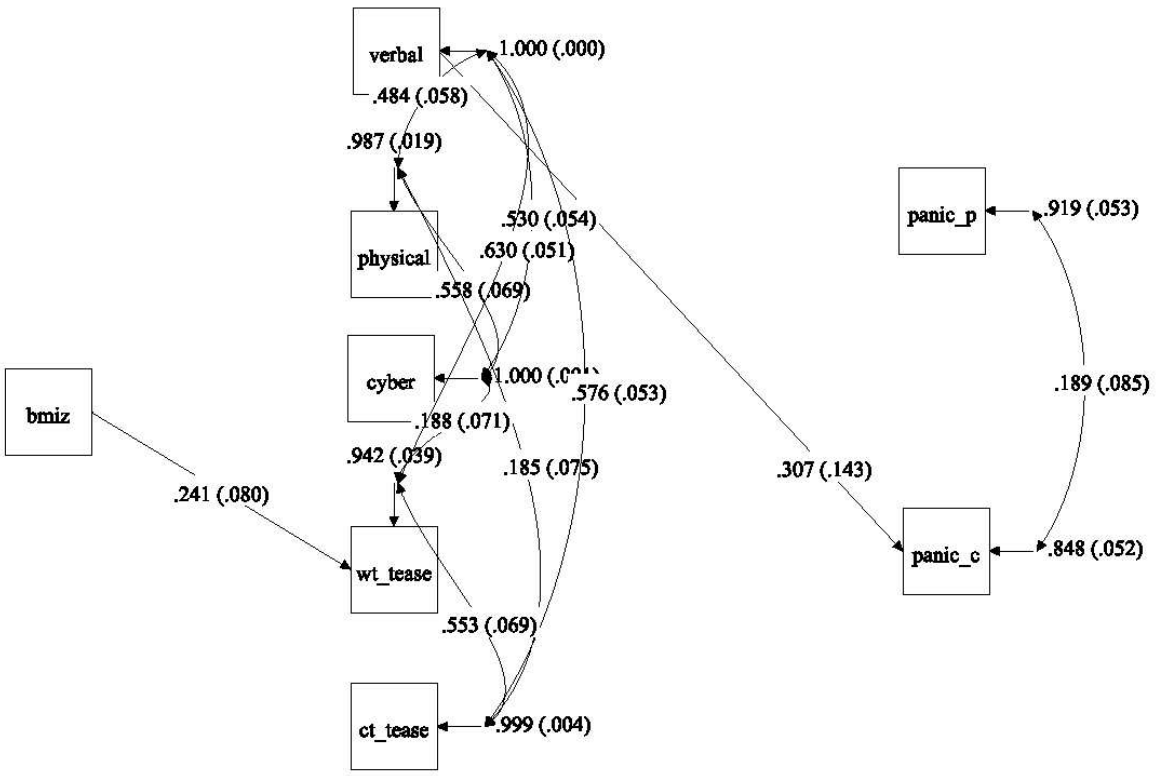

Figure 7A. Path model demonstrating the significant direct and indirect effects of peer victimization and teasing on adiposity and panic disorder symptoms by child and parent report. Standardized solution presented. BMIz = BMI *z*-score; Verbal = Personal Experiences Checklist verbal subscale; Physical = Personal Experiences Checklist physical subscale; Cyber = Personal Experiences Checklist cyber-bullying subscale; Wt_tease = Perception of Teasing Scale weight related teasing subscale; Ct_tease = Perception of Teasing Scale competency related teasing subscale; Panic_p = Screen for Childhood Anxiety Related Emotional Disorders-Parent panic disorder scale; Panic_c = Screen for Childhood Anxiety Related Emotional Disorders-Child panic disorder scale.

Appendix I: Figure 8A

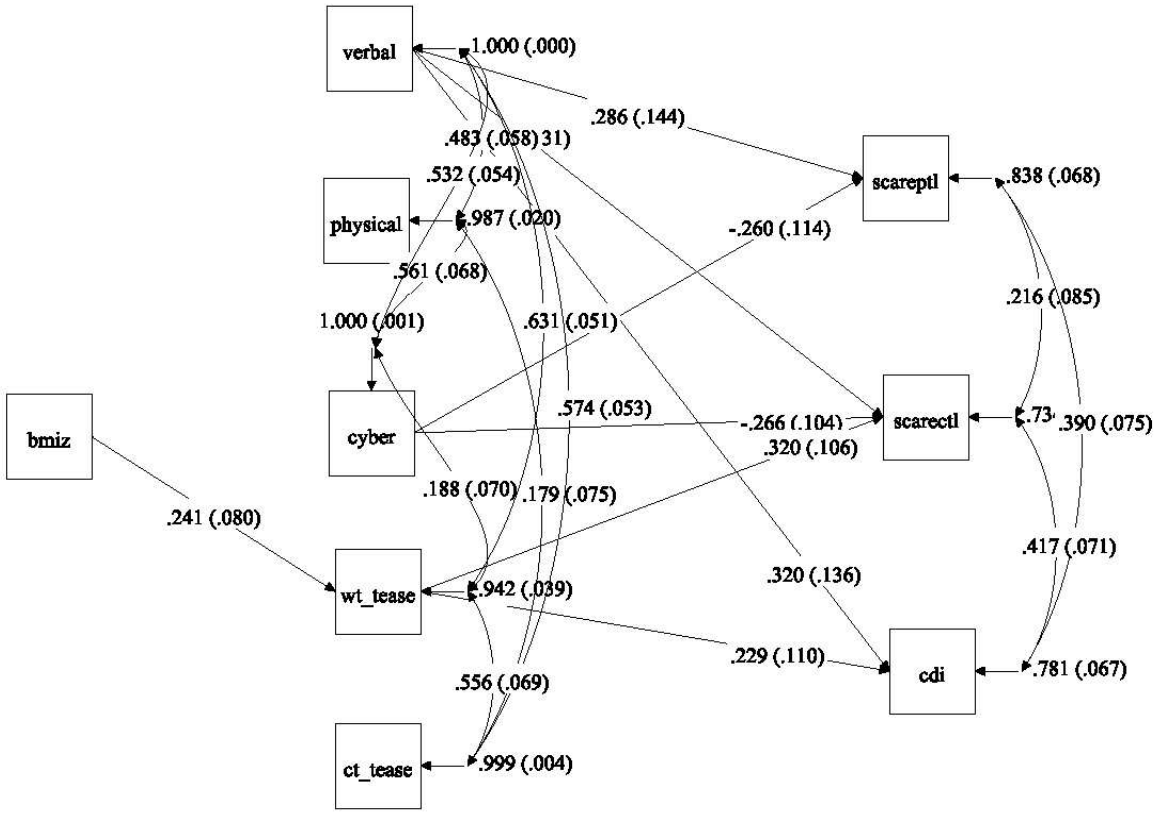

Figure 8A. Path model demonstrating the significant direct and indirect effects of peer victimization and teasing on adiposity and total anxiety by child and parent report including depression as an additional outcome. Standardized solution presented. BMIz = BMI *z*-score; Verbal = Personal Experiences Checklist verbal subscale; Physical = Personal Experiences Checklist physical subscale; Cyber = Personal Experiences Checklist cyber-bullying subscale; Wt_tease = Perception of Teasing Scale weight related teasing subscale; Ct_tease = Perception of Teasing Scale competency related teasing subscale; Scareptl = Screen for Childhood Anxiety Related Emotional Disorders-Parent total scale; Scarectl = Screen for Childhood Anxiety Related Emotional Disorders-Child total scale; CDI = Children's Depression Inventory-2 Short Form.

Appendix J: Figure 9A

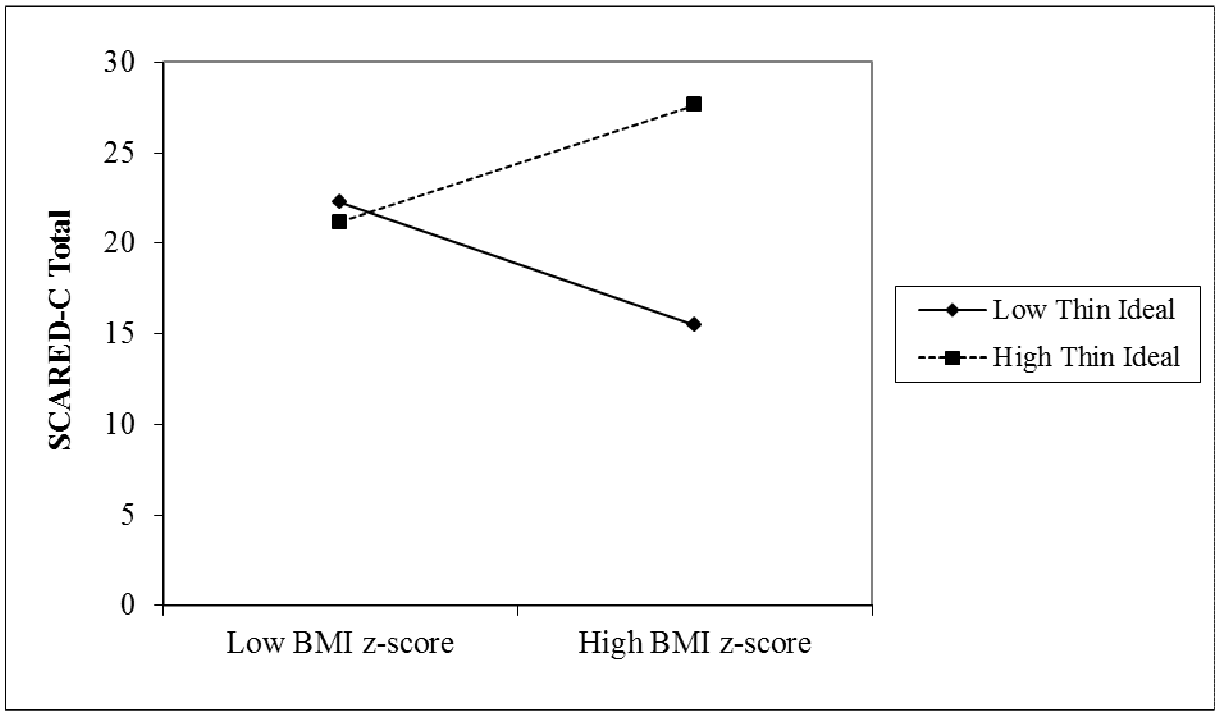

Figure 9A. Interaction effect of thin ideal internalization and adiposity on total anxiety by child report. SCARED-C = Screen for Childhood Anxiety Related Emotional Disorders-Child report.

Appendix K: Figure 10A

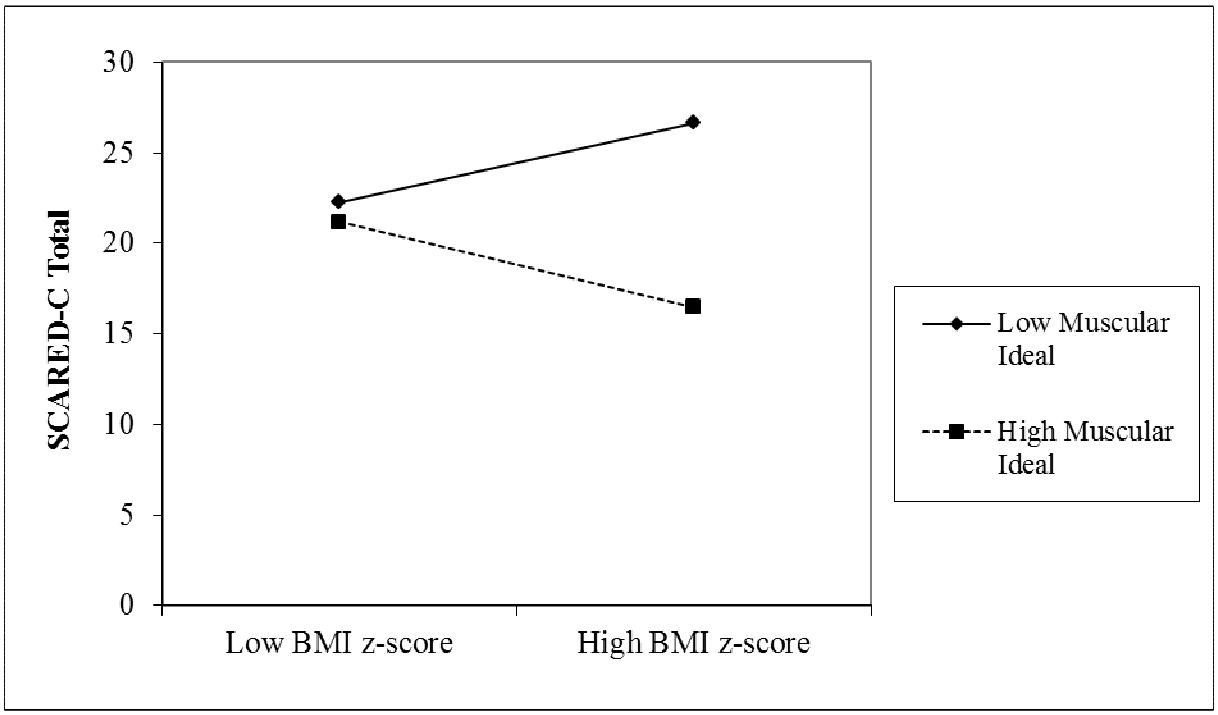

Figure 10A. Interaction effect of muscular ideal internalization and adiposity on total anxiety by child report. SCARED-C = Screen for Childhood Anxiety Related Emotional Disorders-Child report.

Appendix L: Figure 11A

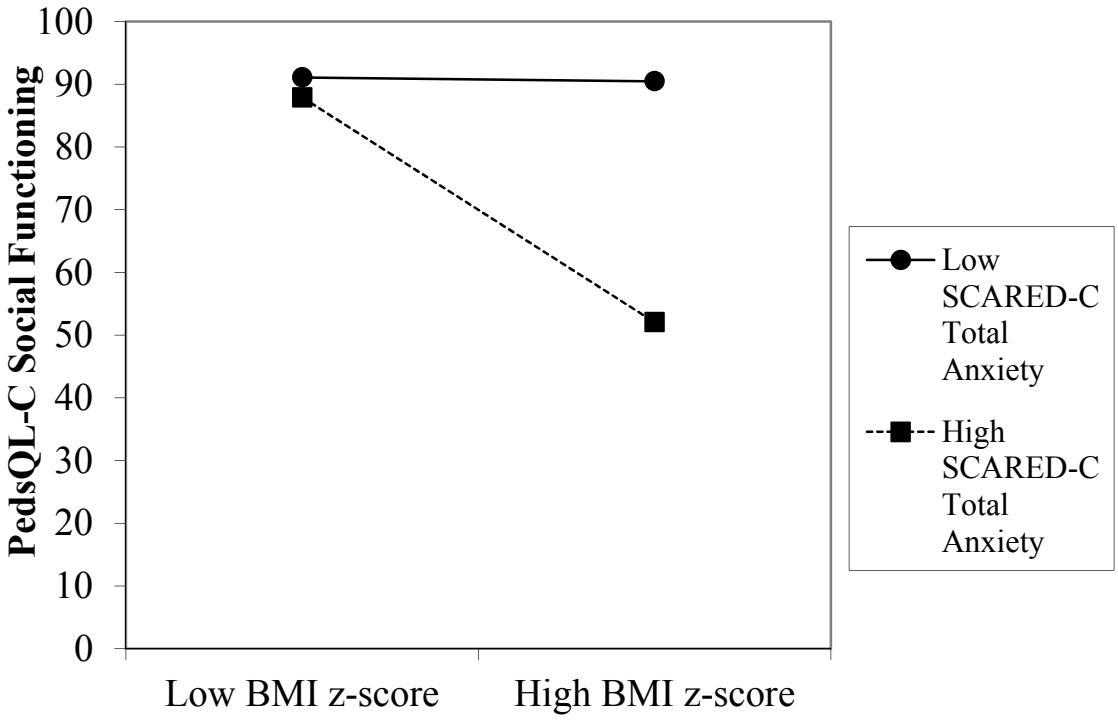

Figure 11A. Interaction effect of anxiety and adiposity on social functioning by child report. PedsQL-C = Pediatric Quality of Life Inventory – Child report.