Links between Peer Relationships in Middle Childhood, Negative Affect and Social Connectedness in Early Adolescence, and BMI in Early Adulthood

by

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Abstract

Although it has been well documented that overweight and obese children and adolescents frequently experience difficulties in their peer relationships, significant gaps remain in the understanding of the long-term contributions of these peer difficulties to elevated weight status. Of interest in the current study was whether the three middle childhood peer domains of acceptance, victimization, and friendships make unique and/or overlapping contributions to body mass index (BMI) across young adulthood and if these associations hold while controlling for childhood weight status and sociodemographic factors frequently associated with elevated BMI. A second goal was to examine the potential mediating links of the relationship between childhood peer difficulties and adult BMI. Data were drawn from the prospective longitudinal Child Development Project ($N = 585$).

Results revealed concurrent bivariate associations between childhood weight status and peer difficulties in all three domains. Furthermore, each peer domain significantly predicted BMI across young adulthood. Peer acceptance, however, emerged as a unique predictor of adult BMI while controlling for childhood weight status and sociodemographic factors with poor peer acceptance predicting elevated BMI across adulthood. Moreover, gender differences in the association between childhood peer difficulties and adult BMI were identified. Additionally, negative affect in early adolescence mediated the relationship between childhood victimization and adult BMI. Possible explanations for the current findings are discussed and recommendations for future research are provided.

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I. Introduction

According to the Center for Disease Control, 35.7% of adults and 17% of children in the United States are currently obese, and projections estimate that at least 44% of Americans in all 50 states will be obese by 2030 (Center for Disease Control, 2012). The World Health Organization reports there were approximately 500 million people suffering from obesity worldwide in 2008, and since 1980 global obesity rates have more than doubled (World Health Organization, 2012). Weight-related concerns often focus on the implications of childhood obesity, but there is an array of economic, health, and psychosocial consequences associated with adult obesity that deserves equal attention. In 2000, the economic costs of adult overweight and obesity in the United States exceeded $117 billion. Obese adults have increased risks of heart disease, elevated blood pressure, Type 2 diabetes, and stroke and are likely to experience social marginalization, discrimination, and rejection (Wellman & Friedberg, 2002). From a public health perspective it is important to identify factors that may be contributing to weight-related problems. Literature reviews and meta-analyses have highlighted numerous factors that co-occur with and possibly antecede weight-related problems, such as early and ongoing interpersonal experiences, including those with peers (Berge, 2009; Gray, Kahhan, & Janicke, 2009).

Early Peer Relationship Experiences

Peer-group experiences and weight status likely are linked in reciprocal, risk-exacerbating ways. That is, children with physical characteristics that set them apart from the peer group—such as being obese—frequently are targets of teasing and victimization, have fewer friends, and tend to be excluded from mainstream peer activities (Adams & Bukowski, 2008). At the same time, these negative peer group experiences can undermine health and well-being and lead to increases in weight-related problems (Janssen, Craig, Boyce, & Pickett, 2004).

What is not yet clear from existing literature is whether peer-relationship difficulties have long-term predictive significance for high BMI and obesity. Some longitudinal data are available spanning periods of a few years in childhood and adolescence (Mahoney, Lord, & Carryl, 2005; Rancourt & Prinstein, 2010; Sweeting, Wright, & Minnis, 2005), but few studies have tracked individuals into their early adult years. Prospective longitudinal data from childhood to early adulthood could help determine whether early peer problems have long-lasting predictive relations with weight problems or if their "effects" are more temporally proximal, i.e., that, as noted, peer difficulties and weight problems tend to co-occur such that any impact of early peer difficulties on subsequent weight problems is attributable to the interrelation of peer problems and weight problems. In other words, after taking into account the co-variation between peer problems and weight problems in childhood, the relation between peer difficulties in childhood and weight problems in early adulthood may be rendered non-significant. This possibility has not been examined in any known prior study. Moreover, given that weight status and obesity have demonstrated modest stability over time, and childhood weight status is predictive of adult weight status (Freedman, Khan, Serdula, Dietz, Srinivasan, & Berenson, 2005), controlling for early weight status can shed further light on the possible unique contributions of peer relationship difficulties to subsequent weight problems.

Difficulties in peer relationships take many forms and not all aspects of problematic peer relationships may play important roles in weight problems, including obesity. Perhaps the most consistent finding in the literature is a link between teasing and victimization and youths' weight problems (Adams & Bukowski, 2008; Janssen, Craig, Boyce, & Pickett, 2004). This is reasonable as peer victimization has been consistently linked with poorer health and increased stress (Biebl, DiLalla, Davis, Lynch, & Shinn, 2011; Knack, Campbell, & Baum, 2011), and

exposure to stress disrupts biological and metabolic processes that contribute to obesity and weight gain (Pervanidou & Chrousos, 2011). Research also has shown that obese children tend to have fewer friends and to be less popular (i.e., have lower levels of peer acceptance) than their non-obese peers (Strauss & Pollack, 2003; Zeller, Reiter-Purtill, & Ramey, 2008). Thus, across a range of peer difficulties, obese and overweight children are at a significant disadvantage.

Although victimization, friendlessness, and low peer acceptance consistently have been found to be associated with weight-related problems, few studies have simultaneously considered multiple aspects of peer difficulties and no study has considered all three. As noted by Brown and Larson (2009), Gifford-Smith, and Brownell (2003), and Ladd (1999), these peer relationship domains may provide unique and additive contributions to social development. That is, for some outcomes the three peer relationship attributes may be non-overlapping in their prediction contributions. For example, Vandell and Hambree (1994) found that peer acceptance and mutual friendships additively predicted self-esteem, social competence, and achievement among children in elementary school. Moreover, Zeller, Reiter-Purtell, and Ramey (2008) found that, although obese children receive significantly fewer best friend nominations and experience less peer group acceptance than their non-obese peers, the two groups did not differ on their number of reciprocated friendships, suggesting obese children are not necessarily friendless and have an awareness of who their friends are.

Peer relationship qualities may also uniquely predict outcomes that are specific to the type of peer relationship problem being considered. For example, peer victimization has been found to uniquely predict school disliking and avoidance, while peer acceptance has been found to uniquely contribute to academic readiness and classroom involvement (Ladd, 1999; Ladd, Kochenderfer, and Coleman, 1997). Pre-adolescent friendships also have been found to uniquely

predict self-worth in adulthood (Bagwell, Newcomb, & Bukowski, 1998). With respect to obesity and weight-related problems, it is important to know whether each type of peer problem constitutes a separate "risk," as in a cumulative risk approach, or whether the presence of one such problem is sufficient as a risk-indicator. In other words, it may be that some domains of peer problems are of greater concern for obesity than others (e.g., that being ostracized by the peer group is more problematic than having few friends). Research is needed that takes into account all three problematic peer relationship indicators.

The significance of peer relationships for health and well-being may be especially important during the elementary-school years as children remain in the same peer group and classroom and are provided fewer opportunities for more integrated socialization (Gifford-Smith & Brownell, 2003). There is a heightened need for close connections (friendships) and teasing and peer victimization become more prominent features of children's peer experiences. Because peer relationship difficulties have been found to be relatively stable over time and predictive of subsequent behavioral and emotional problems (Uchino, 2004), it is plausible that such difficulties will forecast a trajectory leading to adverse health outcomes, including the development of obesity, in early adulthood.

Mediators of Links Between Early Peer Social Experiences and Subsequent BMI

Identifying possible childhood peer-relationship risk factors is important but establishing that early peer problems and subsequent weight problems are related does not shed light on the underlying mechanisms that may drive these relations. The extant research on peer relationship difficulties of obese children provides some useful perspectives on possible mediating mechanisms. Two sets of factors are commonly described. The first may be conceptualized as negative affect or self-defeating perceptions that emerge as feelings of depression, decreased

confidence in one's ability, or anxiety. Some research, for example, has found that peer victimization of obese adolescents is associated with increased depressive symptoms over time (Adams & Bukowski, 2008), and teasing of overweight adolescents is associated with lower self-perceived competence in social activities (Hayden-Wade et al., 2005). Furthermore, reciprocal influences have been identified in the association between self-views and peer stress in adolescence through stress-generation and stress-reaction processes. For example, individuals with poor self-views may behave in ways that elicit negative responses from peers, leading to withdrawal or avoidance, and these maladaptive behaviors, in turn, predict additional victimization and rejection. Conversely, victimization and rejection by peers can lead to internalizing behaviors and negative self-appraisals, which lower social competence and feelings of self-worth (Caldwell, Rudlolph, Gordon, & Kim, 2004). Adams and Bukowski (2008) found support for transactional influences between obesity and depression, as victimization of obese females predicted increases in depression and reductions in physical self-concept, which, in turn, predicted subsequent increases in BMI.

A second mediating mechanism suggested by the literature can be framed in terms of a lack of social connectedness, or, more specifically, a lack of social connections. Adolescence is a time of increasing independence and autonomy, and is characterized by increased interaction with peers and involvement in activities outside of the parental influence (Eccles, 1999). Through interactions with peers and other adults and participation in school, community, or other extra-curricular activities, over time adolescents develop a sense of belonging; accumulation of experiences across the life span are said to contribute to one's sense of social connectedness. Cacioppo and Hawkley (2003) report that individuals high in social connectedness demonstrate active coping strategies and successfully adapt to stress, and the availability of social support is

associated with positive health outcomes. On the other hand, social isolation threatens the ability to recover from stress by weakening the body's anabolic processes (Cacioppo & Hawkley, 2003), and a lack of social connections and feelings of social isolation have consistently been associated with a range of physical and emotional problems, including loneliness.

Obese and overweight adolescents often experience social isolation and marginalization from peers (Gray, Kahhan, & Janicke, 2009), report a preference of sedentary and isolative activities over physical or social activities, and are more socially withdrawn (Zeller et al., 2007). The avoidance of participation in physical activities and gravitation towards sedentary activities is of particular concern, as they are considered contributors to the obesity epidemic. In a study of the stigmatization attached to overweight adolescents, Puhl, Luedike, and Heuer (2011) evaluated peer-reported perceptions of overweight peers and found that 67% of participants reported overweight peers are not included in social activities at school, and 76% stated overweight peers are frequently avoided and ignored. This social marginalization likely contributes to subsequent increases in obesity through transactional processes previously discussed.

A review of the literature indicates that both of the potential mediators can be linked to early peer experiences. Peer relationship problems and exposure to peer rejection and victimization in early childhood often forecasts later relationship difficulties, as these experiences limit the development of important social skills and may influence the way one feels about their own ability. Sullivan (1953) proposed that peers fill developmental needs at different points throughout childhood and adolescence, and during the ages of 6-9, peers help fill the need for acceptance, promote the development of prosocial skills, and provide experiences for social comparison. Because middle childhood is a time of increased exposure to peers, and self-

comparison to peers becomes more common, it is likely that negative peer experiences during this time will contribute to poor self-views, the development of negative affect, and diminished opportunities (and motivation) to build social connections.

These two sets of factors may represent different pathways through which early peer problems fuel the development of weight-related problems. An examination of such pathways requires longitudinal data in which the predictors (peer problems) are assessed at one developmental period, the mediators (self-perceptions and social connectedness) at a later developmental period, and the outcome (high BMI) at an even later developmental period. In the current study, these periods correspond to middle childhood, early adolescence, and early adulthood. Middle childhood is a period in which children develop new social roles, acceptance by the peer group becomes increasingly important, and children are evaluated on performances in comparison with their peers (Eccles, 1999). Early adolescence is a time characterized by increasing autonomy and biological changes, an emphasis on physical appearance and attributes, heightened concern about social evaluation, and involvement in activities with peers outside of the school environment (Eccles, 1999). Early adulthood is a time when pressures for adopting adult roles and responsibilities (such as work and family) mount, and when obesity and its associated risks (e.g., high blood pressure) pose serious health-related concerns.

A final set of issues of interest in the proposed study concerns the role of socio-demographic factors in the links between peer problems and weight problems. It could be argued that family economic circumstances underlie the patterns of relations among predictors and outcomes described earlier. Children from lower socioeconomic (SES) families tend to have lower-quality peer relationships, experience additional life stressors, and also are at greater risk of obesity (Power et al., 2005; Taylor, Lehman, Kiefe, & Seeman, 2006; Wang & Beydoun,

2007). It is therefore important to control for SES when examining links between the predictors, mediators, and outcomes of interest in the present study.

A second key demographic variable is participant gender. Owing to differences in prevalence of obesity across males and females as well as differences in the likelihood of some types of peer relationship problem, controlling for main effects of gender is important in examining the developmental pathways in the link between peer problems and weight problems. Equally important, however, is an examination of gender as a possible moderator of these linkages. There is some evidence that being overweight is more consequential for girls than for boys with respect to the quality of their peer relationships (Janssen, Craig, Boyce, & Pickett, 2004). Evidence is mixed on whether weight problems are more strongly related to depressive symptoms and related negative self-perceptions for girls compared to boys (Adams & Bukowski, 2008; Merten, Wickrama, & Williams, 2008), but the inconsistency of existing findings point to the need of further study of gender differences in predictive patterns.

The Current Study

In summary, the goals of the current study were as follows:

1. To examine the unique and overlapping longitudinal association(s) between peer acceptance, reciprocated friendships, and peer victimization in childhood and body mass index (BMI) in early adulthood while controlling for co-occurring childhood weight problems, ethnicity, SES, and gender.
2. To examine negative affect and a lack of social connectedness in early adolescence as potential mediators of the relationship between childhood peer problems and young adult BMI.
3. To examine gender as a potential moderator of the relationship between childhood peer relationships and young adult BMI.

II. Review of Literature

The present study sought to examine whether and how three domains of childhood peer relationships, specifically peer acceptance, victimization, and friendships, contribute to BMI in early adulthood while controlling for co-occurring childhood weight problems and other factors commonly associated with obesity. Given the developmental importance of positive peer relationships, as well as the health and social consequences associated with obesity, it was important to examine this relationship and the mediating factors that help explain this relationship. Secondly, the current study aimed to examine the development of negative affect (i.e., internalizing problems), and a lack of social connectedness (i.e., loneliness), as potential *mediators* of this relationship. Identifying the mechanisms that explain this association will provide insight on various pathways to obesity and will better inform research and interventions aimed at improving peer relationships and reducing adult obesity. Lastly, this research sought to examine potential gender differences in the relationship between childhood peer problems and adult BMI. Developmental differences between males and females have been well documented in multiple domains, and therefore, a review of gender differences in the pathway to obesity was warranted.

With these goals in mind, the review of literature discusses the following topics: (1) an overview of the obesity epidemic, (2) the unique and concurrent developmental contributions of the peer relationship domains of friendships, peer acceptance, and victimization, (3) the development of negative affect and the peer group's contribution to this development, (4) the importance of social relationships and connectedness in early adolescence and the consequences of a lack of connectedness, (5) gender differences associated with peer relationships and weight status, and (6) sociodemographic factors commonly associated with the development of obesity.

The Prevalence of Obesity and Concerns About Associated Health Problems

The United States has been in the midst of an obesity epidemic for the last three decades. All members of society are impacted by the epidemic, either directly or indirectly. Obesity results in the deaths of 2.8 million adults each year (World Health Organization, 2012) and the economic costs of obesity alone justify further examination into the epidemic. For example, the aggregate annual costs of obesity account for 5 – 7% of total annual medical expenditures, and individual taxpayers pay approximately $175 annually for obesity-related medical care of Medicaid and Medicare recipients (Finkelstein, Ruhm, & Kosa, 2005). Identifying the causes of obesity will not only improve the physical and emotional health and well-being of individuals, but will also alleviate the immense economic burden the disease is currently causing, as it is estimated that, if obesity rates continue to rise, the economic costs of obesity will reach $860.7 to $956.9 billion by 2030 (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008).

Childhood Obesity

Childhood obesity rates are increasing at an alarming rate and are associated with a range of short and long-term developmental consequences. In the US, obesity rates among 12-19 year old adolescents increased from 5% in 1980 to 18% in 2010, and rates among 5-11 year old children increased from 7% to 18% during the same period (Center for Disease Control, 2012). Obese children have increased likelihood of developing sleep apnea, diabetes, cardiovascular problems, such as high blood pressure and metabolic syndrome, insulin resistance, and gastroentological problems, such as gallstones (Center for Disease Control, 2012; Ho, 2009; Must & Strauss, 1999). It is likely these additional health problems contribute to the high number of school absences experienced by obese children (Geier et al., 2007); these absences can, in turn, impact academic and social functioning. Furthermore, childhood and adolescent overweight

and obesity have been associated with an increased likelihood of overweight and obesity in adulthood, and the predictive power of childhood and adolescent BMI increases with age and with BMI (Freedman, Khan, Serdula, Dietz, Srinivasan, & Berenson, 2005; Guo & Chumlea, 1999).

Adult Obesity

The prevalence rates for adults are equally alarming as those for children, and the consequences of adult obesity are equally as important. In 2008, over 300 million women and 200 million men were classified as obese (WHO, 2012), and 35.7% of US adults were obese from 2009 - 2010 (Center for Disease Control, 2012). Adult obesity is associated with increased likelihood of experiencing a heart attack and of developing type-2 diabetes, asthma, high blood pressure, and some forms of cancer, such as colon, prostate, and kidney cancer (US Department of Health and Human Services, 2013). Furthermore, when examining predictors and consequences of elevated adult BMI, Brook, Zhang, Saar, & Brook (2009) found that high BMI in the early thirties is predictive of cognitive dysfunction in the mid-thirties.

Young adulthood is an important developmental period to examine BMI, as BMI tends to increase during the transition from adolescence to young adulthood. For example, in an 8-wave longitudinal study, Patton et al., (2011) tracked changes in BMI of 1,520 adolescents from 9th grade until the age of 24. Results indicated that by age 24, the prevalence rate of obesity had increased to 7%, which was 84% higher than prevalence rates averaged across the first 6 waves. Moreover, the continuity and stability of obesity status was very high from the ages of 20 and 24, suggesting it may be harder to return to a normal weight status during this period. Similarly, McTigue, Garrett, and Popkin (2002) examined the development of BMI across 2 decades using data collected from The National Longitudinal Survey of Youth and reported age-related

increases in BMI throughout young adulthood. More importantly, 80% of the participants identified as obese in their mid-thirties transitioned to an obese status during young adulthood. These results are particularly concerning given that the risk of death is increased among 30 to 64 year olds that are even *moderately* overweight (US Department of Health and Human Services, 2013).

Health issues that emerge later in life can have origins in childhood and adolescence, and a recent report on adolescent health and the current priorities of the World Health Organization (WHO) stressed the importance of evaluating health outcomes from a life course perspective (Bustreo & Chestnov, 2013). Similarly, in a review of the association between social relationships and health behaviors, Umberson, Crosnoe, and Reczek (2010) posit this association can best be examined using a life course perspective as "social ties and health behavior unfold in tandem over the life course" (p. 2). With this in mind, it is plausible that the increases in BMI and obesity that occur in young adulthood are the result of an accumulation of social experiences that have unfolded over time.

Socio-Demographic Variations

Despite the widespread prevalence of obesity, several subgroups have been identified as being disproportionately affected by the epidemic, including members of ethnic minorities, low SES individuals, and women. Because obesity has been identified as relatively stable across time, it is necessary to control for factors commonly associated with weight status when examining the development of obesity across the life course, and these subgroups can be included as covariates in statistical analyses. This will help to ensure there are factors beyond ethnicity, income level, and gender that contribute to and predict weight status. Additionally, knowledge of these disparities affords an opportunity to compare the pathways to obesity of

various subgroups, as this information would help inform interventions to meet the specific needs of the subgroup.

A large body of research indicates that obesity prevalence is higher among African-American and Hispanic individuals than among White individuals (Huang, Lanza, Wright-Volel, & Anglin, 2013; Rendall, Weden, Fernandes, &Vaynman, 2012; Wisniewski & Chernausek, 2009). More specifically, Black and Hispanic women are significantly more likely to be obese than White women (Ljungvall & Zimmerman, 2012; Wang & Beydoun, 2007). Within ethnic groups, a disproportionate number of black women, compared to black men (Robinson, Stevens, Kaufman, & Gordon-Larsen, 2010), are impacted by obesity, and more non-Hispanic white men are overweight compared to non-Hispanic white women (Kanter & Caballero, 2012).These results indicate that there are variations of obesity prevalence between ethnicities, as well as variations within ethnic groups, and, taken together, this information suggests that ethnic-minority women have a very strong risk of obesity.

Lower SES individuals also experience higher rates of obesity than higher SES individuals (O'Dea & Caputi, 2001; Wang & Beydoun, 2007). Senese, Almeida, Fath, Smith, and Loucks (2009) reviewed 30 studies conducted between 1998 and 2008 that examined the association between childhood SES and adulthood weight status, and authors found that higher childhood SES was consistently associated with lower BMI, especially for women. Senese et al., (2009) concluded that SES-related disparities appear to be decreasing over time, as these findings were less consistent than those found in an earlier review conducted by Parsons et al., (1999). High obesity rate among low SES individuals is of concern due to a higher likelihood that low SES individuals will encounter barriers to health care and services.

As previously noted, obesity tends to be more prevalent in women than men. After conducting a review of childhood obesity-related gender differences, Wisniewski and Chernausek (2009) concluded that "boys and girls differ in body composition, patterns of weight gain, hormone biology, and the susceptibility to certain social, ethnic, genetic, and environmental factors" with girls at a higher risk of obesity than boys (p. 81). Recent examinations of gender differences in obesity prevalence have assessed differences in neurological responses to food stimuli, with obese women showing more activation in regions associated with habitual or automatic behavior, and less activation in regions associated with goal-directed or cognitive control of behavior, in motivational contexts than men (Horstmann et al., 2011). These findings indicate that females have greater biological, behavioral, and environmental risks of obesity than males. Knowledge of these differences may help explain variations in weight related outcomes.

An interplay of socialization factors may help explain the large gender and ethnic differences in obesity prevalence. It is well known that females, members of ethnic minorities, and low SES individuals are at increased risk for obesity, and cultural influences on body satisfaction and weight standards are one potential explanation for the disproportionate numbers of minority members and females that are obese. It has been suggested that White women have stronger motivation to be thin compared to African American women (Fitzgibbon, Blackman, & Avellone, 2000; Powell & Kahn, 1995). Furthermore, girls tend to report lower body satisfaction and higher weight concerns than males (Hayden-Wade et al, 2005; Rancourt & Prinstein, 2010), and while males place more emphasis on muscularity, girls focus on maintaining a low weight status (see Holson, Jones, & Birkeland, 2012). Girls report receiving more body-related teasing than boys, and, although teasing has been associated with body image concerns in males and females, this association produces significantly more anxiety in females than in males (Slater &

Tiggeman, 2011). This is particularly concerning given the difference in body composition between males and females, as females are born with more body fat and develop more hip fat deposits after puberty (Wisniewski & Chernausek, 2009). It has also been suggested that being overweight or obese does not have a significant impact on the self-esteem of lower SES children, particularly lower SES males (O'Dea & Caputi, 2001) or on inner-city African-American children (Kaplan & Wadden, 1986). Taken together, these findings suggest that obesity may have the worst social consequences for females, and particularly White females.

Measurement of Obesity

BMI

Body Mass Index (BMI) is a widely accepted and reliable measure commonly utilized to assess weight status. BMI is represented by a numerical value and is calculated by entering height and weight information into the formula: [(weight/(height^2))*703]. The resulting BMI value is then used to classify individuals into one of four weight status classifications. Adults with a BMI of 18.4 and below are classified as underweight; adults with a BMI between 18.5 and 24.9 are classified as normal weight; adults with a BMI between 25.0 and 29.9 are classified as overweight; and adults with a BMI of 30.0 and above are classified as obese. While the same formula is utilized to calculate BMI for children, classification of weight status is dependent on the child's sex and age at the time of measurements. Calculated BMI is plotted on the CDC growth chart to obtain a percentile ranking, comparing BMI in relation to that of other children their age. Children with a BMI in the 4th percentile and below are considered underweight; children in the 5th – 84th percentile are considered healthy weight; children in the 85th – 94th percentile are considered overweight; and children in the 95th percentile and above are

considered obese (World Health Organization, 2012). In sum, both children and adults receive a BMI value that is used to classify their weight status into 1 of 4 categories.

Reporting of BMI

Because BMI is represented by a numerical value that is used to place individuals into weight status categories, it is often reported as both a continuous variable (by BMI numerical value) and/or a categorical variable (by weight status classification). There are statistical advantages to using a continuous BMI measure when predictors and outcomes of BMI are of interest. Also, as pointed out by Keith, Fontaine, and Allison (2013), weight status categories may be of limited use when examining longitudinal changes in BMI as they do not provide insight on potential transitions between weight categories. Welch, Schwartz, and Woloshin (2005) suggest that researchers should examine and report both categorical weight status as well as continuous BMI. Taken together, these findings suggest that researchers should consider which reporting methods would best answer their research question. In the current study, both approaches will be used.

Methods for obtaining height and weight information to create a BMI score differ among researchers. Some research has relied on objective indicators where height and weight information is obtained with the use of scales and a tape measure. Other researchers have relied on respondents, especially adult respondents, to report their height and weight. Shapiro and Anderson (2003) examined the association between self-reported weight and measured weight among 243 college students and found strong, significant associations between the two. Furthermore, Strauss (1999) examined the associations between self-reported and measured height and weight information using a nationally representative sample of 1,657 adolescents. Results indicated that, although females were significantly more likely to underreport their

weight than males, self-reported information resulted in an accurate weight classification in 94% of participants. It therefore would appear that both measured and reported height and weight provide convergent information for use in creating BMI scores.

Importance of Understanding Factors Contributing to Obesity and Weight-Related Problems

Despite the continued growth of obesity rates over the last 30 years, the underlying factors contributing to the epidemic remain largely unclear. While previous research has focused on environmental, biological, and sociocultural contributors to the epidemic, such as a lack of physical activity, genetics, and frequent consumption of fast food (Spruitz-Muer, 2011), Harrist and colleagues (2012) suggest examining obesity using a developmental perspective that focuses on a more complex interplay of interpersonal (such as negative family dynamics and poor peer relationships) and intrapersonal (such as loneliness and depression) factors and processes (Harrist, Topham, Hubbs-Tait, Page, Kennedy, & Shriver, 2012). Examining the development of obesity using a psychosocial risk model, as suggested by Harrist et al., (2012), may identify underlying causes that are targetable for change, will better inform interventions aimed at reducing obesity, and may shed light on the importance of factors that contribute to the disease, such as peer relationships, social connections, and enhanced regulatory abilities.

Interpersonal Relationship Factors as Contributors to Obesity Development

Several researchers have emphasized the role of interpersonal factors in the development of weight-related problems, including high BMI and obesity. Parenting and family relationship quality has received extensive study, with findings generally showing that harsh, authoritarian parenting, as well as psychologically controlling parenting, are associated with concurrent and subsequent weight problems (Berge, 2009; Harrist et al., 2012; Mendelson, White, & Schliecker,

1995; Zeller, Boles, & Reiter-Purtill, 2008). Peer relationship factors have received less research attention, but emerging evidence suggests that peer group experiences play a key role in weight problems and in health-related problems more generally (Adams & Bukowski, 2008; Brendgden & Vitaro, 2008; Janssen, Craig, Boyce, & Pickett, 2004). Of particular interest in the current investigation were the following: (1) Identifying and examining concurrent and predictive links between the three principal peer group challenges in middle childhood—lack of friends, victimization, and peer rejection—and obesity and high BMI. (2) Determining if problems in separate peer domains additively or redundantly predict adult BMI. (3) Identifying long-term connection between peer problems and BMI.

Before turning to the role of the peer group in obesity development, it is important to discuss the key domains of peer relationship problems in middle childhood, the developmental significance of each domain, and their predictive links with psychosocial outcomes.

Middle Childhood Peer Relationships as a Contributor to Developmental Outcomes

Peer relationships are an integral part of human development, and interactions with peers afford children an opportunity to develop a range of skills, such as perspective taking, conflict resolution, and social reasoning (Rubin, Coplan, & Bowker, 2013). Middle childhood is a particularly important period for peer relationship development and is marked by the transition to elementary school, growing cognitive abilities and social competence, an increase in social roles, and more frequent and complex interactions with peers (Eccles, 1999; Gifford-Smith and Brownell, 2003; Rubin, Coplan, Chen, Buskirk, & Wojslawowicz, 2005). Because peer problems experienced during childhood may forge a trajectory of continuing relationship difficulties and establish a persistent social stigma, it is likely that these early difficulties contribute to the

development of emotional, social, and health problems, including obesity, that persist through early adulthood.

The three commonly studied peer domains of acceptance and rejection, victimization, and friendships each make unique contributions to development across the life course, and to fully understand the developmental impact of the peer group, the influences of *each* unique domain must be considered (Ladd, Kochenderfer, & Coleman, 1997). Simultaneously examining the impacts of all three peer domains will highlight these unique affordances, as well as the co-occurrence of participation in multiple domains. Moreover, examining all three domains in relation to obesity development will provide greater insight into *how* peer difficulties contribute to elevated weight status and will highlight which domains, if any, buffer against obesity development. Because of these unique and concurrent contributions the three peer relationship domains make to children's development, a review of the individual and simultaneous contributions of these domains is warranted.

Peer Relationship Domains

Peer Acceptance/Rejection

Peer acceptance and rejection are group-level indicators of the positive and negative regard between a child and other members of the group (Bukowski, Sippola, Hoza, & Newcomb, 2000), and are considered "unilateral concepts" of the peer group's feelings (e.g., degree of liking vs. disliking) towards an individual child (Bagwell, Newcomb, & Bukowski, 1998). Peer acceptance affords children with a sense of inclusion, belongingness, and social satisfaction (Furman & Robbins, 1985; Ladd, Kochenderfer, & Coleman, 1997). Conversely, early exposure to peer rejection may limit children's social interactions and acquisition and practice of social skills, as rejected children may be excluded from play and other social activities by peers or may

proactively limit the effort they put into social relationships to avoid further rejection (Pederson, Vitaro, Barker, & Borge, 2007). For example, chronic exposure to peer rejection has been associated with a decline in independent and cooperative classroom participation among grade school children (Ladd, Herald-Brown, & Reiser, 2008).

Peer status is established early and remains relatively stable across time (Ladd, Herald-Brown, & Reiser, 2008; Mikami, Lerner, & Lun, 2010), as peers develop a cognitive bias against rejected individuals that is difficult to change (Mikami, Lerner, & Lun, 2010). Acceptance from peers is most important during elementary school (Gifford-Smith & Brownell, 2003), and may be influenced by the individual child's behavior (e.g., aggression or withdrawal; Hay, 2005; Rubin et al., 2005) as well as by physical characteristics that distinguish the child from peers, including attractiveness (see Ladd, 1999). This is particularly troublesome for children with social difficulties, such as early peer rejection, which has been found to predict later peer difficulties, including victimization, friendlessness, and further rejection (Ladd & Troop-Gordon, 2003; Hodges & Perry, 1999; Salmivalli & Isaacs, 2005). Moreover, peer rejection has been shown to be a robust predictor of an array of negative social, behavioral, and academic outcomes (Parker & Asher, 1987; Rubin et al., 2005).

Victimization

Peer victimization involves exposure to abusive processes and negative treatment by others (Ladd, 1999; Storch & Ledley, 2005) and can occur in the form of overt or relational victimization. Overt victimization is more prevalent among males and includes physical harm, such as pushing or hitting, threat of harm, teasing, and name calling (Crick & Bigbee, 1998), while relational victimization is more common among females and includes starting rumors, purposefully ignoring or excluding classmates, and other attempts to damage the targeted

individual's social relationships (Hodges, Boivin, Vitaro, & Bukowski, 1999). Victims are often described as physically weak, submissive, and fearful and exhibit socially withdrawn behaviors and internalizing problems such as anxiety (Boivin & Hymel, 1997; Hodges & Perry, 1999), and exposure to victimization contributes to continued insecurity and fear of the peer group (Ladd, 1999; Ladd, Kochenderfer, & Coleman, 1997). In contrast to rejection, which becomes stable during the elementary years, victimization becomes stable by middle school (Boulton & Smith, 1994). Victimized children also often have problems in other domains, as they are frequently rejected and disliked by peers and have few supportive friendships (Hodges & Perry, 1999).

While internalizing problems often antecede victimization, victimized children are also at an increased risk for further depression and other adjustment problems, such as loneliness, poor self-esteem, anxiety, and decreased feelings of social satisfaction (Crick & Bigbee, 1998; Hodges, Boivin, Vitaro, & Bukowski, 1999; Kochenderfer-Ladd & Wardop, 2001; Storch & Ledley, 2005), and victimization frequently results in school avoidance (Crick & Bigbee, 1998). This is particularly concerning given that these behaviors also illicit abuse from perpetrators. Moreover, chronic exposure to peer victimization has been associated with an increased likelihood of later physical problems, such as headaches, and the co-occurrence of victimization *and* emotional symptoms, such as depression, results in worse physical health outcomes than either occurring in isolation, providing evidence for a cumulative risk model (Biebl, DiLalla, Davis, Lynch, and Shinn, 2011).

Friendships

Whereas peer acceptance and rejection reflect group-level processes, friendships reflect dyadic relationships (Rubin et al., 2005) and are characterized by reciprocal liking (Bagwell, Newcomb, & Bukowski, 1998; Rubin et al., 2005), mutual respect, cooperation, and trust

(Gifford-Smith and Brownell, 2003), and by the intimacy, affection, and security they afford friendship members (Bagwell, Schmidt, Newcomb, & Bukowski, 2001; see Rubin et al., 2005). Friendships become more stable with age (see Rubin et al., 2005) and have been identified as being the "most central" aspect of peer relationships during late childhood and early adolescence (Boivin, 2005; Pederson, Vitaro, Barker, & Borge, 2007). During middle childhood, "friendships aid in acquiring knowledge about behavioral norms and help children learn the skills necessary for successful self-presentation and impression management" (Rubin et al., 2005, p. 474). Friendships also afford individuals a sense of self-worth and competence, which is believed to foster successful coping and assist with difficult developmental transitions (see Bagwell, Newcomb, & Bukowski, 1998). Furthermore, friendships aid in the development of conflict resolution and sensitivity to the needs of others (Ladd, 1999), and during times of distress, children learn to offer emotional support and sensitive responding to their friends (see Ladd, 1999). Children tend to put more effort into resolving conflicts with friends, compared to non-friends, and are less likely to blame friends for the problem.

Children choose friends who share similar observable traits, as well as similar behaviors and prosocial tendencies, motivation in the academic domain, and sociability, and these similarities become stronger in adolescence (see Rubin et al., 2005). While most rejected children do tend to report having friends, the friendship quality of poorly accepted children is worse than that of accepted children in multiple domains (Parker & Asher, 1993). Friendships of rejected children are characterized by higher levels of conflict and betrayal, lower levels of intimate disclosure, less help and guidance, and less caring and validation than friendships of well-accepted children (Parker & Asher, 1993), suggesting that the benefits afforded by friendships may depend on the characteristics of those involved. This is particularly important

when considering the peer relationships of obese children, as these friendships may not afford the same provisions as friendships of non-obese children. On the other hand, a lack of friendships also holds negative consequences, as friendlessness is associated with greater reports of loneliness (Parker & Asher, 1993) and lower self-worth (Bagwell, Newcomb, & Bukowski, 1998). Furthermore, children that lack friendships may have a harder time coping with stress, as friends serve as a large source of support and may be more susceptible to the negative influence of other peer difficulties (Hodges, Boivin, Vitaro, & Bukowski, 1999).

Unique Contributions of Peer Relationship Domains

Because peer relationship problems often co-occur, it is important to simultaneously examine the impact of multiple peer domains on various outcomes. This provides insight into the unique developmental contributions and predictive utility of each peer domain as well as the extent to which problems with peers in one domain influence other relationship domains. Identifying the unique developmental contributions of individual domains provides greater insight into peer group dynamics and into the short and long-term influences of the peer group. These examinations can also highlight how the provisions afforded by each domain change over time and across developmental periods. This information will better inform interventions that aim to reduce victimization and promote acceptance and the development of supportive friendships.

One of the first studies to simultaneously consider the influence of multiple peer domains examined the outcomes associated with acceptance, victimization, and friendlessness during the first year of school (Ladd et al., 1997). Results indicated that peer acceptance uniquely predicted academic readiness and social dissatisfaction across Kindergarten, after taking into account victimization. On the other hand, victimization emerged as a unique predictor of school

avoidance and loneliness and uniquely contributed to variation in school liking (Ladd et al. 1997). Erath, Flanagan, & Bierman (2008) examined the unique contributions of friendship and victimization to school adjustment among 6th and 7th grade students. Results revealed a unique association between peer-reported, and not self-reported, victimization and lower academic competence. Furthermore, after taking victimization and control variables into account, friendship and friendship support were both uniquely associated with higher reports of school liking and with higher academic competence.

Bagwell, Newcomb, and Bukowski, (1998) conducted one of the few longitudinal studies to examine unique developmental outcomes of multiple peer domains, as they examined the impact of preadolescent peer acceptance and friendships on adult adjustment. Although rejected and friendless individuals both reported more legal trouble and greater psychological maladjustment in adulthood than accepted and friended individuals, these two domains made non-redundant contributions to adult adjustment (Bagwell, Newcomb, & Bukowski, 1998). For example, friended individuals reported better overall adjustment and better school and family relationship adjustment in adulthood than chumless individuals, and friendship status was uniquely associated with adult depressive symptoms. Furthermore, friendship was a unique predictor of adult general self-worth, suggesting that friendships may serve act as a buffer against stress and contribute to individuals' self-concept. Preadolescent peer rejection was uniquely associated with school adjustment, aspiration level, job performance, and overall life status adjustment, and explained a unique portion of the variance of adult athletic competence, such that participants experiencing higher levels of rejection had lower athletic competence in adulthood. This is of particular concern to the current study, as weight increases across the

transition to young adulthood, and a lack of athletic competence may contribute to elevated BMI in adulthood.

Although peer problems do often co-occur, the influences of each domain are not always reciprocal, a problem in one domain does not guarantee problems in other domains, and the protective functions of individual domains may vary depending on the status of other domains. For example, early rejection has been identified as a predictor of friendlessness at ages 10 and 11, but early friendlessness does not predict rejection at ages 10 and 11 (Pederson, Vitaro, Barker, & Borge, 2007). Similarly, peer rejection, but not friendship status, contributes to change in victimization over time (Hodges & Perry, 1999). Furthermore, the influence of one domain often depends on, or operates through, another domain. For example, early rejection is indirectly associated with adolescent depression through friendedness (Pederson, Vitaro, Barker, &Borge, 2007) and the relationship between depressive symptoms and subsequent rejection is mediated by peer victimization (Kochel, Ladd, & Rudolph, 2012). Moreover, middle childhood friendships vary as a function of their peer acceptance, as friendship quality of low-accepted children is worse than that of average and high-accepted children in multiple domains (Parker & Asher, 1993). Taken together, it appears that simultaneous examination of multiple domains highlights the complexity of peer group dynamics and the influential power of peer group domains, and an understanding of the unique developmental contribution of individual domains will provide insight into the more complex relationships between multiple peer domains.

The Peer Group and Obesity

A growing body of research has examined the association of the peer group with child weight status, with results consistently finding that obese children and adolescents suffer poor psychosocial health, and the social consequences of obesity reach all relationship domains

(Hayden-Wade, et al., 2005; Janssen, Craig, Boyce, & Pickett, 2004; Pearce, Boergers, & Prinstein, (2002); Sweeting, Wright, & Minnis, 2005). Because of the vast array of social consequences obese youth face, examination of the association between each peer domain and obesity is warranted.

Consistent links have been identified between peer acceptance, rejection, and weight status, as overweight and obese children often have poorer social status (Gable, Krull, & Chang, 2009) and are frequently rated lower in lower likability, popularity (Rancourt & Prinstein, 2010), and peer acceptance (Zeller, Reiter-Purtill, & Ramey, 2008) than normal weight peers. A study examining the social relationships of 6^{th}-8^{th} grade youth revealed longitudinal associations between lower BMI and increases in likeability, while higher BMI was longitudinally associated with increased levels of negative weight-related cognitions (Rancourt & Prinstein, 2010). Overweight and obese youth are often marginalized from their peers, and sociometric nominations gathered during Wave 1 of the National Longitudinal Survey of Adolescent Health revealed that that overweight youth exhibit a significantly lower connection to highly nominated peers than normal weight participants (Strauss & Pollack, 2003). Moreover, child, peer, and teacher reports indicate that obese children display more socially withdrawn behaviors than comparison children (Zeller et al., 2008).

The current obesity literature frequently indicates that weight-related teasing and victimization is a widely practiced group phenomenon, as group-based stigmatization towards overweight and obese children and adolescents is consistently reported (Zeller et al., 2008). For example, normal weight youth report being teased more frequently by an individual friend, while overweight youth are victimized and teased by members of the peer group in general (Hayden et al., 2005). This phenomenon is similar to that of rejection, where the peer group establishes and

maintains a cognitive bias and negative attribution towards an individual that is difficult to overcome or change. For example, obese youth are often described as mean and lazy (see Gray, Kahhan, & Janicke, 2009) and are viewed as more physically unattractive, sick and tired, isolated, sensitive, and less athletically competent than normal weight children (Zeller et al., 2008). Because of the importance of social acceptance during childhood and adolescence, Quinlan, Hoy, and Costanzo, (2009) conclude that "any stigmatizing social experience may be harmful to functioning in overweight adolescents" (p. 998). The widely accepted negative views held about obesity and weight status may explain the host of negative outcomes associated with obesity.

Although obesity research is a relatively new field, weight-based stigmatization was documented as early as the 1960's using picture nomination methods. When using this technique, children are provided pictures of healthy looking children, obese children, and children with other physical disabilities, such as a facial deformation or the use of a wheelchair, and asked to rank their likeability of the individuals based on the pictures. In two studies conducted 40 years apart, obese children were significantly more likely to receive the lowest likeability rankings, while healthy children were significantly more likely to receive the highest rankings (Latner and Stunkard, 2003; Richardson, Goodman, Hastorf, and Dornbusch, 1961). Although obesity rates have drastically risen since the 1960's, interestingly, there were more cognitive biases towards the obese individuals in the most recent study. These studies highlight the cultural importance placed on weight status and appearance, and these findings are both important and concerning, as negative outcomes associated with obesity may be attenuated when children feel they are unable to control or change their status within the peer group.

Victimization is one of the most frequently addressed peer relationship domains in the current obesity literature, and a review of this literature reveals that overweight children and adolescents are regular targets of victimization by peers (Hayden-Wade et al., 2005; Janssen, Craig, Boyce, & Pickett, 2004; Sweeting, Wright, & Minnis, 2005). Cross-sectional studies have identified direct relationships between victimization and BMI such that as BMI increases, the likelihood of victimization also increases, especially among females (Janssen, Craig, Boyce, & Pickett, 2004). Furthermore, victimization rates of obese youth are estimated to be twice as high as those of normal-weight peers (Hayden-Wade, et al., 2005; Sweeting, Wright, & Minnis, 2005).

Short-term longitudinal assessments have examined victimization as a predictor of weight status and BMI. For example, Adams and Bukowski (2008) examined this association across a four year period in adolescence and found that victimization predicted changes in weight status from time 1 to time 3. These changes differed by gender, as victimization at time 1 predicted increases in BMI for females and decreases in BMI for males. Interestingly, low self-concept mediated the relationship between victimization exposure and change in BMI. Similarly, victimization and low self-esteem at age 11 predicted increases in weight status and BMI between the ages of 11 and 15 (Sweeting, Wright, & Minnis, 2005). In contrast, no short-term longitudinal associations between weight status and peer victimization were identified across an 11-month period suggesting a possibility that victimization exerts an impact on weight status over time (Rancourt & Prinstein, 2010).

Teasing is one of the most commonly documented forms of victimization among obese youth (Puhl, Luedike, & Heuer, 2011). For example, 1,555 adolescents in two high schools were interviewed about their attitudes and behaviors towards overweight (OV) children, and results

indicated that the most common form of bullying was verbally teasing overweight students (Puhl, Luedike, & Heuer, 2011). Of the study participants, 85-92% reported OV children are called names and made fun of during physical activities; 71% reported OV children are teased in the cafeteria; 76% reported that OV children are avoided and ignored by peers, 67% reported OV children are often excluded from school social activities, and 68% reported rumors are often spread about OV children. The high frequency of victimization that occurs during physical activity and at meal times is particularly concerning, given than a lack of physical activity may contribute to increased weight status and victimization is associated with an increase in unhealthy weight management behaviors, such as bulimia and starvation (Gray, Kahhan, & Janicke, 2009). Moreover, the high number of participants reporting knowledge of weight-based teasing lends further support for the stigmatization attached to high weight status.

Higher rates of victimization are consistently associated with increased weight-related concerns, internalizing problems and unhealthy weight control behaviors (Gray, Kahhan, & Janicke, 2009; Sweeting, Wright, & Minnis, 2005). For example, in one study weight-related teasing significantly predicted increased concerns about weight, higher levels of loneliness, a lower desire to participate in physical and social activities, and a higher desire to engage in sedentary and isolated activities above and beyond weight status and gender (Hayden-Wade, et al., 2005). Given that these consequences are also characteristics that attract victimization, it is likely that these outcomes contribute to an ongoing cycle of victimization. Moreover, a withdrawal from social activities may contribute to further rejection by the peer group.

The obesity literature has documented friendship associations similar to those that are reported in the peer relationships literature. For example, although they are less liked overall, *most* obese children do still report having friends (Zeller et al., 2008). However, a comparison of

the friendships of normal and overweight youth revealed that the likelihood of receiving no friendship nominations is significantly higher for overweight adolescents than for their normal-weight peers, and overweight individuals receive significantly fewer friendship nominations than normal weight individuals (Strauss & Pollack, 2003). Furthermore, overweight individuals made significantly more friendship nominations than they received, and a dose-dependent association between weight status and friendship nominations was identified, with normal and underweight participants receiving the most friendship nominations and obese participants receiving the fewest nominations (Strauss & Pollack, 2003).

Friendships of obese individuals may not provide the same protective functions afforded by friendships of obese individuals. For example, overweight adolescents are likely to be friends with other overweight adolescents (Valente, Fujimoto, Chou, & Spruijt-Metz, 2009), suggesting they may be marginalized from normal weight peers. Similarly, Strauss and Pollack (2003) reported that participants who nominated overweight individuals as friends were likely to be unpopular themselves and friends of normal-weight participants received more friendship nominations than did friends of overweight peers. Because overweight and obese children are stigmatized by the larger peer group, it is possible that these friendships are characterized by higher levels of conflict and betrayal, lower levels of intimate disclosure, less help and guidance, and less caring and validation than friendships of well-accepted children (Parker & Asher, 1993).

Gender differences are frequently identified in the association between peer relationships and weight status. For example, higher popularity status has been associated with increases in muscle gaining among males, while a longitudinal association between higher BMI and increased body dissatisfaction was identified among females (Rancourt & Prinstein, 2010). Similarly, Wang, Houshyar, and Prinstein (2006) reported that higher popularity among males is

associated with a muscular silhouette, while lower popularity is associated with "thin and heavy silhouettes." A stronger association was identified between obesity and body dissatisfaction among females than among males, while males exhibited a stronger association between muscle/fitness cognitions and social preference than females. Interestingly, in a study conducted by Pearce, Boergers, and Prinstein, (2002) overweight males reported receiving less victimization than obese or underweight males, suggesting an overweight status may be the desired social norm for adolescent males. Identifying these gender differences will allow for a more accurate interpretation of outcomes associated with weight status.

Although some research does simultaneously examine the influence of weight status on multiple peer domains, this has not yet been a primary focus of the obesity literature, and unique contributions of individual peer domains to weight status have received little study. Furthermore, while most previous research has focused on the peer difficulties resulting from elevated weight status, the current study examined these difficulties as unique *contributors* to elevated BMI. By identifying individual peer domains that contribute to obesity development, as well as those that protect against it, root problems can be appropriately addressed and protective functions promoted. Furthermore, most research in this area has been conducted using cross-sectional or short-term longitudinal study designs, and research has rarely examined this association across multiple developmental periods.

Potential Mediating Links between Childhood Peer Problems and Young Adult BMI

Establishing that a link exists between childhood peer problems and adult BMI does provide insight into the development of obesity; however, this knowledge does not provide an explanation into *how* these early peer experiences can influence weight status two decades later. Examining and understanding potential mechanisms will shed light on the development of high

BMI and can help pinpoint which underlying factors might be targeted to reduce weight status and improve health and well-being. Two potential mediating links suggested by the literature are feelings of loneliness resulting from a lack of social connectedness and engagement with peers, and the development of negative affect and self-perceptions, such as depression. Although often correlated with loneliness, the development of negative affect is representative of a more general sense of unhappiness with life circumstances.

According to the life course perspective, experiences occurring during one developmental period can influence outcomes and behaviors during subsequent periods (Umberson, Crosnoe, & Reczek, 2010). Because early adolescence is a time characterized by increasing social evaluation, a greater emphasis on physical appearance and attributes, and increased participation in social activities (Eccles, 1999), it is likely that children experiencing peer difficulties during middle childhood may have subsequent problems in these domains, and these difficulties may, in turn, contribute to poorer health outcomes, such as obesity, in young adulthood. Specifically, poor peer relationships in middle childhood may forecast (a) loneliness resulting from disengagement from peers (i.e., lack of social connectedness), and (b) the development of negative affect (i.e., internalizing problems such as anxiety and depression). In the following sections, the literature on social connectedness and negative affect during early adolescence, as well as their links with childhood peer problems and adult weight status, are reviewed.

Social Connectedness as a Potential Mediator between Childhood Peer Problems and Adult Obesity

Humans are social beings that share an innate desire to be connected with others, and a sense of belonging and connectedness is considered a basic human need (Baumeister & Leary, 1005; Jose, Ryan, & Pryor, 2012). An individual's sense of social connectedness begins to

develop early and is posited to influence adaptation across the life course (Williams & Galliher, 2006). For example, the reduced social capital of obese youth is posited to contribute to the poor social and economic status of obese adults (Strauss & Pollack, 2003). Furthermore, supportive relationships and social interactions during childhood promote the development of healthy regulatory and stress systems (see Umberson & Montez, 2010). Therefore, it is plausible that early peer difficulties leads to weaker adolescent social ties, as individuals may withdraw from the social world to avoid further rejection and victimization (Oh, Rubin, Bowker, Booth-LaForce, Rose-Krasnor, & Laursen, 2008).

Connectedness during Adolescence

A primary developmental task during adolescence is the engagement in meaningful social relationships, social activities, and experiences. Research consistently indicates that connectedness in the school, community, family, and peer domains is negatively associated with emotional distress and depressive symptoms, stress, and anxiety (Libbey, Ireland, & Resnick, 2002; McGraw, Moore, Fuller, & Bates, 2008), and participation in extracurricular activities has been shown to improve the peer status and social engagement of obese youth (Mahoney, Lord, & Carryl, 2005; Strauss & Pollack, 2003). Additionally, adolescent social connectedness has been identified as a longitudinal predictor of adult well-being (Olsson, McGee, Nada-Raja, & Williams, 2012), and adolescent social ties promote the development and maintenance of health behaviors and norms (Cacioppo & Hawkley, 2003; Umberson & Montez, 2010), such as participation in physical activity (Salvy et al., 2007). The ability to meet these norms, in turn, fosters a sense of belongingness and self-worth, can improve emotion regulation (Cohen, 2004), and improves the likelihood that these health behaviors will be maintained in adulthood.

Loneliness

Despite the well-documented benefits of social connectedness, some individuals remain disconnected from the social world, and social isolation has been associated with negative physical and mental health consequences, including dysregulated physiological systems, increased blood pressure, allostatic load, and poorer ability to cope with stressors (Cacioppo, et al, 2002; see Umberson & Montez, 2010). Because supportive social ties buffer against stress (Uchino, 2004), and stress and dysregulated physiological systems have been identified as contributors to obesity (Pervanidou & Chrousos, 2011), it is plausible that positive social connections play a key role in protecting against an elevated weight status. These positive social connections may have enhanced importance during early adolescence, as this can be a particularly stressful developmental period.

Loneliness is one manifestation of social disconnectedness that results when the needs for belonging and social engagement are not met, and feelings of loneliness are often characteristic of individuals that experience social isolation (see Heinrich & Gullone, 2006). Compared to non-lonely college students, lonely college students report higher levels of stress and perceived social threats, poorer social interactions, and less confidence in their ability to meet regular life demands (Hawkley, Bernston, Burleson, & Cacioppo, 2003). Similarly, lonely adolescents report lower self-worth (Qualter & Munn, 2002), motivation, and social expectations (Seginer & Lilach, 2004) than non-lonely adolescents, and adolescent loneliness is characterized by feelings of sadness (Buchholz & Catton, 1999). Interestingly, lonely girls report higher expectations of positive social relations than do lonely boys (Seginer & Lilach, 2004).

Loneliness is also associated with altered physiological arousal and reports of depression. For example, lonely college students demonstrate higher basal total peripheral resistance (TPR) and lower cardiac output (CO) than non-lonely college students, both in a laboratory setting and

across varying social contexts in everyday life, putting them at risk for the development of hypertension (Hawkley, Bernston, Burleson, & Cacioppo, 2003). Furthermore, depression and loneliness are frequently correlated (Nangle, Erdley, Newman, Mason, & Carpenter, 2003), but studies have shown their social and physical influence is not redundant. For example, Hawkley, Bernston, Burleson, and Cacioppo (2003) report that loneliness predicts negative social interactions above the influence of depressive affect, and loneliness has repeatedly been identified as a predictor of subsequent depression and negative affect (Cacioppo & Hawkley, 2003; Qualter, Brown, Munn, & Rotenberg). These findings are particularly relevant to the current study, as high blood pressure and depression have both been implicated as contributors to obesity.

The distinction between loneliness and affect is important, as both may uniquely contribute to the development of obesity, warranting individual examinations of their potential mediating links. Loneliness occurs when a desired level of social engagement and connections are not achieved. Negative affect, on the other hand, is representative of a more general sense of unhappiness and can result from a failure to meet a range of accepted standards, such as physical attractiveness, athletic ability, or academic achievements or from cumulative exposure to stressors outside of the peer domain, such as poverty. Because lonely individuals lack sources of social support, regular life stressors may be more difficult to navigate, leading to the subsequent development of negative affect.

Interestingly, lonely individuals also demonstrate different neurological responses to social stimuli than do non-lonely individuals (Cacioppo, Norris, Decety, Monteleone, & Nusbaum, 2008). For example, lonely and non-lonely individuals demonstrate differences in activation of the ventral striatum (VS), a brain region associated with reward and appetitive

behavior, in responses to viewing positive and negative social and non-social stimuli. Non-lonely individuals demonstrate greater activation in this region in response to pleasant *social* photographs, and, conversely, lonely individuals demonstrate greater activation in response to pleasant *non*-social pictures (Cacioppo, et al, 2008). This is particularly interesting, as recent neurological research indicates that youth exhibit heightened biological sensitivity for rewards during early adolescence (Somerville, Jones, & Casey, 2010), and the attainment of social connections is considered a rewarding experience (see Cacioppo et al., 2008). Lonely adolescents lacking connectedness with peers may engage in emotional eating, substance use, or other delinquent or unhealthy behaviors as a means of achieving the reward satisfaction they seek. This possibility warrants concern, as lifetime problems, such as unhealthy behaviors, drug and alcohol use, and relationship problems are often rooted in adolescence (Dahl, 2004).

Social Connectedness and Obesity

Robust findings indicate obese youth frequently suffer loneliness and are isolated and marginalized from their peers (Strauus & Pollack, 2003). However, because weight status, poor peer experiences, and social connectedness are often assessed simultaneously, it is difficult to determine the directions of influence and establish causation. For example, when assessed concurrently, elevated weight status has been identified as a significant predictor of loneliness and a higher desire to engage in sedentary and isolated activities, particularly among females (Hayden-Wade, et al., 2005). However, weight-related teasing significantly predicted these factors above and beyond weight status and gender, suggesting the negative peer experiences may have the strongest impact on the social lives and sense of connectedness of obese youth.

Adolescent Connectedness and Adult Obesity

Longitudinal studies examining the developmental implications of adolescent connectedness have consistently demonstrated the importance of these social relationships for adult health. For example, Gustafsson, Janlert, Theorell, Westerlund, and Hammarstrom (2012) found that adolescents experiencing peer problems at age 16 reported higher levels of distress, ate fewer vegetables, and were at risk of social isolation at age 43, as they were more likely to live alone, have a small social network, and be unemployed. Adolescent peer problems were significantly associated with metabolic syndrome in adulthood, as well as each individual component of the syndrome. Although the association with adult BMI was not directly examined in this study, obesity is often associated with metabolic disorders. These results are particularly concerning given that cumulative exposure to stress is associated with increased risk of negative health outcomes (see Umberson & Montez, 2010) and the combined risks of living alone and being unemployed drastically reduce the socialization opportunities of these adults. A lack of connection with other individuals results in a diminished support network and a lower likelihood that positive health behaviors and coping strategies, including regular exercise and consumption of healthy foods, will be encouraged.

Caspi, Harrington, Moffitt, Mild, and Poulton (2006) examined the impact of childhood and adolescent social isolation on adult cardiovascular health in one of the few studies to examine the social influences on health across multiple developmental periods. Results indicated that childhood social isolation predicted poor adult health status beyond childhood weight status, SES, and IQ. Furthermore, exposure to isolation across multiple developmental periods resulted in a dose-respondent relationship with adult health, as greater isolation was associated with poorer health outcomes, providing support for the impacts of cumulative risks.

While these longitudinal studies do provide insight into the association between adolescent connectedness and adult obesity, these studies often focus on older adolescents, and rarely examine the impact of early adolescent social connections. Furthermore, relatively few, if any, of these studies have been conducted in the United States. Moreover, longitudinal studies examining the relationship between obesity and connectedness often limit the sample to obese individuals, eliminating the ability to draw definitive conclusions about the temporal sequence of social problems and obesity development. Lastly, few studies simultaneously examine the factors that contribute to these poor social connections during adolescence. Simultaneously examining the contributors to, and outcomes associated with, adolescent social connectedness during different developmental periods will shed light on how social connections are involved in obesity development.

Middle Childhood Peer Problems and Negative Self-Perceptions in Early Adolescence

The social world and the relationships we engage in impact multiple facets of development throughout the life course, including the development of affect and self-perceptions. An individual's self-perceptions are based, in part, on relational experiences and how they believe others perceive them (Ladd & Troop-Gordon, 2003), and middle childhood peer problems have consistently been linked with internalizing disorders and negative affect in adolescence (Adams & Bukowski, 2008; Hodges & Perry, 1999; Pederson, Vitaro, Barker, & Borge, 2007). The accumulation of negative peer experiences has a greater impact on the development of psychosocial problems and negative self-views than does the status of current peer relationships (Ladd & Troop-Gordon, 2003), and, although difficulties in all three peer domains have been linked with the development of negative affect, children that experience

childhood rejection from the peer group may be at the greatest risk, as rejection is a group phenomenon that tends to remain stable over time (Ladd & Troop-Gordon, 2003). The negative thoughts and attitudes towards rejected youth are reinforced by multiple peers (Ladd & Troop-Gordon, 2003) and may contribute to the saliency and internalization of these beliefs.

Self-perceptions become more critical and complex during early adolescence, as the emphasis placed on physical attractiveness increases and positive self-images and self-esteem decrease (Cowie, 2012). Negative affect develops when an individual fails to meet widely accepted standards or believes that the standard is unachievable (Brooks-Gunn & Warren, 1989). The development of negative affective responses to stress, as well as the intensity of emotional reactions to stress, increase during early adolescence as hormone levels rapidly increase and the endocrine system begins to function at the beginning of puberty (Brooks-Gunn & Warren, 1989; Dahl, 2004; Somerville, Jones, & Casey, 2010). Because the general prevalence of depressive symptoms and other psychosocial disorders increases during adolescence (Brooks-Gunn & Warren, 1989), this may be a particularly vulnerable time for youth with a history of chronic peer difficulties, such as overweight and obese adolescence.

Associations Between Obesity and Negative Affect

Due to the importance placed on physical appearance during early adolescence, individuals deviating from the accepted attractiveness standard, such as the thin ideal, have a heightened risk for developing negative affect and negative self-perceptions, and robust findings indicate that obesity is associated with negative affect and poor self-perceptions, especially among females. Because of the highly stigmatized nature of obesity, and the widely-held conceptions that obese youth are lazy, socially unskilled, and athletically incompetent (Zeller, Reiter-Purtill, & Ramey, 2008), it is not surprising that obese adolescents have a higher

likelihood of experiencing depression than non-obese adolescents (Rushton, Forcier, & Schectman, 2002; Sweeting, Wright, & Minnis, 2005) and frequently report anxiety, poor self-esteem (Huang, Lanza, Wright-Volel, and Anglin, 2013), and increased concerns about weight status (Hayden-Wade, 2005; see Stice, 2002). Although the obesity literature demonstrates robust associations between elevated weight status and negative affect, they are often assessed concurrently, eliminating the ability to make causal inferences. Furthermore, researchers often simultaneously report on the negative peer experiences and affect of obese children, rendering the temporal sequence of peer difficulties, affect, and obesity development unclear. Some research indicates that exposure to weight-based stigmatization and victimization results in poorer self-esteem, body satisfaction, and quality of life among overweight youth (Gray, Kahhan, & Janicke, 2009). Moreover, Hayden-Wade et al., (2005) report that teasing is associated with loneliness regardless of weight status and posit that the *chronic* victimization experiences of overweight children may explain the high rates of depression and poor quality of life commonly reported by overweight youth. On the other hand, Quinlan, Hoy, and Costanzo (2009) report that distress level associated with teasing, and not the frequency of teasing experiences, has the greatest impact on self-esteem and depression among adolescents attending weight loss camp. Individuals reporting higher levels of distress from teasing experienced the worst outcomes in both domains, suggesting that maladaptive coping skills may play a role in the psychosocial functioning of overweight and obese children.

Examining the factors that contribute to, and the outcomes associated with, the development of negative affect and self-perceptions during different developmental periods will shed light on the individual and cumulative influences of peer difficulties and negative affect on obesity development. Because negative affect is frequently associated with emotionality, it is

plausible that development and use of regulatory abilities and adaptive coping mechanisms may improve the affect of obese individuals suffering negative peer experiences. Negative affect that is not addressed and managed during adolescence can have consequences for adult functioning, as trajectories leading to less than optimal outcomes in adulthood are often forged during adolescence (Dahl, 2004).

Affect as a Contributor to Obesity

Several studies have documented a longitudinal association between negative affect in adolescence, such as depression and anxiety, and subsequent development of obesity. For example, Pine et al., (1997) reported that, among females, depressive symptoms at the age of 14 are predictive of obesity *and* BMI at age 22. Furthermore, using the National Longitudinal Study of Adolescent Health, Goodman and Whittaker (2002) reported that, among 7^{th}-12^{th} graders, depressive symptoms at baseline emerged as a unique predictor of obesity 1 year later, even after controlling for initial BMI, parental obesity, and other demographic variables. Similarly, elevated depressive affect among 11-15 year old adolescent females is a significant predictor of later obesity onset (Stice, Presnell, Shaw, & Rohde, 2005).On the other hand, a meta-analysis of this association reveals findings are often mixed, with some studies reporting a reverse association where obesity precedes depression development (see Luppino et al., 2010). Moreover, the association between adolescent depression and adult obesity is more consistent among females than among males (Richardson et al., 2003).

While these studies do provide insight into the longitudinal association between negative affect and obesity development, these studies rarely examine this association across multiple developmental periods. Moreover, many of these studies address depression development in late, rather than early, adolescence. Examining the development of depression during this important

transitional period will expand current knowledge on the association between negative affect during adolescence and the subsequent development of adult obesity. Furthermore, few studies simultaneously examine the contributors to, and outcomes associated with, adolescent affect, and this examination across multiple developmental periods should provide additional insight into obesity development across the life course.

Potential Direct Links between Childhood Peer Problems and Young Adult BMI

Although loneliness and negative affect may serve as important mechanisms through which early peer difficulties exert an impact on young adult obesity, it also is possible that childhood peer relationship problems exert a direct effect on young adult BMI. Exposure to peer difficulties can be considered stressors, and exposure to stress has frequently been implicated as a contributor to the development of obesity and other metabolic diseases (Gunnar & Quevedo, 2007; Sinha & Jastreboff, 2013). This is of particular concern as obese individuals often suffer social and emotional stressors as a result of their weight status, and this may contribute to the continuity of obesity. Greater frequency of stressful experiences and "chronic stressors" across the life course has been associated with higher BMI, smoking status, and excessive consumption of alcohol, even after including race, gender, age, and SES as covariates (Sinha & Jastreboff, 2013). Van Jaarsveld, Fidler, Steptoe, Boniface, and Wardle (2009) compared weight statuses of adolescents with varying stress levels and found that, although there were no differences in rate of weight change based on stress level, high stress adolescents consistently had higher BMI's than low-stress adolescents across all 5 waves of the four year period. Authors propose that stress experienced earlier in life by the high-stress group may have accounted for these results and suggest that early stress exposure may forge the adiposity trajectory. Because peer relationship problems can be sources of stress, and stress systems of rejected children may be activated for a

prolonged period of time (Gunnar and Quevedo, 2007), it is plausible that these relationship difficulties may contribute to additional problems and increased weight status across the life course.

Chronic exposure to stress has also been identified to alter food intake through neurological processes, as brain reward circuitry has been implicated as a key component of increased stress-induced food intake (Adams & Epel, 2007; Sinha & Jastreboff, 2013). Adams & Epel suggest the high consumption of palatable food, such as fast food, is attributed to the reward sensations resulting from this consumption. Consuming palatable foods produce effects very similar to those produced by drugs, and individuals begin to eat habitually in search of the opioid sensation they receive. Similarly, Kanokski (2012) suggests that increased caloric intake of nutritionally deficient food may be the result of underlying cognitive processes. Therefore, it appears that neurological processes may play a role in the development and maintenance of obesity, and this role may be similar to that of neurological processes involved with substance use and addiction. Because of the plasticity of the brain, the development of adaptive coping skills may ameliorate these maladaptive neurological responses.

Summary

The preceding literature highlights the importance of the peer group and the varying developmental influences of individual peer domains. Peer difficulties can serve as major sources of stress, particularly at a time when high importance is placed on the social world, and the consequences of peer difficulties during one developmental period often linger and impact adjustment and adaptation during subsequent developmental periods. Stress has frequently been implicated as a contributor to obesity, and because peer problems often persist over time, an

examination of obesity development across the life course is warranted and provides a novel approach of examining contributors to this epidemic.

Goals of the Present Study

One of the primary goals of the current study was to examine the impact of childhood peer problems on the development of obesity during young adulthood. More importantly, the current study aimed to identify the mechanisms that explain this link between early peer difficulties and subsequent weight status. Most obesity research has been cross-sectional in nature, and there have been few, if any, studies that examine social contributors to, and consequences of, obesity across multiple developmental periods. In addition, this study examined the impact of peer difficulties in multiple domains.

Given the proceeding review, the following questions were examined:

1) Is weight status in young adulthood uniquely predicted by middle childhood peer rejection, victimization, or friendlessness?

   1a) Do these predictive relationships hold after controlling for socio-demographic factors, including SES, race/ethnicity, gender, and childhood weight status?

2) Is the relationship between childhood peer problems and adult weight status mediated by early adolescent loneliness and anxiety/depression?

3) Does the relationship between early peer difficulties and adult weight status differ by gender?

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III. Method

Participants and Overview

Data for the current study was collected as part of the Child Development Project, an ongoing multi-site, longitudinal study aimed at examining children's development in multiple contexts across time (Dodge, Bates, & Pettit, 1990; Pettit, Lansford, Malone, Dodge, & Bates, 2010). The initial sample was comprised of 585 participants from the Nashville, TN, Knoxville, TN, and Bloomington, IN areas. Participants were originally recruited in 1987 and 1988 prior to participants' entrance into Kindergarten. Eighty-five percent of participants were approached at random during pre-Kindergarten registration and asked to participate in the project; of those approached, 70% agreed to participate. Remaining participants were later recruited by mail, by phone, or at registration on the first day of school. Initial interviews and assessments were completed with parents during the summer prior to the child's start of Kindergarten, and annual assessments have been conducted since. During annual assessments data have been gathered from a variety of sources, including children, teachers, peers, romantic partners, and observations completed by trained researchers and research assistants. The initial sample was comprised of a moderately diverse set of participants; of the original 585 participants, 52% were male, 81% were European American. The mean Hollingshead Four Factor Index of Socioeconomic Status (1979) was 39.5 (SD = 14.01), indicating that while most participants were considered middle class, a range of socioeconomic statuses were represented in the sample.

Measures

Peer Relationship Predictors in Middle Childhood

Sociometric interviews were conducted with participants at school each winter of Kindergarten through 3rd grade. Participants were provided a list of children in the classroom, or

pictures of their classmates, and asked to identify how much they liked each child by rating them on either a 3 or 5-point scale. Low ratings were indicative of disliking, while higher ratings were representative of liking. Children were also asked to name three children they liked the most and three children they liked the least and to identify children that displayed aggressive or prosocial behaviors.

Peer Acceptance

Nominations for peer-liking and peer-disliking were standardized within-classrooms, and social preference scores were created for each child by subtracting the standardized disliking score from the standardized liking score. A composite social preference score was created by averaging scores across all four years ($\alpha = .77$).

Peer Victimization

In grade 3 or 4 participants were asked about classmates who often get picked on, teased, or punched. For each question, ("Who gets hits and punched by other kids?" "Who gets picked on by other kids?" and "Who gets teased or called names?") participants were asked to nominate three children. Within classroom nominations were standardized and averaged across the three items to create composite index of peer victimization ($\alpha = .82$).

Reciprocated Friendships

The number of matching (reciprocated) high liking ratings (indicated by the highest score on the rating scale) were calculated and added together for each participant. A composite score was created by averaging the number of reciprocated friendship ratings received across all four years ($\alpha = .56$). The modest cross-grade reliability for reciprocated friendships likely is due to the changing composition of classrooms such that friends from previous years may not be in the same classroom in subsequent years.

Weight Status

Young Adult Body Mass Index

BMI was computed at three time points based on a combination of self-report and measured height and weight information. Participants reported height and weight information in written assessments during years 18 and 23, when participants were ages 23 and 28, respectively. In year 19 or 20, when participants were 24 or 25 years old, a trained research assistant objectively measured the height and weight of 410 participants. Weight was measured in pounds using a portable scale, and height was assessed using a measuring tape. At each point, BMI was calculated using the standard procedure endorsed by the Center for Disease Control (BMI = Height/weight^2*752). BMI was significantly correlated across time points and was therefore summed and averaged across all three years to create a composite index of young adult BMI (α = .92). Because of the differential health risks associated with being overweight and obese obesity and overweight status, BMI was used to classify individuals into a weight group. To examine the association between childhood peer difficulties and adult weight status, participants with a BMI of 18.4 and below were classified as underweight; participants with a BMI between 18.5 and 24.9 were classified as normal weight; participants with a BMI between 25.0 and 29.9 were classified as overweight; and participants with a BMI of 30.0 and above were classified as obese.

Childhood Weight Status

During years 1 – 4, when participants were in Kindergarten through 3rd grade, parents completed the Child Behavior Checklist (CBCL). The CBCL is a 118-item measure that assesses children's competencies and problems in 8 different domains (Achenbach, 1991). Items are rated on a 3-point scale from 0 (not true) to 2 (very true or often true). Two items from the CBCL assess weight status ("My child overeats" and "My child is overweight"). These items were

summed and averaged across all four years to create a composite index of childhood weight status ($\alpha = .91$).

Lack of Social Connectedness: Loneliness

During 6th grade participants completed The Loneliness and Social Dissatisfaction Scale (Asher, Hymel, & Renshaw, 1984). This is a 24-item measure ranked on a 5-point scale from 1 (always true) to 5 (not at all true) that is designed to assess an individual's social satisfaction and feelings of loneliness. Examples of items include "I have no one to talk to," "I don't have anyone to play with," and "I don't get along with other children." The measure includes 8 filler items that assess an individual's participation and interests in various hobbies and activities, and these items (#'s 2, 5, 7, 11, 13, 15, 19, and 23) were excluded from analyses. Item numbers 3, 6, 9, 12, 14, 17, 18, 20, 21, and 24 were reverse scored to ensure that higher scores are reflective of greater levels of loneliness and social dissatisfaction. Items were then summed and averaged to create a composite index of child reported loneliness and social dissatisfaction ($\alpha = .87$).

Parents completed a shorter, 4-item version of the loneliness scale the previous year when children were in 5th grade, and this scale is designed to examine how children feel about themselves in social situations. These items ("My child thinks he/she has an easy time making friends," "My child feels alone," "My child thinks it is hard to get other kids to like him/her," and "My child says he/she is lonely") were rated on a 5 point scale from 1 (always true) to 5 (not at all true). Item #'s 2, 3, and 4 were reverse scored to again ensure that higher scores reflect greater levels of loneliness, and all items were summed and averaged to create a composite index of parent reported loneliness and social dissatisfaction ($\alpha = .80$). The child and parent loneliness composites were significantly correlated ($r = .34$, $p = .001$) and therefore were standardized and averaged to create a multi-informant composite index of loneliness and social dissatisfaction.

Negative Affect: Anxiety/Depression

Parents completed the Child Behavior Checklist in year 8, when participants were in 7th grade. The anxious/depressive symptoms subscale is comprised of 14 items (#'s 12, 14, 31, 32, 33, 34, 35, 45, 50, 52, 71, 89, 103, and 112), and sample items include "Nervous, highstrung, or tense," "cries a lot," "feels worthless or inferior," and "fears own thoughts or actions." The subscale has demonstrated high reliability and validity (Achenbach, 1991).

IV. RESULTS

Preliminary Analyses

Descriptive analyses were conducted to determine the mean, standard deviations, and number of participants for all study variables (see Table 1). On average, in middle childhood, participants reported relatively low levels of victimization, were generally accepted by peers, and reported having friends. In early adolescence, on average, participants experienced relatively low levels of loneliness, according to parent and child reports. Furthermore, parents reported that, on average, participants displayed low levels of negative affect. On average, participants maintained a normal or overweight weight status across young adulthood. More specifically, according to current CDC standards, 1.6% of participants were classified as underweight, 46.3% were classified as normal weight, 33.3% were overweight, and 18.8% of participants were obese.

Correlations were conducted for all study variables and are presented in Table 1. Higher BMI across young adulthood was significantly associated with fewer reciprocated friendships (r = -.09, p < .05), poorer peer acceptance (r = -.22, p < .01), and higher victimization (r = .12, p < .05) in middle childhood. BMI was most strongly correlated with peer acceptance, which is not surprising given the importance of acceptance during this developmental period. Furthermore, childhood victimization was positively correlated with adolescent negative affect (r = .14, p < .01) and adolescent loneliness (r = .32, p < .01), such that higher levels of victimization during middle childhood were associated with higher reports of loneliness and higher levels of negative affect during adolescence. Conversely, childhood acceptance was negatively correlated with both (r_{affect} = -.16, p < .01; $r_{loneliness}$ = -.33, p < .01), indicating that higher levels of childhood acceptance were associated with lower levels of negative affect and loneliness during early adolescence. Although childhood friendship was significantly correlated with adolescent

loneliness (r = -.26, p < .01), it was not associated with adolescent affect. Higher childhood weight status was significantly associated with fewer friendships (r = -.1, p < .05), poorer acceptance (r = -.15, p < .01), and higher reports of victimization (r = .14, p < .01) in middle childhood; with higher reports of loneliness (r = .16, p < .01) and negative affect (r = .16, p < .01) during early adolescence; and with higher BMI across young adulthood (r = .48, p < .01). Lastly, higher adult BMI was significantly associated with high levels of adolescent loneliness (r = .10, p < .05) and negative affect (r = 12, p < .05).

Primary Analyses

Main effects of peer relationship problems. A series of regression analyses were conducted using SPSS to examine the primary aims of the current study (see Tables 2 – 4). First, all peer relationship domains were entered simultaneously in step 1. Childhood peer acceptance was significantly associated with adult BMI (β = -.22, p < .01) such that individuals with poor peer acceptance during middle childhood tended to have higher BMI in early adulthood. No significant relationships between adult BMI and the other two peer domains emerged ($\beta_{friendship}$ = .04, p = .59; $\beta_{victimization}$ = .03, p = .60). Taken together, the childhood peer domains accounted for 5% of the variance in adult BMI. Next, all control variables were entered in the first step with the three peer domains entered simultaneously in the second step. No significant relationships between adult BMI and the three childhood peer domains emerged when control variables were also considered ($\beta_{friendship}$ = .01, p = .89; $\beta_{acceptance}$ = -.1, p = .15; $\beta_{victimization}$ = -.01, p = .83), providing support for the inclusion of these controls. Because only a portion of the sample received a victimization score (n = 386), a subsequent analysis was conducted without the use of victimization. During this third analysis, all control variables were entered in the first step, followed by acceptance and friendships in the second step. Results indicated that, when

victimization was not included in the model, poorer childhood peer acceptance again emerged as a significant predictor of higher BMI across young adulthood ($\beta = -.12$, $p < .05$), providing additional support for the predictive relationship between childhood social preference and adult body mass index. Middle childhood friendships, however, were not a significant predictor of adult BMI ($\beta = .02$, $p = .72$). The inclusion of acceptance and friendship explained an additional 1.1% of the variance in adult BMI, and, taken together, sociodemographic variables, childhood weight status, and middle childhood acceptance and friendship accounted for 26.9% of the variance in adult BMI.

Next, to determine if the large number of participants without a victimization score was impacting the analyses, the relationships between all three peer variables and adult BMI were re-examined using AMOS. AMOS uses full information maximum likelihood estimation (FIML) with missing data, which results in unbiased parameter estimates and appropriate standard errors. FIML estimates are generally superior to those obtained with listwise deletion or other ad hoc methods. As before, all control variables and peer-domain variables were simultaneously entered in the model. Again, no significant relationships emerged between adult BMI and the victimization and friendship domains. Peer acceptance, on the other hand, did emerge as a significant predictor of adult BMI ($\beta = -.12$, $p < .05$), highlighting the influence of the smaller victimization sample on the results (see Table 5). Therefore, victimization was examined separately in the remainder of analyses, all of which were conducted using SPSS.

Next, the impact of victimization on adult BMI was examined without the inclusion of the other peer domains (see Table 6). All control variables were entered in the first step, followed by victimization in the second step. Like friendships, childhood victimization was not a significant predictor of adult BMI ($\beta = .03$, $p = .56$). Of the three peer domains, peer acceptance

was the only domain to demonstrate a significant main effect on adult BMI when sociodemographic variables and childhood weight status were also considered. Although the effect of peer acceptance on adult BMI is modest, this influence is robust, as peer acceptance emerged as a significant predictor of adult BMI in multiple analyses. That is, controlling for SES, gender, childhood weight status, and ethnicity, peer acceptance remained a significant predictor of adult BMI.

Gender as a moderator of links between peer problems and adult BMI. To examine whether bivariate relations between predictors and outcomes differed by gender, correlations were computed separately for boys and girls (see Table 7). It can be seen that significant correlations between peer problems and BMI were only found for girls, such that higher BMI was associated with lower peer acceptance and higher victimization. These gender differences were further explored in a series of regression models (see Tables 8 – 10). Each peer domain and gender interaction was examined separately, with control variables, including gender, entered in the first step, the individual peer domain entered in the second step, and the peer domain x gender interaction entered in the third step. The interaction of friendship and gender did not significantly predict adult BMI ($\beta_{friendsxgender} = .05$, $p = .59$), but both the acceptance x gender and victimization x gender interactions were significant predictors ($\beta_{acceptancexgender} = -.12$, $p < .05$; $\beta_{victimizationxgender} = .16$, $p <. 05$). In other words, the relationships between acceptance and adult BMI and between victimization and adult BMI differed for males and females. The interaction of acceptance and gender explained an additional 1% of the variance in adult BMI, and taken together, all predictors accounted for 27.5% of the variance. The interaction of victimization and gender explained an additional 1% of the variance in adult BMI, and, taken together, all predictors accounted for 30.2% of the variance (See tables 7 – 9).

Simple slopes analyses revealed that higher levels of peer acceptance predicted lower adult BMI for females (β = -.20, $p < .001$), but not for males (β = -.03, $p > = .05$) (See Figure 1). Conversely, lower levels of victimization predicted lower levels of adult BMI for females (β = .11, $p < .1$) but not for males (β = -.07, $p > .05$) (see Figure 2). Therefore, it appears that problematic peer relationships during childhood put females at risk for elevated BMI in young adulthood.

To further examine the interaction between gender and BMI, analyses of variance were conducted with a BMI classification variable. Using the BMI guidelines endorsed by the CDC, BMI was used to classify participants as underweight, normal weight, overweight, or obese. Due to the small percentage of participants that were underweight (1.8%), one category was created representing both under- and normal weight participants. Of the 516 participants that received a BMI classification, 47.9% were under- or normal weight, 33.3% were overweight, and 18.8% were obese. The proportion of obese individuals is slightly lower than the national obesity rate. Separate analyses were conducted for peer acceptance and victimization.

It should be noted that although childhood peer difficulties served as the dependent variable (outcomes) in these analyses, they were assessed prior to the assessment of the independent variable (predictor) of BMI. For peer acceptance, a 3 (weight classification group) x 2 (gender) ANOVA revealed a marginally significant main effect for gender ($p = .07$), a significant main effect for weight status ($p < .001$), and a significant weight x gender interaction ($p < .05$). The weight x gender interaction is depicted in Figure 3. It can be seen that acceptance is highest among under/normal weight females, lowest among obese females, and in-between for overweight females. Each of these groups differed significantly from the other via post-hoc comparisons. Although under/normal weight and overweight males did not differ in levels of

peer acceptance, both had significantly higher acceptance than obese males. It can also be noted that no gender differences in peer acceptance were found for the overweight or obese groups, but under/normal weight young adult females were significantly higher in childhood acceptance (t = -3.61; $p < .001$) than under/normal weight males (M_{males} = .14; $M_{females}$ = .48). Analyses for peer victimization revealed no significant main effects or interactions for gender or weight category.

Tests of mediation. Although the previous analyses do shed light on the relationship between early peer difficulties and subsequent adult body mass index, they do not provide insight on the mechanisms linking the problematic peer domains and BMI. A series of mediation path analyses were fit in order to examine early adolescent affect and loneliness as mediators of these relationships. Criteria for testing for mediation (Baron & Kenny, 1986) were met for both peer acceptance and victimization and for both putative mediators (i.e., that the predictor was significantly associated with both the mediator and the outcome and the mediator was significantly associated with the outcome), as can be seen in Table 1.

First, adolescent loneliness and affect were separately examined as mediators of the relationship between childhood acceptance and adult BMI. When entered alone, peer acceptance was a significant predictor of adulthood BMI (β = -.22, $p < .001$; R^2 = .048), accounting for 4.8% of the variance in adult BMI. Loneliness was a significant predictor of adult BMI in the first step (β = .1, $p < .05$; R^2 = .010), and acceptance remained a significant predictor in the second step (β = -.18, $p < .001$; ΔR^2 = .028). When acceptance was entered in the second step, the ΔR^2 was reduced to .028, indicating that 58.3% of the effect of peer acceptance was accounted for by loneliness. A Sobel test was conducted to examine the significance of these indirect effects, and results indicate that the effect of acceptance on BMI is not significantly mediated by adolescent loneliness (z = -.75, p = .46).

When affect was entered in the first step it also emerged as a significant predictor of adult BMI (β = .12, $p < .05$; $R^2 = .014$). Although acceptance continued to significantly predict BMI when entered in the second step (β = -.19, $p < .001$; $\Delta R^2 = .034$), the ΔR^2 was reduced to .034, indicating that 29.2% of the effect of peer acceptance was accounted for by adolescent affect. However, results of a Sobel test indicate that negative affect during adolescent does not significantly account for the indirect effects of middle childhood peer acceptance and BMI across young adulthood ($z = -1.5$, $p = .13$).

Following the same procedure used with acceptance, loneliness and affect were examined as mediators of the relationship between victimization and BMI. When entered alone, peer victimization emerged as a significant predictor of adult BMI (β = .12, $p < .05$; $R^2 = .015$), accounting for 1.5% of the variance in adult BMI. Similarly, loneliness emerged as a significant predictor of adult BMI (β = .13, $p < .05$; $R^2 = .017$) when entered in the first step. The association between victimization and BMI, however, was rendered non-significant (β = .08, $p = .18$; $\Delta R^2 = .006$) when victimization was entered in the second step. Furthermore, when victimization was added in the second step the ΔR^2 was reduced to .006, indicating that 60 % of the effect of peer victimization on BMI was accounted for by adolescent loneliness. However, results of a Sobel test indicate this indirect effect is not significantly explained by adolescent loneliness ($z = 1.53$, $p = .13$).

When affect was entered in the first step, it also emerged as a significant predictor of adult BMI (β = .18, $p < .01$; $R^2 = .033$), but the association between victimization and BMI was reduced to non-significance when victimization was entered in the second step (β = .09 $p = .13$; $\Delta R^2 = .008$). The inclusion of early adolescent affect as a mediating variable reduced the direct effect of middle childhood peer victimization on adult BMI by 46.7% [(.015 - .008) / - .015). To

further investigate this mediating effect, a Sobel test was conducted, and results provided further support for mediation ($z = 1.98$, $p < .05$). In other words, early adolescent negative affect mediates the relationship between middle childhood victimization and adult BMI. This indicates that greater exposure to victimization predicts higher BMI across young adulthood, and it does so through negative affect during adolescence. Taken together, victimization and affect account for 4.1% of the variance in BMI across young adulthood.

V. DISCUSSION

The overarching goal of the current study was to extend the literature on obesity development and to identify interpersonal and intrapersonal factors that contribute to elevated body mass index by examining the predictive links between peer difficulties during one developmental period (middle childhood) and body mass index in a later developmental period (early adulthood). Emerging adulthood is an important period to study contributors to BMI, as BMI tends to increase during this time (McTigue, Garrett, & Popkin, 2002; Patton et al., 2011), and the associated health consequences worsen during adulthood (US Department of Health and Human Services, 2013). Furthermore, obese adults have poorer social and economic capital, lower educational attainment, and poorer mental health than non-obese young adults (Averitt & Korenman, 1996; Pagan & Davilla, 1997), adding to the collective economic burden associated with elevated weight status.

Harrist and colleagues (2012) recently proposed a model of obesity development that emphasizes the role of interpersonal and intrapersonal factors. This is not to say that individual factors such as lack of exercise or frequent fast food consumption are unimportant. Rather, the focus on relationship experiences (such as those in the peer group) and cognitive-emotional processes (such as depression and loneliness) helps to broaden perspectives on obesity risk to include a variety of developmentally salient social-contextual factors. Following their proposed model, the current study examined intrapersonal and interpersonal factors that contribute to increased BMI over two decades. The importance of peer relationships for socialization and adaptive interpersonal development has been extensively documented (Rubin, Coplan, & Bowker, 2013), but this investigation extends the study of the impact of childhood peer experiences to a key health outcome in early adulthood. A central finding of the current study

was that low levels of peer acceptance across grade school years were significantly associated with higher early-adult BMI net of other peer relationship difficulties, of early background characteristics, and of childhood weight problems. This and related findings are discussed in the sections that follow.

Unique and Overlapping Developmental Contributions to Young Adult BMI

Although the associations of childhood and adolescent peer relationships and weight status have frequently been documented (Puhl, Luedicke, & Heuer, 2011), most studies examining these links have focused on either the concurrent peer difficulties associated with a high weight status (Strauss & Pollack, 2003; Zeller, Reiter-Purtill, & Ramey, 2008) or on peer difficulties resulting from elevated weight status (Rancourt & Prinstein, 2010). Less research has examined the long-term contributions of these difficulties to subsequent weight status. Of the studies that have examined the contribution of peer difficulties to weight status, most examine the contributions of a single peer domain (Adams & Bukowski, 2008) or fail to control for factors that are frequently associated with obesity and elevated weight status (Janssen, Craig, Boyce, & Pickett, 2004; Sweeting, Wright, & Minnis, 2005). Furthermore, few, if any, studies have examined the contributions of different types of peer problems (e.g., low peer acceptance and lack of friends) to BMI across multiple developmental periods. Because it has been well documented that individual peer domains provide unique *and* overlapping contributions to development across childhood and adolescence (Brown and Larson, 2009; Gifford-Smith, & Brownell, 2003; Ladd, Kochenderfer, & Coleman, 1997) the current study sought to identify the redundant and unique contributions of middle childhood acceptance, victimization, and friendships to BMI across young adulthood.

At the bivariate level, each individual childhood peer domain was concurrently associated with childhood weight status and predictively associated with BMI in young adulthood, with difficulties in each domain associated with higher childhood weight status and adult BMI. These associations were not surprising given the large body of literature consistently documenting the cross-domain peer difficulties overweight children and adolescents frequently experience (Hayden-Wade, et al., 2005; Janssen, Craig, Boyce, & Pickett, 2004; Pearce, Boergers, & Prinstein, 2002); Puhl, Luedicke, & Heuer, 2011; Sweeting, Wright, & Minnis, 2005). Furthermore, significant bivariate associations were also found between adult BMI and childhood weight status, ethnicity, and socioeconomic status. These findings are in alignment with the previous literature that have consistently identified ethnicity, high childhood weight status, and low childhood SES as risk factors of elevated BMI and weight status (Freedman et al., 2005; Senese et al., 2009; Wang & Beydoun, 2007). Although gender was significantly associated with mother-reported childhood weight status (i.e., girls had more weight problems than boys), it was unrelated to adult BMI. However, as will be discussed below, there were gender differences in the links between peer problems and adult BMI.

In addition to the significant bivariate associations between each peer domain and adult BMI, all three middle childhood peer domains also demonstrated significant concurrent associations with each other. Individuals low in peer acceptance tended to also experience victimization and have fewer friendships than individuals that reported greater levels of peer acceptance. Moreover, the associations between acceptance and friendship and acceptance and victimization were stronger than the association between friendship and victimization, highlighting the concordant association between poor peer acceptance and difficulties in other peer domains.

More importantly, results from the regression analyses indicate that peer acceptance (but not friendship or victimization) remained a significant, albeit modest, predictor of adult BMI after controlling for these background factors. This unique, robust association highlights the connection between social relationships and physical health and provides additional insight into the long-term influence of social relationships on outcomes in multiple domains. As previously discussed, both friendship and victimization were associated with BMI at the bivariate level. However, once their overlap with peer acceptance was taken into account, they were no longer significantly associated with adult BMI. It is possible that friendships and victimization are connected to weight issues in adulthood owing, at least in part, to their association with peer acceptance.

When considering the developmental importance of peer acceptance during middle childhood (Gifford-Smith & Brownell, 2003; Ladd, Herald-Brown, & Reiser, 2008), coupled with the innate need for human belonging (Baumeister & Leary, 1995), this finding makes theoretical sense. Although a need for belonging and social connection is developmentally important throughout the life course, it is particularly important during middle childhood when children are learning to navigate social roles and establish social connections (Eccles, 1999; Gifford-Smith and Brownell, 2003). Because children remain in the classroom with the same peers throughout the day, a lack of acceptance can have harsh, long-term consequences on children (Parker & Asher, 2007; Rubin et al., 2005; Salmivalli & Isaacs, 2005). The importance of this finding is amplified when one considers the structure of elementary school classrooms and the large number of children publicly exposed to rejection by their peers.

Elementary school may be particularly difficult for children with characteristics that differ from the peer group, such as being overweight or obese. Associations between poor peer

acceptance and elevated weight status have frequently been documented, as overweight and obese children and adolescents are often described as experiencing high levels of peer rejection and social marginalization (Gable, Krull, & Chang, 2009; Zeller, Reitier-Purtill, & Ramey, 2008). The current study provides further evidence for the concurrent association between childhood acceptance and elevated weight status, as higher parent-reported weight status is significantly associated with poorer acceptance across middle childhood. More importantly, it extends our understanding of the long-term association between peer acceptance and weight status, as it is among the first to examine the long-term developmental contributions of peer acceptance to adult BMI, above and beyond childhood weight status.

As noted, victimization and friendship did not make additive or unique contributions to adult BMI when sociodemographic variables and childhood weight status were also considered. It also was the case that neither victimization nor friendship predicted BMI above and beyond peer acceptance. This was particularly surprising given the consistent links between peer victimization and teasing and weight status (Adams & Bukowski, 2008; Hayden-Wade et al., 2005; Pearce, Boergers, & Prinstein, 2002; Sweeting, Wright, & Minnis, 2005). Because friendship and victimization become more stable and influential in later childhood and early adolescence (Boulton & Smith, 1994; Boivin, 2005, see Rubin et al., 2005), it is possible that peer difficulties in these domains do not significantly contribute to elevated adult BMI until they are experienced during subsequent developmental periods. Similarly, acceptance may lose predictive power over time as other peer domains gain importance. However, a lack of peer acceptance often predicts subsequent problems in other peer domains (Ladd & Troop-Gordon, 2003), such as victimization, and cumulative exposure to peer difficulties may also contribute to adult weight status. Alternatively, the provisions afforded by peer acceptance may be particularly

important for health outcomes. Therefore, it is important that establishing strong social relationships and acceptance is encouraged and supported at an early age.

On the other hand, methodological limitations may explain the lack of significant associations between the victimization and friendship domains and adult BMI in the current study. Unlike peer acceptance and friendship, victimization was assessed at a single time point. It is likely that health outcomes associated with victimization are cumulative, and measures of victimization at multiple time points would have been more reliable and may have provided a more accurate indicator of the relationship between childhood victimization and adult BMI. This notion is in alignment with previous research that has failed to find short-term associations between victimization and subsequent weight status (Rancourt & Prinstein, 2010). Measures of acceptance and friendship, on the other hand, were obtained for all study participants and were assessed at four time points across middle childhood. While the cross-time composite social preference score was reliable ($\alpha = .77$), the cross-year friendship measure demonstrated limited reliability ($\alpha = .56$). Furthermore, the cross-year friendship assessment utilized in the current study did not directly examine the number of reciprocated friendships of each child, as children were asked to rate how much they liked their classmates; these reciprocated liking ratings were then used to create an indicator of reciprocated friendships. Moreover, the assessment of friendship used in the current study did not take friendship quality into account, and this should be considered in future research.

Peer Relationship Stressors and Health Outcomes

It is plausible that the direct impact of middle childhood peer acceptance on adult BMI is attributed to the stress caused by a lack of acceptance by the peer group. Peer relationship difficulties can be sources of stress at all stages throughout the life course, and early experiences

of peer rejection may put children at risk of experiencing high levels of stress across adolescence and into adulthood, as early rejection is associated with subsequent difficulties in other peer domains (Ladd & Troop-Gordon, 2003). Furthermore, exposure to stress has frequently been linked with obesity development, with neurological processes that contribute to altered food intake, and with other adverse health outcomes (Adams & Epel, 2007; Gunnar & Quevedo, 2007; Sinha & Jastreboff, 2013; Van Jaarsveld, Fidler, Steptoe, Boniface, & Wardle, 2009).

Although the primary goal of the study was to identify interpersonal contributors to elevated weight status, results of the study contribute to the broader body of literature on the association of social relationships and health. While this is the first known study to examine the impact of individual middle childhood peer domains on adult BMI across emerging adulthood, a growing body of literature is documenting the long-term impact of social relationships on physical health outcomes (Biebl, DiLalla, Davis, Lynch, & Shinn, 2011; Gustafsson, Janlert, Theorell, Westerlund, & Hammarstrom, 2012; Harris, Qualter, & Robinson, 2013; Wolke, Copeland, Angold, & Costello, 2013). Furthermore, early social difficulties have been associated with other long-term outcomes, such as a higher likelihood of living in poverty and having difficulty maintaining stable employment (Bagwell, Newcomb, & Bukowski, 1998; Wolke, 2013), again highlighting the importance of these early social relationships.

Gender Differences

Another study aim was to examine gender differences in the contributions of peer difficulties to BMI across time, as a large body of literature consistently reports differences in weight status based on gender (Wisniewski & Chernausek, 2009). Furthermore, the implications of weight status classification (i.e., overweight v. obese) differ for males and females (Hayden-Wade et al., 2005; see Holson, Jones, & Birkeland, 2012). Therefore, in addition to examining

the associations between childhood peer difficulties and adult BMI, examination of peer difficulties and categorical weight status in adulthood was also warranted.

Consistent with the previous literature (Adams & Bukowski, 2008; Slater & Tiggeman, 2011; Sweeting, Wright, & Minnis, 2005), the current study identified gender differences in the association between peer difficulties and weight status, and these differences are readily apparent at the bivariate level when individually examining correlations for males and females. For example, among females, adult BMI is significantly associated with childhood weight status, acceptance, and victimization and with negative affect during adolescence; in addition, the relationship between BMI and loneliness among females is marginally significant. On the other hand, childhood weight status is the only variable that is significantly associated with adulthood BMI among males, although the association between childhood acceptance and adult BMI was marginally significant.

Results of moderation analyses provided further support for gender differences, as poor peer acceptance in childhood emerged as a significant predictor of elevated adulthood BMI for females, and, similarly, greater exposure to victimization emerged as a marginally significant predictor of higher adulthood BMI. Conversely, among males, no significant peer relationship-adult BMI associations emerged. These findings suggest that childhood peer difficulties are particularly important to females across middle childhood, and a lack of acceptance may contribute to long-term health consequences. Although one cannot conclude that these early peer difficulties are not important for males, they may be more consequential for females with respect to weight-related health issues.

One potential explanation of these gender differences includes differences in reward sensitivity of men and women. Interestingly, recent research examining the neural correlates of

obesity indicate that there is greater activation in the area of the brain associated with reward sensitivity among obese men and women when confronted with an option for immediate satisfaction of hunger (Horstmann et al., 2011). Furthermore, obese women display high sensitivity to immediate rewards and a lack of inhibitory goal-directed behavior. Therefore, rejected females with an unmet need for belonging may engage in destructive behaviors, including emotional eating, in an effort to have their needs met and obtain a sense of reward satisfaction (Harrist et al., 2012).

An examination of the association between childhood acceptance and categorical weight status in adulthood provided additional insight into the relationship between childhood acceptance and adult weight status. Males and females identified as obese in adulthood had significantly lower levels of childhood acceptance compared to normal or overweight/underweight individuals, and these findings highlight the negative implications of an obese status for both makes and females. However, whereas females identified as overweight in adulthood had significantly lower levels of peer acceptance than normal or underweight females, overweight and normal/underweight adult males did not significantly differ on childhood acceptance. This is consistent with literature suggesting that an overweight status is ideal for males (Pearce, Boergers, & Prinstein, 2002) and sheds light on the different implications of each weight status. While an overweight status may represent a negative health outcome of early peer difficulties for females, it may be an adaptive and desired outcome among males. In general, males strive to maintain a muscular physique (muscular individuals tend to have higher BMIs, as the presence of muscle mass is not accounted for during the calculation of BMI), while females seek to maintain a normal weight status (see Holson, Jones, & Birkeland, 2012), and this may

account for these gender differences in the link between childhood peer difficulties and adult weight status.

Mediating Links between Peer Problems and Young Adult BMI

To gain a true understanding of the complex relationship between childhood peer difficulties and adult BMI, potential mediating mechanisms explaining these links should be explored. According to Harrist's proposed model, it is likely that intrapersonal factors help explain the relationship between interpersonal factors and weight status (2012). Because early peer difficulties are frequently associated with subsequent loneliness and depression and anxiety (Adams & Bukowski, 2008; see Heinrich & Gullone, 2006; Hodges & Perry, 1999), and loneliness and depression and anxiety are frequently associated with obesity (Goodman & Whittaker, 2002; Stice, Presnell, Shaw, & Rhode, 2005), these two intrapersonal factors were examined as potential mediators of the peer difficulty-adult BMI relationship.

Consistent with this literature, at the bivariate level, loneliness and negative affect were significantly associated with all three peer domains and with BMI across adulthood (Crick & Bigbee, 1998; Parker & Asher, 1987; Rushton, Forcier, & Schectman, 2002; Strauus & Pollack, 2003; Sweeting, Wright, & Minnis, 2005). Furthermore, loneliness and affect each significantly predict adult BMI, and, more importantly, negative affect emerged as a mediator of the relationship between childhood victimization and adult BMI. This is not entirely surprising given that depression has frequently been identified as a contributor to, and outcome of, obesity (Goodman & Whittaker, 2002; Pine et al., 1997; Stice, Presnell, Shaw, & Rhode, 2005). Furthermore, negative affective responses to stress increase during the transition to adolescence, and early adolescents exhibit heightened biological sensitivity for rewards (Brooks-Gunn & Warren, 1989; Somerville, Jones, & Casey, 2010). Additionally, negative affect and self-

perceptions perpetuate and reinforce peer difficulties (Hodges & Perry, 1999), as negative affective responses to peer stress, such as depressive symptoms, are consistently associated with subsequent increases in victimization and rejection (Dill, Vernberg, Fonagy, Twemlow, & Gamm, 2004; Hodges & Perry, 1999). Depressed and anxious youth often avoid social situations and relationships in an attempt to dodge further victimization (Kercehr & Rapee, 2009; see Petersen, Compas, Brooks-Gunn, Stemmler, Ey, & Grant, 1993) and because of the social expectation to engage in activities during this time, these avoidant behaviors result in further peer difficulties. It is therefore plausible that the relationship between negative affect during early adolescence and BMI across emerging adulthood is mediated by further peer difficulties resulting from this affect. Alternatively, it is also plausible that the use of adaptive coping skills may moderate this mediating effect.

On the other hand, loneliness did *not* emerge as a mediator of the relationship between the peer domains and adult BMI, and negative affect did not mediate the relationship between acceptance and adult BMI. Chronic exposure to loneliness has frequently been associated with poor health, mental health, and behavioral outcomes in children and adolescents (see Asher & Pacquette, 2003). It is likely that the impacts of loneliness on health domains do not occur over a short period of time, but instead develop as a result of prolonged feelings of loneliness. In the current study, loneliness was examined at a single time-point, and this may have limited the ability to detect mediating effects. Future research should examine loneliness experienced for a prolonged period of time as a mediator of this relationship.

Although not the focus of the current study, a lack of regulatory behaviors and skills may play a role in the association of peer difficulties and subsequent adult BMI. When a developmental need, such as the need for social connectedness during early adolescence, is not

met in a developmentally normative way (i.e., through activity participation) individuals will seek alternative ways to fulfill their needs (Eccles & Wigfield, 2000). Early adolescence can be a particularly vulnerable developmental period, as youth exhibit heightened biological sensitivity for rewards during early adolescence (Somerville, Jones, & Casey, 2010). Individuals that lack connectedness with peers may engage in emotional eating, substance use, or other delinquent or unhealthy behaviors as a means of achieving the reward satisfaction that adolescents seek and as a response to stress. The development of regulatory abilities may protect against these reactive behaviors and promote the physical health of adolescents.

Limitations

The current study provides additional insight into the obesity epidemic and highlights the importance of childhood peer relationships for later outcomes in intrapersonal and health domains. The longitudinal nature of the current study provided an opportunity to examine the impact of these early peer difficulties on outcomes across three developmental periods. Despite the strong study design, study limitations were present and should be discussed. The methodological limitations previously outlined should be addressed in future research. For example, victimization ratings could be obtained at multiple time points throughout middle childhood (or the developmental period of interest) to provide an understanding of the impacts resulting from cumulative exposure to victimization. Examining loneliness at multiple time points during adolescence would also likely provide an opportunity to detect outcomes associated with chronic loneliness. Furthermore, friendship could be examined using alternative sociometric methods that directly examine friendship status. Additionally, researchers should consider examining friendship quality and characteristics of friends as contributors to adult BMI,

as friendship quality has been identified as a moderator of the effects of negative parenting on adolescent externalizing behaviors (Lansford, Criss, Pettit, Dodge, & Bates, 2003).

Adult weight status was assessed using a combination of self-report and objective measures of BMI. According to the World Health Organization, "overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health" (World Health Organization, 2012). One criticism of the use of BMI is that it does not differentiate between body fat and muscle mass. However, methods that do directly examine body fat, such as underwater weighing and dual-energy x-ray absorptiometry (DXA), tend to be less readily available and more expensive than BMI assessment (Center for Disease Control, 2012), frequently rendering BMI the most plausible and cost-effective method of assessment. An additional critique of utilizing BMI to assess weight status is the use of self-report height and weight information. While objective measures of height and weight are viewed as the most accurate, self-report information has been identified as an acceptable and reliable method of obtaining the height and weight information needed to compute BMI (Shapiro & Anderson, 2003; Strauss, 1999). The use of BMI to assess weight status is justified and supported by empirical literature; however, future research should examine the longitudinal relationship between peer domains and weight status using additional measures when possible.

Height and weight information was not collected until participants were young adults, so measures of BMI were not available to examine childhood weight status. Instead, childhood weight status was assessed using mother reports of child problems and eating habits. Although not an ideal measure of weight status, we are confident of the reliability of the information due to the stability of these reports across childhood, as well as the moderately high association with body mass index in adulthood. Future longitudinal studies should consider collecting measures

of body mass index throughout the study duration to examine how problematic social relationships can influence health related outcomes across time.

Conclusions and Future Directions

While previous studies have consistently shown that overweight and obese children experience more difficulties in their relationships with peers, this study was among the first to demonstrate that peer difficulties in childhood can uniquely contribute to body mass index in adulthood. Using longitudinal data spanning more than 20 years, contributors to obesity were examined during middle childhood, mediating links in early adolescence, and BMI across emerging adulthood, providing an opportunity to examine contributors to BMI across the life course. With the high costs associated with obesity, and obesity-related illnesses, there is a social obligation and economic responsibility to address the causes of obesity. Lessening the prevalence of obesity would not only directly lower health care expenses, but it may also indirectly alleviate the economic burden associated with elevated weight status, as obesity is frequently linked with depression, poor life satisfaction, and low self-esteem and confidence (World Health Organization, 2013). Because life satisfaction, positive affect, and the display of positive emotions have been identified as predictors of productivity and work place success (Boehm & Lyubomirsky, 2008), it seems likely that reducing obesity and improving the psychosocial health of individuals would increase the productivity and economic output of previously overweight or obese individuals. The current study's findings suggest that improving peer relationship quality in middle childhood may be one means of combatting obesity and related health problems.

Because of the widespread number of negative outcomes associated with childhood peer difficulties, there is also a social and moral obligation to identify strategies to promote a culture

of acceptance in elementary school classrooms and to nurture the social competence of children in an effort to promote the development of positive social relationships. Multiple interventions aimed at reducing bullying and improving the social skills of rejected children have been implemented. For example, the Olweus Bullying Prevention Program has shown to reduce the prevalence of bullying and to increase the rates of reporting of bullying incidents (Olweus & Limber, 2010).

However, behavioral problems and social skills deficits may not be the only contributor to peer rejection, as children that simply deviate from social norms are often rejected from the peer group (Mikami, Lerner, & Lun, 2010). This may stifle the development of creativity and the expression of individual differences, as these behaviors are negatively reinforced by the peer group. Furthermore, children engaging in cross-ethnic social relationships are often disliked and rejected by the larger peer group, and these early social dynamics may contribute to the maintenance of segregation and stereotypical ethnic beliefs. Teachers and school personnel should be trained to promote a culture of inclusion and acceptance to address the negative developmental consequences associated with early peer rejection, as promoting a culture of acceptance may help make engaging in diverse relationships less foreign and more normalized. Additionally, teachers should actively praise the behaviors of rejected children in order to draw attention to the child's positive characteristics and to encourage creativeness and the acceptance of differences. Lastly, our definition of academic achievement should be re-evaluated. Rather than focusing on the importance of grades and test scores, the focus should be on learning, as this may help to alleviate rejection resulting from academic disparities. In addition to promoting a culture of acceptance, schools should also educate children on adaptive

coping and problem solving skills, as adaptive coping helps protect individuals from the adverse consequences of stress and may prevent children from further exposure to peer difficulties.

To further establish the importance of social relationships for health, and to better understand contributors to elevated weight status, future longitudinal investigations should continue to identify economic and social outcomes of negative peer experiences during middle childhood and should examine the contributions of peer difficulties to BMI at additional developmental periods. Additionally, protective factors that promote positive outcomes despite these early peer difficulties should also be identified, as early peer difficulties do not lead to poor adult outcomes for all children.

Elevated weight status impacts millions of people, and the consequences are problematic to an individual's physical, social, and mental wellbeing. Although obesity research has increased over the last few years, more information is needed to gain a deeper understanding of contributors to this disease. As proposed by Harrist and colleagues (2012), researchers should continue to examine interpersonal factors and intrapersonal factors that work in concert to impact weight status. For example, as a complement to examining the contributions of peer relationships to BMI, researchers could examine aspects of the parent-child relationship that may impact weight status. Furthermore, research should also continue to identify the mediating links that explain the relationship between a lack of early childhood acceptance and adult BMI, as this is critical to deepen our understanding of these relationships. As previously noted, it is likely that a lack of regulatory abilities and the neurological processes associated with reward satisfaction play a role in this relationship. Identification of these contributing factors is needed to ensure that the appropriate actions can be taken and future research should examine the role of regulation in the association between middle childhood peer difficulties and adult BMI.

In sum, the current study highlights the importance of middle childhood peer relationships on BMI in early adulthood and the interconnectedness of social and physical health. The findings reported in the current study have large implications for the education system, as the restructuring of elementary school classrooms and the promotion of a culture of acceptance may have long-standing impacts on the physical, emotional, and social health of individuals. Additionally, weight loss interventions should consider incorporating a social component into program designs to ensure that the social needs of participants are being met. It has long been recognized that humans are social beings with an innate need for belongingness and connection to others (Baumeister & Leary, 1995), but having this need met may be a protective factor against elevated weight status.

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Appendix A – Tables and Figures

Table 1. *Descriptive Statistics and Correlations.*

		Correlations									
		1	2	3	4	5	6	7	8	9	10
Control Variables											
1. Gender (0 = male, 1 = female)		-									
2. Ethnicity (0 = EA/other, 1 = AA)		.03	-								
3. SES		-.05	-.40**	-							
4. Childhood weight status		.12**	.10*	-.17**	-						
Childhood Peer Domains											
5. Number of friends		.00	.03	.00	-.1*	-					
6. Peer acceptance		.13**	-.11**	.22**	-.15**	.50**	-				
7. Victimization		-.05	-.06	-.10	.14**	-.29**	-.45**	-			
Early Adolescent Loneliness and Affect											
8. Loneliness		.02	-.08	-.01	.16**	-.26**	-.33**	.32**	-		
9. Negative affect		.07	-.06	-.04	.16**	-.08	-.16**	.14**	.47**	-	
Adult Weight Status											
10. Young adult BMI		-.03	.10*	-.24**	.48**	-.09*	-.22**	.12*	.10*	.12*	-
	Mean	0.48	0.17	39.53	0.1	3.25	0.16	1.64	0	3.91	26.6
	SD	0.5	0.37	14.01	0.28	1.67	0.8	1.87	0.82	3.68	6.82
	n	585	585	570	567	574	577	386	451	459	517

* $p < 0.05$, ** $p < 0.01$

Table 2. *Regression of young adult BMI on childhood peer relationships domains.*

		Young Adult BMI	
Step	Predictor		
		β	ΔR^2
1.	Peer Relationship Domains		0.05***
	Friendships	.04	
	Peer acceptance	-.22**	
	Peer victimization	.03	

**$p < .01$, *** $p < .001$

Table 3. *Regression of adult BMI on childhood peer domains, controlling for sociodemographic variables.*

		Young Adult BMI	
Step	Predictor		
		β	ΔR^2
1.	Control Variables		.29***
	SES	-.20***	
	Gender	-.10*	
	Child weight status	.48***	
	Ethnicity	-.01	
2.	Peer Relationship Domains		.01
	Friendships	.01	
	Acceptance	-.1	
	Victimization	-.01	

* $p < .05$, *** $p < .001$

Table 4. *Regression of adult BMI on childhood peer difficulties, controlling for sociodemographic variables using AMOS with FI ML.*

		Young Adult BMI
Step	Predictor	
		β
1.	Control Variables	
	SES	-.17***
	Gender	-.10*
	Child weight status	.44***
	Ethnicity	.00
2.	Peer Relationship Domains	
	Friendships	.02
	Acceptance	-.12*
	Victimization	.00

*p<.05, ***p<.001

Table 5. *Regression of adult BMI on childhood friendships and peer acceptance, controlling for sociodemographic variables.*

		Young Adult BMI	
Step	Predictor		
		β	ΔR^2
1.	Control Variables		.26***
	SES	-.16***	
	Gender	-.09*	
	Child weight status	.46***	
	Ethnicity	.01	
2.	Peer Relationship Domains		.01*
	Friendships	.02	
	Acceptance	-.12*	

* $p < .05$, *** $p < .001$

Table 6. *Regression of adult BMI on childhood victimization, controlling for sociodemographic variables.*

		Young Adult BMI	
Step	Predictor		
		β	ΔR^2
1.	Control Variables		.29***
	SES	-.20***	
	Gender	-.1*	
	Child weight status	.48***	
	Ethnicity	-.01	
2.	Peer Relationship Domains		.0
	Victimization	.03	

* $p < .05$, *** $p < .001$

Table 7. *Correlations among all study variables by gender.*

	1	2	3	4	5	6	7	8	9
Control Variables									
1. Ethnicity (0 = EA/other, 1 = AA)	1	-.40**	.06	.02	-.13*	-.03	-.05	-.12~	.07
2. SES	-.41**	1	-.19**	.06	.24**	-.11	-.06	.01	-.32**
3. Childhood weight	.17**	-.15*	1	-.13*	-.21**	.22**	.18**	.21**	.57**
Childhood Peer Domains									
4. Number of friends	.03	-.06	-.06	1	.47**	-.24**	-.24**	-.12~	-.09
5. Acceptance	-.10~	.22**	-.12*	.54**	1	-.47**	-.30**	-.13~	-.30**
6. Victimization	-.09	-.08	.03	-.35**	-.43**	1	.31**	.16*	.25**
Early Adolescent Loneliness and Affect									
7. Loneliness	-.12~	.05	0.13~	-.29**	-.38**	.35**	1	.49**	.12~
8. Affect	-.01	-.08	.07	-.05	-.21**	0.13~	.46**	1	.20**
Adult Weight Status									
9. Adult BMI	.15*	-.16*	.33**	-.09	-.12~	-.05	.08	.02	1

~ $p < .1$, * $p < .05$, ** $p < 0.01$ level,
Female correlations on top; male correlations on bottom

Table 8. *Moderating influence of gender on relationship between childhood peer acceptance and adult BMI, controlling for sociodemographic variables.*

		Young Adult BMI	
Step	Predictor		
		β	ΔR^2
1.	Control Variables		.26***
	SES	-.16***	
	Gender	-.1*	
	Child weight status	.46***	
	Ethnicity	.01	
2.	Peer Relationship Domains		.01**
	Peer acceptance	-.11**	
3.	Peer Relationship x Gender		.1*
	Acceptance x Gender	-.12*	

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

Table 9. *Moderating influence of gender on relationship between childhood friendship and adult BMI, controlling for sociodemographic variables.*

		Young Adult BMI	
Step	Predictor		
		β	ΔR^2
1.	Control Variables		.26***
	SES	-.16***	
	Gender	-.1*	
	Child weight status	.46***	
	Ethnicity	.01	
2.	Peer Relationship Domains		.00
	Friendships	-.04	
3.	Peer Relationship x Gender		.00
	Friendship x Gender	.05	

* $p < .05$, *** $p < 001$

Table 10. *Moderating influence of gender on relationship between childhood peer victimization and adult BMI, controlling for sociodemographic variables.*

		Young Adult BMI	
Step	Predictor		
		β	ΔR^2
1.	Control Variables		.29***
	SES	-.2***	
	Gender	-.1*	
	Child weight status	.48***	
	Ethnicity	-.01	
2.	Peer Relationship Domains		.00
	Victimization	.03	
3.	Peer Relationship x Gender		.01*
	Victimization x Gender	.16*	

* $p < .05$, *** $p < .001$

Figure 1. *Moderating influence of gender on relationship between childhood acceptance and young adult BMI.*

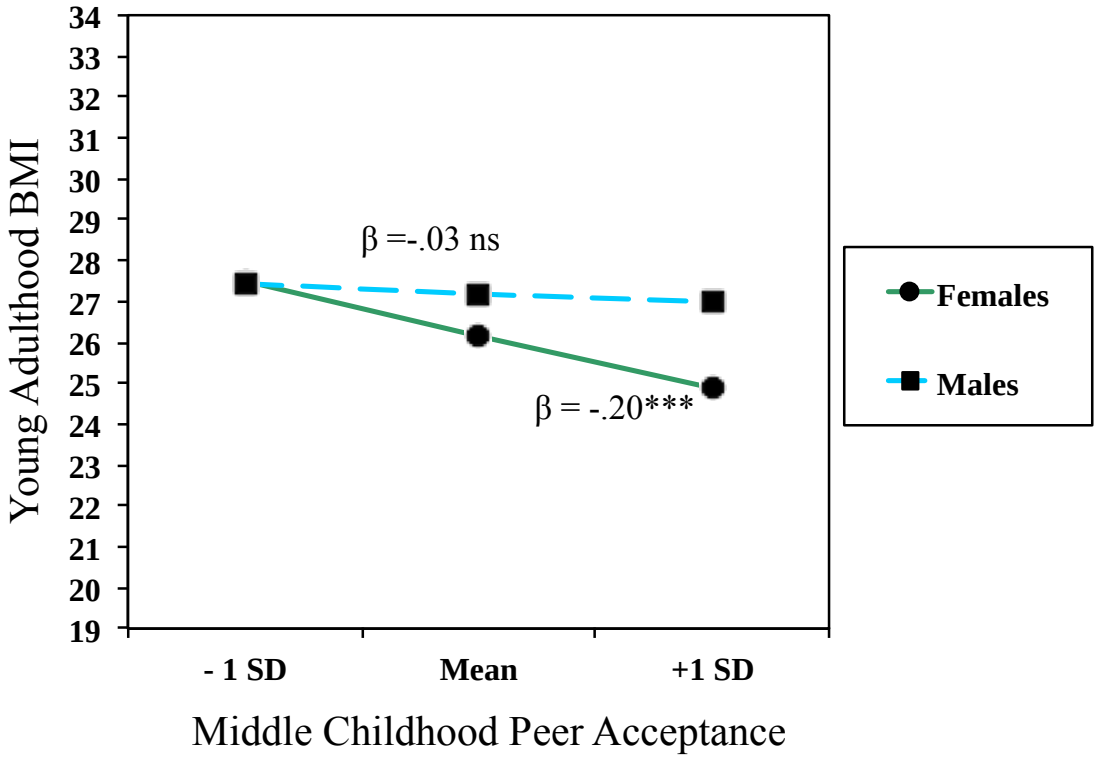


Figure 2. *Moderating influence of gender on relationship between childhood victimization and young adult BMI.*

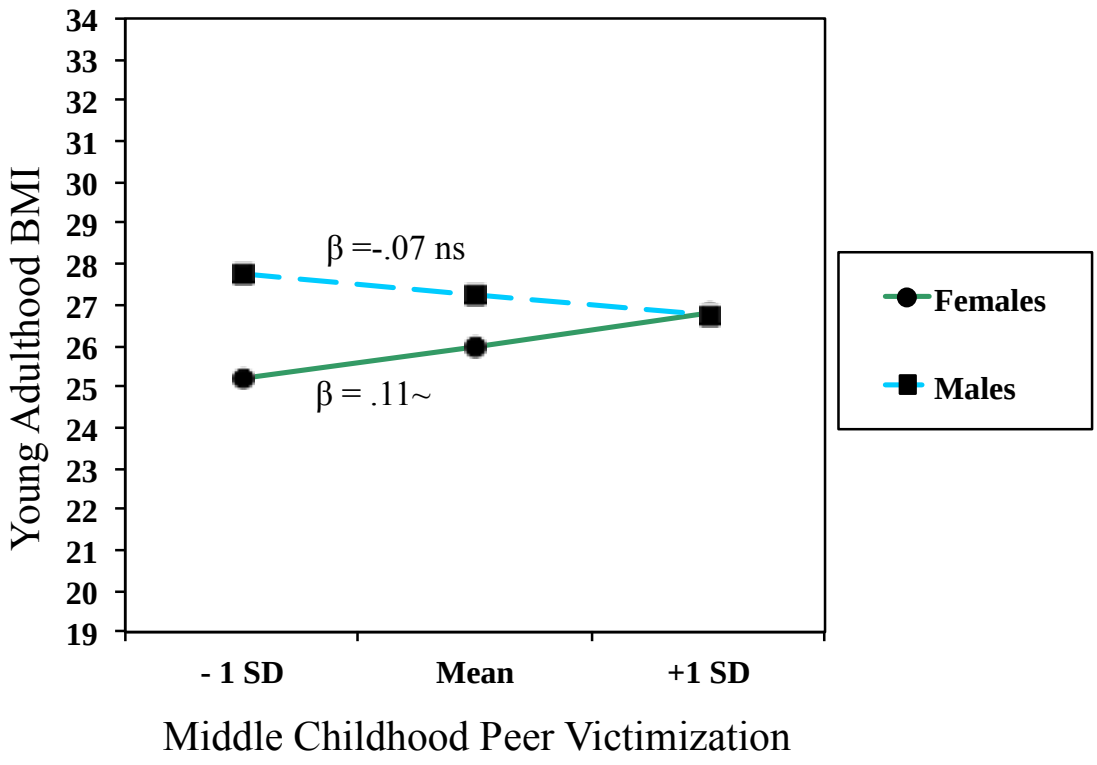


Figure 3. *Difference in relationship between childhood peer acceptance and adult weight classification, by gender.*

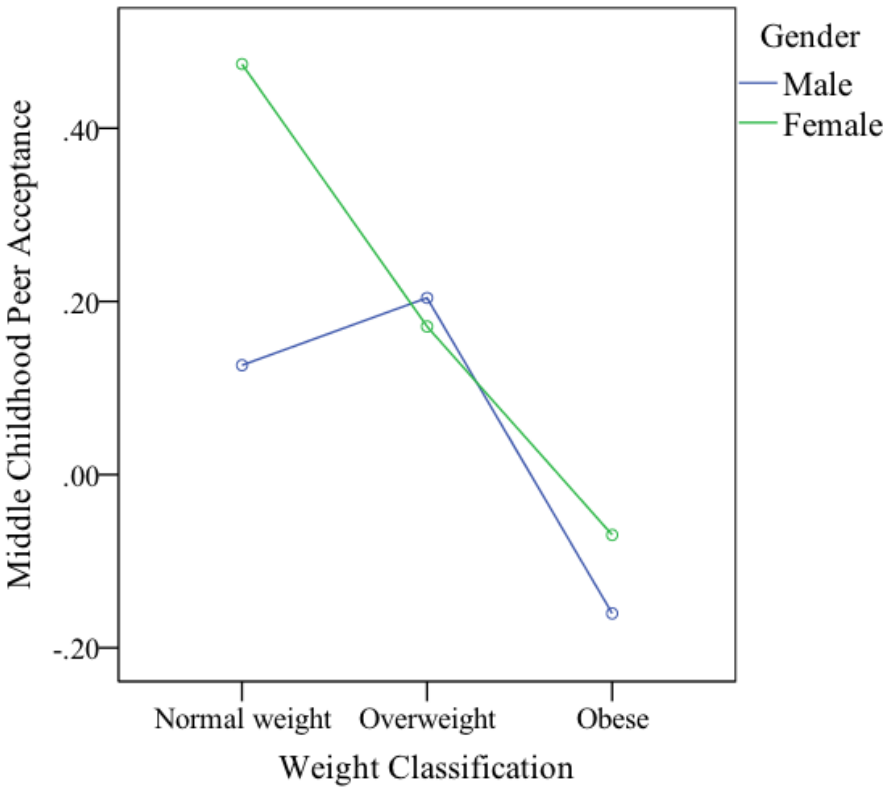
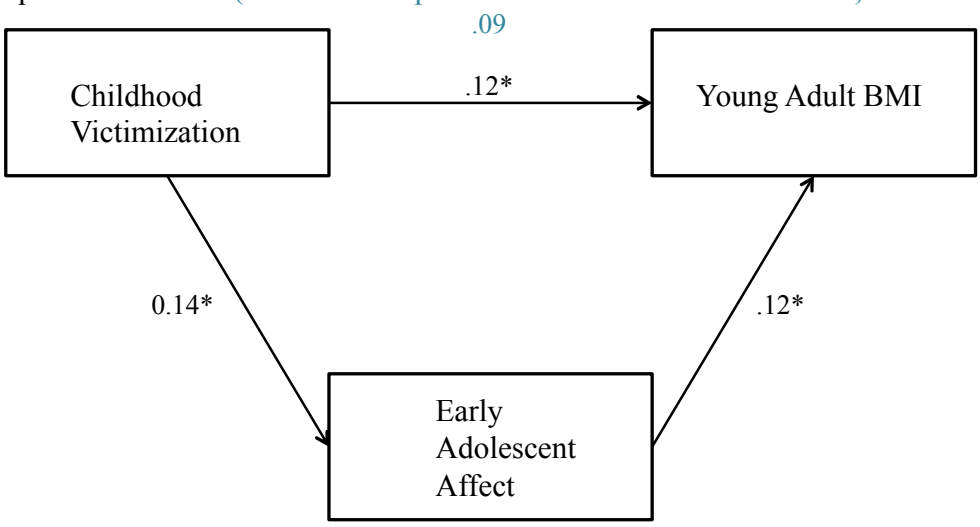


Figure 4. Mediation model: effect of childhood peer victimization on young adult BMI mediated through early adolescent affect: Standardized path coefficients (Standardized path coefficient for mediated effect).



* $p < .05$

Appendix B - Data Collection Instruments

TCID _____ Date _____
Name _____ Interviewer's initials ____

LONELINESS AND SOCIAL DISSATISFACTION SCALE

	ALWAYS TRUE	MOSTLY TRUE	SOMETIMES TRUE	HARDLY EVER TRUE	NOT AT ALL TRUE
1. It's easy for me to make new friends at school.	1	2	3	4	5
2. I like to read.	1	2	3	4	5
3. I have nobody to talk to	1	2	3	4	5
4. I'm good at working with other children.	1	2	3	4	5
5. I watch TV a lot.	1	2	3	4	5
6. It's hard for me to make friends.	1	2	3	4	5
7. I like school.	1	2	3	4	5
8. I have lots of friends.	1	2	3	4	5
9. I feel alone.	1	2	3	4	5
10. I can find a friend when I need one.	1	2	3	4	5
11. I play sports a lot.	1	2	3	4	5
12. It's hard to get other kids to like me.	1	2	3	4	5
13. I like science.	1	2	3	4	5
14. I don't have anyone to play with.	1	2	3	4	5
15. I like music.	1	2	3	4	5
16. I get along with other kids.	1	2	3	4	5
17. I feel left out of things.	1	2	3	4	5
18. There's nobody I can go to when I need help.	1	2	3	4	5
19. I like to paint and draw.	1	2	3	4	5
20. I don't get along with other children.	1	2	3	4	5
21. I'm lonely.	1	2	3	4	5
22. I am well-liked by the kids in my class.	1	2	3	4	5
23. I like playing board games a lot.	1	2	3	4	5
24. I don't have any friends.	1	2	3	4	5

Prefix all variable names with M*

CHILD BEHAVIOR CHECKLIST – P

Child's Name _____

This is a list of items that describe children and youth. For each item that describes your child now or within the past 6 months, please circle the 2 if the item is very true or often true of your child. Circle the 1 if the item is somewhat or sometimes true of your child. If the item is not true of your child, circle the 0. Please answer all items as well as you can, even if some do not seem to apply to your child.

0 = Not True (as far as you know) 1 = Somewhat or Sometimes True 2 = Very True or Often True

---

0 1 2 1. Acts too young for his/her age AH1

0 1 2 2. Allergy (describe)_____ AH2
0 1 2 3. Argues a lot AH3
0 1 2 4. Asthma AH4
0 1 2 5. Behaves like opposite sex AH5
0 1 2 6. Bowel movements outside toilet AH6
0 1 2 7. Bragging, boasting AH7

0 1 2 8. Can't concentrate, can't pay attention for long AH8
0 1 2 9. Can't get his/her mind off certain thoughts; obsessions (describe): _____ AH9
0 1 2 10. Can't sit still, restless, or hyperactive AH10
0 1 2 11. Clings to adults or too dependent AH11
0 1 2 12. Complains of loneliness AH12
0 1 2 13. Confused or seems to be in a fog AH13
0 1 2 14. Cries a lot AH14
0 1 2 15. Cruel to animals AH15
0 1 2 16. Cruelty, bullying, or meanness to others AH16

0 1 2 17. Daydreams or gets lost in his/her thoughts AH17
0 1 2 18. Deliberately harms self or attempts suicide AH18
0 1 2 19. Demands a lot of attention AH19
0 1 2 20. Destroys his/her own things AH20
0 1 2 21. Destroys things belonging to his/her family or others AH21
0 1 2 22. Disobedient at home AH22
0 1 2 23. Disobedient at school AH23
0 1 2 24. Doesn't eat well AH24
0 1 2 25. Doesn't get along with other kids AH25
0 1 2 26. Doesn't seem to feel guilty after misbehaving AH26
0 1 2 27. Easily jealous AH27
0 1 2 28. Eats or drinks things that are not food—don't include sweets (describe) _____ AH28
0 1 2 29. Fears certain animals, situations, or places other than school (describe):_____ _____ AH29
0 1 2 30. Fears going to school AH30
0 1 2 31. Fears he/she might think or do something bad AH31
0 1 2 32. Feels he/she has to be perfect AH32
0 1 2 33. Feels or complains that no one loves him/her AH33
0 1 2 34. Feels others are out to get him/her AH34
0 1 2 35. Feels worthless or inferior AH35

0 1 2 36. Gets hurt a lot, accident-prone AH36
0 1 2 37. Gets in many fights AH37
0 1 2 38. Gets teased a lot AH38
0 1 2 39. Hangs around with others who get in trouble AH39
0 1 2 40. Hears sounds or voices that aren't there (describe): _____ AH40

0 1 2 41. Impulsive or acts without thinking AH41
0 1 2 42. Would rather be alone than with others AH42
0 1 2 43. Lying or cheating AH43

0 1 2 44. Bites fingernails AH44
0 1 2 45. Nervous, high-strung, or tense AH45
0 1 2 46. Nervous movements or twitching (describe)_ AH46
0 1 2 47. Nightmares AH47
0 1 2 48. Not liked by other kids AH48
0 1 2 49. Constipated, doesn't move bowels AH49
0 1 2 50. Too fearful or anxious AH50
0 1 2 51. Feels dizzy AH51
0 1 2 52. Feels too guilty AH52
0 1 2 53. Overeating AH53

0 1 2 54. Overtired AH54

0 1 2 55. Overweight AH55
56. Physical problems without known medical cause:
0 1 2 a. Aches or pains AH56A
0 1 2 b. Headaches AH56B
0 1 2 c. Nausea, feels sick AH56C
0 1 2 d. Problems with eyes (describe):_____ AH56D
0 1 2 e. Rashes or other skin problems AH56E
0 1 2 f. Stomachaches or cramps AH56F
0 1 2 g. Vomiting, throwing up AH56G
0 1 2 h. Other (describe): _____ AH56H

0 1 2 57. Physically attacks people AH57
0 1 2 58. Picks nose, skin, or other parts of body (describe) _____ AH58
0 1 2 59. Plays with own sex parts in public AH59
0 1 2 60. Plays with own sex parts too much AH60
0 1 2 61. Poor school work AH61
0 1 2 62. Poorly coordinated or clumsy AH62
0 1 2 63. Prefers being with older kids AH63
0 1 2 64. Prefers being with younger kids AH64
0 1 2 65. Refuses to talk AH65
0 1 2 66. Repeats certain acts over and over; compulsions (describe) _____ AH66
0 1 2 67. Runs away from home AH67
0 1 2 68. Screams a lot AH68
0 1 2 69. Secretive, keeps things to self AH69
0 1 2 70. Sees things that aren't there (describe): _____ AH70
0 1 2 71. Self-conscious or easily embarrassed AH71
0 1 2 72. Sets fires AH72
0 1 2 73. Sexual problems (describe): _____ AH73
0 1 2 74. Showing off or clowning AH74
0 1 2 75. Shy or timid AH75
0 1 2 76. Sleeps less than most kids AH76
0 1 2 77. Sleeps more than most kids during day and/or night (describe) _____ AH77
0 1 2 78. Smears or plays with bowel movements AH78
0 1 2 79. Speech problem (describe): _____ AH79
0 1 2 80. Stares blankly AH80
0 1 2 81. Steals at home AH81
0 1 2 82. Steals outside the home AH82
0 1 2 83. Stores up things he/she doesn't need (describe) _____ AH83
0 1 2 84. Strange behavior (describe): _____ AH84
0 1 2 85. Strange ideas (describe): _____ AH85
0 1 2 86. Stubborn, sullen, or irritable AH86
0 1 2 87. Sudden changes in mood or feelings AH87
0 1 2 88. Sulks a lot AH88
0 1 2 89. Suspicious AH89
0 1 2 90. Swearing or obscene language AH90
0 1 2 91. Talks about killing self AH91
0 1 2 92. Talks or walks in sleep (describe) _____ AH92
0 1 2 93. Talks too much AH93
0 1 2 94. Teases a lot AH94
0 1 2 95. Temper tantrums or hot temper AH95
0 1 2 96. Thinks about sex too much AH96
0 1 2 97. Threatens people AH97
0 1 2 98. Thumb-sucking AH98
0 1 2 99. Too concerned with neatness or cleanliness AH99
0 1 2 100. Trouble sleeping (describe) _____ AH100
0 1 2 101. Truancy, skips school AH101
0 1 2 102. Underactive, slow moving, or lacks energy AH102
0 1 2 103. Unhappy, sad, or depressed AH103
0 1 2 104. Unusually loud AH104
0 1 2 105. Uses alcohol or drugs (describe): _____ AH105
0 1 2 106. Vandalism AH106
0 1 2 107. Wets self during the day AH107
0 1 2 108. Wets the bed AH108
0 1 2 109. Whining AH109
0 1 2 110. Wishes to be opposite sex AH110
0 1 2 111. Withdrawn, doesn't get involved with others AH111
0 1 2 112. Worries AH112

113. Please write in any problems your child has that were not listed above:

0 1 2 _____ AH113
0 1 2 _____ AH114
0 1 2 _____ AH115

9. About how tall are you without shoes? _____ FEET _____ INCHES

10. About how much do you weigh without shoes? _____ POUNDS

11. Are you happy with your current weight?
    a) Yes
    b) No

12. How would you describe your weight?

1	2	3	4	5
Very underweight	Slightly underweight	About the right weigh	Slightly overweight	Very overweight

13. Which of the following are you trying to do about your weight?

1	2	3	4
Lose weight	Gain weight	Stay the same weight	I'm not trying to do anything about my weight

1. During the past 30 days, did you exercise to lose weight or to keep from gaining weight?
    a) Yes
    b) No

2. During the past 30 days, did you eat less food, fewer calories, or foods low in fat to lose weight or to keep from gaining weight?
    a) Yes
    b) No

3. During the past 30 days, did you go without eating for 24 hours or more (also called fasting) to lose weight or to keep from gaining weight?
    a) Yes
    b) No

4. During the past 30 days, did you take any medication, diet pills, powders, or liquids without a doctor's advice to lose weight or to keep from gaining weight? (do not include meal replacements such as Slim Fast)
    a) Yes
    b) No

5. During the past 30 days, did you vomit or take laxatives to lose weight or to keep from gaining weight?
    a) Yes
    b) No

For the next several questions, I'd like you to think back to your childhood and early teenage years.

19. When you were between the ages of 5 and 10, your parents/caregivers were concerned that you were:

1	2	3	4	n/a
Very underweight	Slightly underweight	Slightly overweight	Very overweight	Your parents were not concerned about your weight

20. When you were between the ages of 11-15, your parents/caregivers were concerned that you were:

1	2	3	4	n/a
Very underweight	Slightly underweight	Slightly overweight	Very overweight	Your parents were not concerned about your weight