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Parental and Family Predictors of Adolescent Weight Loss and Health Change in a Multidisciplinary Obesity Intervention

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PARENTAL AND FAMILY PREDICTORS OF ADOLESCENT WEIGHT LOSS AND HEALTH CHANGE IN A MULTIDISCIPLINARY OBESITY INTERVENTION

A thesis submitted in partial fulfillment of the requirements of the degree of Master of Science at Virginia Commonwealth University

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Abstract

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The home environment, parental health attitudes, and parental diet and exercise behaviors have been associated with childhood obesity. The current study utilized a family systems framework to examine the effect of these variables on weight and health changes in a primarily Black sample of 530 parent-adolescent dyads enrolled in a multidisciplinary weight loss intervention. Parent-reported psychosocial variables and demographic information were used to test models predicting changes in adolescents' body mass index, cholesterol, and percentage body fat over the first six months of the intervention. The effect of parent participation in a psycho-education parent group on adolescent health outcomes was also examined. Several significant demographic, parental, and home environment predictors emerged in the models. By identifying specific aspects of the home environment, parent attitudes, and parent behavior to modify in interventions, these findings have significant implications for the prevention and treatment of childhood obesity.

Parental and Family Predictors of Adolescent Weight Loss and Health Change in a Multidisciplinary Obesity Intervention

The prevalence of overweight and obesity in American children and adolescents has tripled since 1980 (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). The 2008 National Health and Nutrition Examination Survey reported that 31.7% of children aged 2-19 had body mass index (BMI) scores greater than the 85th percentile for their height and gender, placing them within the overweight range. In addition, 11.9% of the children surveyed had a BMI above the 97th percentile, placing them well within the obese range (Ogden et al, 2010). Recent research indicates that as of 2010, the prevalence of overweight and obesity among US adolescents have remained elevated (Ogden, Carroll, Kit, & Flegal, 2012). Complex behavioral and sociocultural factors appear to contribute to the increasing prevalence of pediatric overweight and obesity; and, the interaction of these factors is referred to as the obesogenic environment (Golan & Crow, 2004).

Childhood obesity is conceptualized as the result of an energy imbalance, with energy intake exceeding energy expenditure. Larger portion sizes, high levels of sugar and fat in our diet, and increased daily caloric intake partially explain the rising prevalence rates of pediatric obesity. With our increasingly sedentary lifestyles, many children consume more energy than they expend in physical activity, resulting in overweight and obesity (Decklebaum & Williams, 2001; Epstein, Paluch, Roemmich, & Beecher, 2007). At the most fundamental level, obesity interventions within families, schools, and communities must account for this energy imbalance by targeting physical activity and diet (Dietz & Gortmaker, 2001). Lifestyle based interventions

seek to modify physical activity levels and child dietary intake to decrease the child's current weight and to prevent future weight gain. While pragmatic, conceptualizing the etiology of pediatric obesity solely as the result of an energy imbalance is overly simplistic and obscures the influence of genetic and cultural factors. Societal and systemic factors contribute to rapidly increasing rates of pediatric overweight and obesity. For example, neighborhood safety and distance to free recreation facilities from the home can significantly impact a child's level of physical activity. Additionally, school lunch programs and the availability of affordable, healthy food items in neighborhood stores shape a child's dietary intake (Davison & Birch, 2001).

The childhood obesity epidemic warrants serious attention from both the medical and psychological professionals due to the significant risks associated with pediatric overweight and obesity. Compared to their healthy-weight peers, overweight and obese children have an increased risk of developing type 2 diabetes, asthma, and sleep apnea. They also have a greater likelihood of remaining obese into adulthood (Center for Disease Control, 2009). Further, overweight and obese children are more likely to have elevated blood pressure, insulin, and cholesterol levels, putting them at risk for premature cardiovascular disease in adulthood (Deckelbaum & Williams, 2001; Freedman, Dietz, Srinivasan, & Berenson, 1999). Moreover, pediatric overweight and obesity are associated with poor psychosocial well-being. Compared to their healthy weight peers, obese children exhibit lower self-esteem and other indicators of quality of life, usually associated with social stigmatization and teasing; . Experiencing weight-related teasing is a significant predictor of the quality of life of obese children (Porter, in press; Stern, Mazzeo, Gerke, Bean, & Laver, 2006). Eisenberg and colleagues (2003) found that adolescents who experienced weight-based teasing from peers and family members were likely

to endorse low body satisfaction, low-self-esteem, and depressive symptoms, including suicidal ideation.

Considering the marked health and psychological impairments associated with pediatric overweight and obesity, there is a great need for prevention and intervention efforts in this area. Interventions targeting pediatric overweight and obesity aim to obviate further weight gain to prevent the development of health problems associated with obesity in childhood and later in life. Family-based pediatric weight loss interventions address childhood obesity by targeting obesogenic factors in the home environment and by utilizing parent education to encourage the adoption of healthy lifestyle behaviors for both the obese child and the entire family.

The current project examined the relations among family dynamics, parental attitudes, and adolescents' weight loss after six months of participation in an interdisciplinary weight-loss intervention. Specifically, the study focused on family system factors, parental attitudes, and parent behaviors, hypothesizing that these factors are related to obese adolescents' weight and health changes over the first six months of participation in the intervention.

Theoretical Framework: Systems Theory

Research in pediatric obesity often focuses on individual-level factors, ignoring systemic variables that influence weight related attitudes and behaviors (Harkaway, 2000; Hooper, Burnham, & Richey, 2009; Hudson, 2008; Rhee, 2008). To understand the nature of pediatric obesity better, it is imperative to consider the systems in which the child operates (Harkaway, 2000). In fact, a systems-oriented conceptualization is useful in studying pediatric overweight and obesity because children's weight-related attitudes and behaviors are shaped considerably by those of their parents, as well as family dynamics (Hooper et al., 2009). This conceptualization of pediatric obesity is theoretically grounded in the social ecological and family systems models.

The social ecological model focuses not only on individual characteristics, but also on larger familial, cultural, and societal factors that either directly or indirectly influence an individual's attitudes and behavior (Brofenbrenner, 1979). These various levels of influence are organized along a continuum with proximal influences exerting a direct influence on the individual and distal influences shaping behavior indirectly. Each level of influence is interdependent; changing a distal influence would alter more proximal influences and eventually impact an individual's behavior. To affect substantial behavioral change, multiple subsystems within the ecological system should be targeted (Whittemore, Melkus, & Grey, 2010). The ecological systems theory has been utilized to model various health behavioral changes including preventing youth substance abuse (Connell, Gilreath, Aklin, & Brex, 2010), promoting physical activity within schools (Langille & Rogers, 2010), and preventing type 2 diabetes (Whittemore et al., 2010). Within the context of pediatric obesity, ecological systems oriented research focuses on the systems in which the adolescent is embedded to identify factors fostering obesogenic environments and behaviors (Gable & Lutz, 2000).

Borrowing from family systems theory, researchers have applied the social ecology model to conceptualize obesogenic factors within the family environment. Within this framework, adolescent obesity results from the interaction of several subsystems within the home (Hooper et al., 2009). Individual-level factors, parental factors, and larger family dynamics work in concert to create an obesogenic environment. Cultural factors permeate all levels of this model. Family variables that affect the child's weight status such as parenting style or food availability in the home are in turn shaped by the family's cultural beliefs (Kitzman-Ulrich, Wilson, St. George, Lawman, Segal, & Fairchild, 2010). In effect, pediatric overweight

and obesity is the result of reciprocally reinforcing relations among family subsystems (Wrotniak, Epstein, Paluch, & Roemmich, 2005).

A study led by Gable and Lutz (2000) examined the direct and indirect factors within the family environment that put children at risk for obesity. The researchers compared household characteristics (e.g. food availability, family income) and parental characteristics (e.g. parenting beliefs and style) with child weight, sedentary activity frequency, and diet. Consistent with the social ecological model, Gable and Lutz found significant associations between household and parental characteristics, and the child's risk for obesity. Exploring the family as a unit rather than focusing solely on the obese child illuminates the factors that put some children at risk for obesity but not others.

In a 2009 study, Hooper and colleagues used family systems theory to identify elements within the family related to adolescent overweight in a predominately Black sample. The researchers investigated three subsystems within the family, the adolescent, parent-adolescent, and family interaction contexts, to determine the extent to which those subsystems related to adolescent weight status. Consistent with the social ecological and family systems models, Hooper and colleagues found that family subsystem factors such as parent's perception of his or her own weight status, parent perception of their adolescent's weight status, parent perception of family conflict, and family resources predicted the adolescent's weight status. Not only had family system factors predicted adolescent weight, but parent-reported, as opposed to child-reported, perception of quality of interactions in the home served as an effective proxy of the tenor of the home environment.

Identifying risk and protective factors in the family environment is one way to facilitate children's weight loss. Assessing parent health related behaviors and motivation can identify

risk factors within the home that may hinder children weight or health changes. This information can be used to tailor weight-loss efforts specific to a family's needs or circumstances, creating interventions relevant and effective for various populations (Kitzman et al., 2008). The following review presents a summary of the relevant literature regarding the impact of the home environment, parent attitudes, parent behavior, and cultural factors on child weight and health.

Home Environment

Examining the structure and interpersonal dynamics of the family system provides useful insight into the factors maintaining childhood overweight and obesity. In this context, the home environment is comprised of both the emotional climate and sociocultural characteristics of the household. Assessing stress, conflict, cohesion, emotional expression, and family structure can help target interventions to meet the needs of various families.

Familial stress has been implicated in maintaining and exacerbating childhood overweight (Puder & Munsch, 2010). In their review of the literature, Garaksy and colleagues (2009) identified six types of familial stress associated with child overweight and obesity: family disruption and conflict, mental and physical health problems, housing issues, health care disruption, financial strain, and a lack of cognitive and emotional support in the home. This relation between family stress and child overweight is especially salient for low-income, minority families, for whom psychological stressors have been found to mediate the association between poverty and parenting practices (McLoyd, 1990).

Familial stress may alter child weight status through a variety of mechanisms. First, financial and psychological stress on the parents may tax finite emotional and material resources necessary for ensuring children's healthy diet and physical activity levels (Garasky, Stewart, Gunderson, Lohman, & Eisenmann, 2009). Puder and Munsch (2010) posited that caloric

overconsumption may function as a way of coping with familial stress. Moreover, family stress may also disrupt or prevent parents and children from engaging in healthy behaviors. For example, financial stress may represent a barrier, perceived or actual, to the purchase of healthy food or parents coping with the stress of holding multiple jobs may not have the time to devote to preparing healthy meals or engaging in physical activity with their children (Kitzman, Dalton, & Buscemi, 2008). Kitzman and colleagues (2008) also asserted that there is a bidirectional relationship between pediatric obesity and family stress. The psychological and health side effects associated with caring for an obese child could present additional stress for parents and families by taxing emotional and financial resources. Thus, decreasing the stress level of the home environment may not only improve the quality of life of the obese child, but might indirectly alter his or her weight status.

Perceived levels of conflict and cohesion also serve as a proxy for assessing the emotional climate of the home. In the family systems literature, cohesion is conceptualized as "the emotional bonding and the degree of individual autonomy family members' experience" (Maynard & Olson, 1987, p. 502). High levels of perceived supportiveness in families have been associated with weight-loss in overweight children aged 6 - 12 years (Epstein, Valoski, Wing, & McCurley, 1994; Kitzman et al., 2008). Differences in perceived levels of cohesion have been found between families with and without obese children. In a 1985 study, Beck and Terry used the Family Environment Scale to assess levels of cohesion between eight families with an obese child and eight families without obese children. Families with obese children were perceived to have higher levels of conflict and lower levels of cohesion. Mendelson and colleagues (1995) observed gender differences in perceived family cohesion in their adolescent sample. Obese adolescent girls were more likely to perceive their families as having less cohesion,

expressiveness, and democratic style than non-obese adolescent girls. Additionally, Chen and Kennedy (2004) found that low levels of communication between family members were associated with elevated BMI in children.

Home environments characterized by frequent conflict, aggression, neglect, and unsupportive family interactions have been associated with negative mental and physical health outcomes for children; which can shape mental and physical health into adolescence and adulthood (Repetti, Taylor, & Seeman, 2002). Within the context of pediatric obesity, family conflict is positively associated with elevated BMI in children (Garasky et al., 2009; Hooper et al, 2009). Using the Family Environment Scale to assess conflict in family interactions, Zeller and colleagues (2007) found that obese mothers were more likely to perceive their family environment as high in conflict and low in cohesion than mothers of non-obese children. Conflict in the family environment also has implications for treatment outcomes, high levels of perceived conflict in the family is associated with low treatment adherence in children with various chronic diseases, including cystic fibrosis and diabetes (Zeller, Reiter-Purtil, Modi, Gutzwiller, Vannatta, & Davis, 2009). It is important to note that given the cross-sectional nature of these studies, it is difficult to determine if the relation between perceived conflict and obesity is the result or consequence of the child's weight.

Levels of emotional expression in the home are important to assess when examining childhood obesity at the family level. Within the family systems literature, emotional expressiveness refers to the degree to which family members allow one another to openly express emotions (Moos & Moos, 1994). The pattern of emotional expression within the family has been associated with child eating behaviors. Topham and colleagues (2011) examined the interaction of parenting style, emotional expressiveness, and child emotional eating behaviors.

The researchers found a significant, negative association suggesting that high emotional expressiveness in families was related to low levels of emotional eating in children. Additionally, a high level of emotional expressiveness in families has been identified as a protective factor for overweight and obese adolescents. In one study, overweight adolescents who felt they could share emotions with their parents were found to be less likely to engage in unhealthy behaviors, such as skipping meals or following fad diets, than peers who reported low levels of emotional expressiveness in their family (Mellin, Neumark-Stainer, Story, Ireland, & Resnick, 2002). These findings suggest that emotionally supportive home environments likely function as protective factors against overweight in adolescents by decreasing stress and conflict within the home. Such findings are useful for family-based adolescent obesity interventions because programs can encourage emotional expressiveness within families to improve the home environment.

Finally, the structure of the family has been associated with child weight status. Single parent families have been found to be more likely to have obese children than two parent households (Gable & Lutz, 2000; Zeller et al., 2007). However, support from extended family systems, such as grandparents or other relatives, has been identified as a protective factor in maintaining healthy child weight (Kumanyika, 2008). Considering the influence of parental motivation and adherence with treatment protocol on the child's weight status, knowledge of the structure of the family may identify resources available to facilitate weight loss efforts.

Research indicates that is important to examine the emotional tenor of the home when conceptualizing pediatric overweight and obesity from a family systems perspective. Assessing baseline levels of conflict, cohesion, and emotional expression will help identify risk and protective factors that will likely influence children's performance in a weight-loss intervention.

Additionally, the literature on the association between the home environment and child weight provides useful guidance for family-based health behavior change programs.

Parent Level Factors

Parents have been shown to be effective agents of change in pediatric weight loss interventions. It is logical to involve parents in these interventions as they have the power to modify many obesogenic factors in the home: parents provide access to certain types of food, parents decide when and how much the child will eat, and parents model food and exercise attitudes (Golan & Crow, 2004; Keery, Eisenberg, Boutelle, Neumark-Sztainer, & Story, 2006; Neumark-Sztainer, Bauer, Friend, & Hannan, 2010). Considering that adolescents have more autonomy over their diet and physical activity compared to young children, it is logical that the effect of parental behaviors and attitudes is a more distal influence on adolescent health-related behavior. However, parental behavior and attitudes may influence adolescents' health-related attitudes indirectly. For example, adolescent weight may be affected by the adolescent's internalization of parental attitudes or other aspects of parental influence over the home environment (Uzark, Becker, Dielman, Rocchini, & Katch, 1988). Assessing parent attitudes and health-related behaviors provides information that could potentially increase the efficacy of family-based weight loss interventions by identifying family dynamics to either modify or support to facilitate children's weight loss and maintenance of the healthy weight in the future.

Parent Attitudes. When examining pediatric overweight and obesity, it is imperative also to consider parent motivation and attitudes toward treatment. Parents are usually responsible for seeking and initiating treatment, consenting to treatment protocol, and complying with various aspects of treatment (Dhingra, Brennan, & Walkley, 2010). Parental motivation is associated with treatment initiation (Dhingra et al., 2010), as well as premature termination

(Braet, Jeannin, Mels, Moens, & Van Winckel, 2010). Evidence from the psychotherapy literature indicates that parents who perceive interventions as useful and relevant are more likely to participate consistently with the treatment protocol. Motivation to seek treatment is impacted by the parent's perception of the severity of the child's problem and causal attributions of the problem (Morrisey-Kane & Prinz, 1999). To maximize the effects of an intervention, it is important to assess levels of parent motivation and attitudes toward treatment to ensure parent buy in, as well as the child's success in the intervention (Nock & Photos, 2006). To ensure that a child enrolls and remains in a weight loss intervention, parents must believe that the treatment is effective. Moreover, parents who believe in the efficacy of the intervention will be more likely to adhere to treatment protocol, such as making dietary changes, facilitating physical activity, and attending required sessions with program leaders. Baseline levels of parent motivation and confidence in the treatment can be used to target families who will succeed in the intervention, as well as families who may require specialized attention to bolster parent participation and child weight loss.

Parental recognition of the child's weight status is critical for ensuring the child's success in a weight loss intervention. Parents' perception of their child's weight is influenced by both parent BMI and sociocultural norms. Parents' own weight status can obscure their ability to recognize overweight or obesity in their child. Overweight parents are less likely to report their child as being overweight, whereas non-overweight parents were more likely to report their child's weight status accurately (Doolen, 2009; Young, 2008). Furthermore, Rhee and colleagues (2005) found that overweight parents were less motivated to make health-related changes to decrease their child's weight compared to non-overweight parents. Parental perception of their child's risk for overweight and obesity are also culturally bound (Caprio,

Daniels, Drewnowski, Kaufman, Palinkas, Rosenbloom, & Schwimmer, 2008). Black women tend to report satisfaction with larger body sizes than White women (Chandler-Laney, Hunter, Ard, Roy, Brock & Gower, 2009; Wallcott-McQuigg, Sullivan, & Logan, 1995). Taking culture-bound attitudes surrounding ideal body image and weight loss into account in pediatric obesity interventions enhances the relevance of the intervention for the entire family.

Parent education shapes child weight status by informing parental heath related behaviors and attitudes. Haas and colleagues (2003) examined family demographic variables related to obesity in youth aged 6 to17 and found that parents with fewer years of education were more likely to have overweight or obese children compared with parents with higher levels of education. The researchers hypothesized that parental education drives decisions about diet and exercise, ultimately shaping children's weight status. Supplementing parent knowledge about nutrition, healthy diet, and exercise promotes positive changes in the child's weight status (Golan & Weizman, 2001). Parental psycho-education is a crucial factor to consider when examining childhood obesity from a family systems perspective because changing the parent's health-related attitudes and behaviors may ameliorate the health of the obese child and the entire family system (Golan & Crow, 2004).

Parent Behavior. It is also essential to examine parental behaviors relating to feeding and physical activity in studies of pediatric lifestyle modification programs, considering the influence that parents hold directly and indirectly shaping their children's health behaviors. These parenting behaviors, in combination with genetic predispositions, put children at risk for becoming overweight and obese (Kral & Rauh, 2010). Parental behaviors warranting attention from psychologists include modeling of diet and exercise behaviors, parental feeding practices, parenting style, and adherence with treatment protocol.

Parent Modeling.

Parents exert considerable influence on their child's weight status by modeling dietary patterns, levels of physical activity, and levels of sedentary behaviors for their children (Lindsay, Sussner, Kim, & Gortmaker, 2006). Findings from the parent modeling literature indicate that what parents do may be more important than what parents say, specifically in terms of the diet and physical activity patterns children learn from their parents. Interventions targeting pediatric obesity can modify the diet and exercise of the entire family to change the obese child's diet and exercise patterns.

Parents' own dietary intake has been proven to be a strong predictor of their children's dietary intake. This is logical considering that the foods parents consume are likely to be the same food available to the child in the home (Cusatis & Shannon, 1996). Parents shape a child's diet in two ways: first, parents provide the food in the home, and parents also shape food preferences and eating habits children may carry for life (Story, Neumark-Sztainer, & French, 2002). One study looking at 191 female children found that the girls' fruit and vegetable intake was positively associated with fruit and vegetable intake of the parents and negatively associated with parents pressuring children to eat fruits and vegetables (Fisher, Mitchell, Smickilas-Wright, & Birch, 2002). Family meals serve as one way in which children and adolescents learn food preferences and dietary patterns modeled by parents (Story et al., 2002). Additionally, parent food preferences have been found to predict child nutritional intake (Golan & Crow, 2004) and food neophobia (Pliner & Loewen, 1997). These findings indicate that the diet patterns parents model influence children's preference for and intake patterns of specific foods. While adolescents have more autonomy in selecting the food they eat, it is important to continue to assess parent food modeling when studying obese adolescents because the adolescents likely

internalized the parents' preferences and diet patterns at an early age (Fisher et al., 2002). To create lasting changes in children's dietary intake, improvements in nutrition need to be addressed for the whole family, rather than just the obese child.

Just as parents model dietary patterns for their children, the physical and sedentary activity levels of parents are associated with those of their children (Golan & Crow, 2004). Measuring child and parent physical activity with accelerometers, Kalanis and colleagues (2001) found that parent physical activity predicted the frequency of the child's physical activity level but not the duration of activity. Parent sedentary activity levels are also related to child sedentary activity levels. McGuire and colleagues (2002) studied determinants of physical and sedentary activity in a diverse sample adolescents participating in Project EAT (Eating Among Teens). Parent sedentary behavior was found to be associated with television viewing in Black and Hispanic boys. Although adolescents are more autonomous than younger children and likely have more choice in their decisions to engage in physical activity, parent modeling of physical activity is still an important predictor of adolescent activity (Sallis, Prochaska, & Taylor, 1999). Such findings suggest that encouraging parents to exercise more frequently would increase the likelihood their children will also engage in physical activity. Family-based interventions encouraging physical activity are one method for effecting change in this area.

The significant effect of parental modeling of health related behaviors on child weight is supported by the success of interventions that reduce children's weight by modifying parent behavior. Weight loss programs targeting parents as the sole agent of change have been shown to be more effective in decreasing child BMI and increasing fruit and vegetable intake than programs targeting children alone (Golan, 2006; Golan & Crow, 2004; Golan & Weizman, 2001; Janicke, Sallinen, Perri, Lutes, Huerta, Silverstein, & Brumback, 2008; Mazzeo, Gow, Stern, &

Gerke, 2008). Additionally, parent-only interventions have been found to be more cost-effective treatment modality for childhood obesity, especially for underserved populations (Janicke, Sallinen, Perri, Lutes, Silverstein, & Brumback, 2009). In two follow-up studies of children who participated in child-parent weight loss interventions, Epstein and colleagues (1987, 1994) found significant differences in BMI between children who had participated in the family-based versus child-only interventions both five and ten years after the interventions had ended. These findings suggest that parental involvement in the pediatric weight-loss programs is crucial for ensuring the child's success both immediately after the intervention and further into the child's development. The psycho-educational component of these family-based interventions affects change in the children's weight by instilling effective parenting practices, weight loss behaviors, and nutritional knowledge in the parents. Targeting parents ameliorates the home environment, fostering healthy eating and exercise behaviors for the entire family (Epstein et al., 2007).

Feeding Style.

While parental modeling of diet and exercise behaviors are associated with children's food intake and exercise, parents approach to meals and feeding their children also have important implications for child weight and diet. Examples of parental feeding behaviors warranting attention from researchers studying pediatric obesity include limiting access to certain food, encouraging a child to eat even in the absence of hunger, and using food as a positive reinforcer (Rhee, 2008). Family based weight-loss interventions can teach parents to alter their feeding style and to model healthy dietary behaviors to attenuate children's weight gain.

Parents may have the best intentions in restricting their child's access to certain types of food. For example, parents may restrict their children from eating second servings at meals or

might declare certain types of food as "off-limits" in the home (Rhee, 2008). Despite the good intentions of the parents, using restrictive feeding practices is associated with unhealthy feeding behaviors in children. In a study investigating the family system correlates of adolescent obesity, Berge (2010) found that adolescents whose parents exhibited high levels of control and restriction in the feeding relationship were more likely to have overweight or obese children.

A parent's use of restrictive feeding practices is also associated with an increased consumption of unhealthy foods in children (Fisher & Birch, 1999). Davison and Birch (2001) reported a similar relation between parental restriction and child weight, positing that parents who encourage their children to eat in the absence of hunger likely disrupt their child's ability to regulate hunger, fostering overeating patterns. When parents actively restrict their child's diet, children do not learn to adjust their food intake according to internal satiety cues (Rhee, 2008). Thus, the child's inability to recognize hunger and satiety predisposes him or her to overeating. Moreover, the child is likely to eat unhealthy, "off limits" foods in the absence of hunger when they are available (Birch, Fisher, & Davidson, 2003).

Parents can use pressure to eat with their children by offering children more food (e.g. "would you like seconds?") or by prompting children to eat more (e.g. "finish your plate") (Rhee, 2008). Parental use of pressure to eat in order to diversify their child's dietary intake has been found to be counterproductive. In a sample of mother-daughter dyads, mothers who used pressure in the feeding relationship were more likely to have daughters who endorsed high levels of picky eating and low levels of fruit and vegetable intake (Galloway, Fiorito, Lee, & Birch, 2005).

Parents who pressure their children to eat healthy foods may cause the child to dislike and reject that specific food. Galloway and colleagues (2006) conducted an experiment in which

children were given soup and pressured by a research assistant to finish their soup during the five minute pressure trials. Children in the pressure condition were more likely to make negative comments in response to the soup than children in the no pressure condition. Moreover, children who were not pressured to eat increased their intake of the soup at a significantly different rate over time compared to children who were pressured to eat. The researchers concluded that the use of pressure has the short-term benefit of getting children to eat certain foods in the moment, but in the long term may lead children to dislike those specific foods. The results indicate that parental modeling of healthy fruit and vegetable intake might be a more effective way of improving child dietary intake than the use of pressure to eat.

When considering the implications of these findings, it is important to note that the majority of these studies examined the feeding patterns of mother-daughter dyads. Moreover, the overwhelming majority of participants in these studies were White. Within the child feeding literature, there is a dearth of research examining non-White families (Rhee, 2008). Spruijt-Mertz and colleagues (2002) used the Child Feeding Questionnaire to examine the relation between maternal feeding practices and child weight in a sample of White and African-American children. The researchers found no difference in the relation between maternal pressure to eat and body mass in both the White and Black children, indicating that their model was appropriate for use with Black families. Cardel and colleagues (2012) found conflicting results using the CFQ in a diverse sample. The researchers examined the relation between feeding style and child adiposity in a sample of White, African American, and Hispanic children of varied socioeconomic backgrounds. Parental restriction was significantly associated with child overweight, with Hispanic parents endorsing the highest levels of restriction. The findings indicate that parental feeding style varies as a function of race and socioeconomic status (SES).

More research is needed to examine the relationship between parental feeding style and child weight in minority families to identify factors driving systematic differences in child obesity across racial and ethnic groups.

Parenting Style.

Parenting style characterizes how parents interact with their children; parenting style has been found to influence the relation between parenting behaviors and child health outcomes (Rhee, 2008). Within the pediatric obesity literature, Baumrind's (1971) classic typology is used to operationally define parenting style to differentiate between authoritative, authoritarian, and permissive parenting styles. Authoritative parenting is characterized by high levels of parental supervision and structure, as well as parental support responsiveness to the child's needs. Authoritarian parenting is characterized by high levels of demand and structure, but low levels of parental responsiveness to the child's needs. Permissive parenting style is characterized by low levels of demand, structure, and discipline coupled with high levels of responsiveness.

It is useful to examine parenting style when studying childhood obesity from a family systems perspective because parenting style functions as an indicator of the emotional climate of the home (Rhee, 2008). The use of primarily authoritarian parenting style is associated with low levels of child fruit and vegetable consumption (Kremers, Brug, de Vries, & Engles, 2003) and elevated child BMI (Rhee, 2008). Berge and colleagues (2010) examined the relation between parenting style and adolescent BMI and concluded that it differs by gender. No association was found between maternal or paternal parenting style and daughter BMI; however, maternal use of authoritarian parenting was associated with elevated BMI in sons. Studying parenting style also as clinical applications; family-based interventions can target parent behaviors by providing psycho-education about effective parenting styles in order to alter child weight and health (Golan

& Weisman, 2001). Interventions can encourage parents to utilize authoritative, rather than authoritarian, parenting styles to support child weight changes (Berge et al., 2010).

Parental Adherence.

Parent adherence to treatment protocol and participation in the intervention has been associated with child weight loss (Golan, 2006). To best understand the effect of parent participation on child weight loss, it is useful to conceptualize this parental factor as a continuous, rather than as a discrete, variable. Heinberg and colleagues (2009) used this framework to investigate the effect of parent involvement in a 12-week obesity intervention. Not only was parental involvement associated with weight loss, but the least involved families were 8 to 12 times more likely to have children with little or no weight loss at the end of the intervention. Parents may hinder their child's weight loss in obesity treatment programs by not adhering to treatment protocol.

Obesity in Black Children

When studying overweight and obesity in children it is important to consider culture as a proximal variable. Although rates of childhood obesity have been rising steadily over the past twenty years, differential increases in prevalence rates indicate that minority children are at greater risk for becoming overweight and obese compared to their White peers. According to the 2008 NHANES survey, the prevalence rate for obesity in White male children has increased from 11.6% to 16.7% between 1988 and 2008. For White female children, the prevalence rate has increased from 8.9% to 14.5%. However, for Black children, the prevalence rates increased from 10.7% to 19.8% for males, and from 16.3% to 29.2% for girls (Wang, Liang, Tussing, Braunschweig, Caballero, & Flay, 2007). Thus, pediatric obesity is especially threatening to children and adolescents in the Black community.

Over the course of 20 years, Black children have surpassed their White peers in weight, becoming overweight or obese at faster rates than their White peers. These statistics indicate that the risk for developing obesity is shaped heavily by race and gender. African American girls face the highest of obesity, with almost one–third of those sampled at or above the 95th percentile BMI cutoff. This predisposition to overweight and obesity in Black girls reinforces a vicious cycle: obese children are more likely to mature into obese adults. Obese women are at higher risk for developing gestational diabetes and giving birth to obese babies, who then develop into obese adults (Kumanyika, 2008). Traditional causes of obesity, such as inadequate physical activity levels or calorie overconsumption inadequately explain this health disparity, and there is a great need for increased research unpacking the complex sociocultural factors driving these disparate prevalence rates (Wang et al., 2007).

Research does indicate that racial differences in the prevalence of pediatric overweight and obesity transcend levels of SES. In general, youth from low SES families are more likely to be overweight or obese than their middle class peers (Wang et al., 2007). However, obesity rates are higher for Black children than White children across all levels of SES. Delva and colleagues (2007) examined overweight middle and high school youth participating in the University of Michigan's Monitoring the Future project. The researchers sought to examine the relation between demographics, eating behaviors, sleeping behaviors, parenting practices, and the child's risk for obesity. For White children, the prevalence of obesity decreased as family income increased, as the researchers hypothesized. However, the proportion of overweight Black and Hispanic students remained elevated across low, middle, and high levels of SES. Introducing lifestyle behaviors, such as frequency of sedentary activity, frequency of physical activity, diet, and average nightly sleep only blunted, but did not eliminate, the relation between risk for

overweight and race (Delva, Johnston, & O'Malley, 2007). Similarly, in a 2003 study, Gordon-Larsen and colleagues used information from the NHANES sample to model the effects of race, parent education, and household income on overweight prevalence rates across both race and gender. Confirming the findings in similar studies, an inverse relation between overweight prevalence, family income, and parental education was only found for White children, specifically White girls. The Hispanic, Asian, and Black children in the sample showed significantly higher rates of obesity, even at the highest levels of family income and parent education. The continued presence of this association, even when health behaviors are controlled for, indicates that cultural variables not accounted for in the model are at play. These findings highlight the importance of studying sociocultural risk factors for pediatric obesity, instead of looking to family income and parent education as predictors of risk.

The factors currently associated with obesity in White children do not adequately address obesity in the Black population and fail to explain the overrepresentation of minority children with obesity. Ecological systems research provides a more comprehensive explanation of Black pediatric obesity by looking to the child's home and community environments to explain differential obesity rates according to race. The growing body of literature addressing racial differences in the prevalence of pediatric obesity illustrates the need for health professionals to consider other proximal variables affecting weight besides genetic predisposition, diet, and physical activity, such as the physical and social environment in which the child operates (Gordon-Larsen, Adair, & Popkin, 2003).

One cannot discuss obesity without considering culture as a proximal variable because culture shapes many obesogenic factors such as food preferences, food preparation, attitudes toward diet and exercise, and body image (Kumanyika, 2008). Culturally relevant obesity

research in the Black community should address individual, family, and community factors contributing to pediatric overweight and obesity while tailoring interventions to the unique concerns facing Black families. Alleyne and LaPoint (2004) recommend that researchers and policy makers consider the intersection of race, class, and gender when designing and implementing efforts to foster healthy developmental outcomes in Black children.

Specific Aims

Combating childhood overweight and obesity is not just an individual challenge, but a family challenge. Research has identified protective factors within the family which encourage positive changes in the child's weight and health, helping the entire family achieve sustainable lifestyle improvements (Jackson, Mannix, Faga, & McDonald, 2005). Family systems theory provides a useful framework for modeling the complex interaction of these variables within the context of the child's environment. Rhee (2008) touted the benefits of a family systems focus in obesity intervention: modifying global influences creates a "trickle down" effect in that altering parental behaviors and the family environment ultimately affects the child's weight. Intervention and prevention efforts targeting pediatric overweight and obesity must address the complex web of individual, family, and sociocultural factors shaping a child's weight status. Moreover, there is a need for culturally sensitive research aimed at investigating the factors maintaining health disparities and differential rates of obesity in African-American children and adolescents. A primary advantage of ecological systems models of pediatric obesity with a minority population is the fact that these models respect the unique competencies of Black children and their families (Ogbu, 1985).

The current study utilized a family systems framework to examine the associations between parent-reported variables and changes in adolescent health biomarkers over the course

of the first six months of the obesity intervention. Specifically, the study examined the home environment (levels of perceived conflict and cohesion), parental attitudes (parental concern for the child's health and parental use of pressure in the feeding relationship), parent behaviors (parental adherence with treatment protocol), and demographic variables (family income, parent education, race, child age, and child gender). Because of the multitude of physiological sequelae associated with childhood obesity (Deckelbaum & Williams, 2001), three health indicators were used as separate outcome measures: BMI, percent body fat, and cholesterol at 6 months into the intervention. The study aimed to examine the effect of these variables the health and weight outcome indicators, ultimately testing a model for this phenomenon in White and Black families with obese adolescents.

Aim 1. The first research aim was to examine the differences in health outcomes between children whose parents participated in a psycho-education group versus a control condition. It was hypothesized that the health outcome changes for children whose parents participated in the group would be significantly different than children whose parents who did not participate in the group.

Aim 2. The second aim was to test a model of the relation between the home environment, parent behavior, parent attitude, demographic variables, and changes in the child's weight and health indicators between baseline and six months into the intervention. The purpose of the research question was to identify the best predictors of child weight and health change for each of the three outcome measures over the first six months of the intervention.

Methods

Participants

This study examined 530 parent-adolescent dyads enrolled in a multidisciplinary weight loss intervention. Parent psychosocial and demographic data, adolescent demographics, and

parent group membership were collected at baseline. Parent adherence with treatment protocol was measured at 6 months into the intervention. Adolescent BMI and child health data were collected at baseline, 3, and 6 months into the intervention. Demographic information for the participants in this study are summarized in Table 1.

Among the parents, the majority s (71.3%) identified as Black and 22.3% identified as White. The majority (90%) of parents were female, and the average baseline age of parents was 42 (*SD* = 7.2). The majority of parents reported that their highest level of education attained was some college (25.3%) or a college degree (20.6%). Of the parent sample, 4.0% reported having less than a high school diploma and 6.6% reported completing a graduate degree. A total of 134 parents did not report their education level. It is possible that a significant portion of those who did not report their education level did not go to college, and their missing information may have inflated our proportion of participants completing some college. The majority of parents (72.1%) reported having a combined family income of less than $50,000 per year. A total of 140 parents did not report their combined family income on the intake documents.

Among the adolescent participants, the majority (72.51%) identified as Black and 20.6% identified as White. The majority (67.5%) of the participants in the study were female. The average baseline age of the adolescent participants was 13.8 years (*SD* = 1.78).

Table 1.

Participant Demographic Information

Variable	*M*	*SD*	*n* (%)
Child Gender			
Male	--	--	172 (32.5)
Female	--	--	358 (67.5)
Child Race/Ethnicity			
White	--	--	109 (20.6)
Black	--	--	384 (72.5)
Parent Gender			
Male	--	--	42 (7.9%)
Female	--	--	477 (90%)
Parent Race/Ethnicity			
White	--	--	118 (22.3)
Black	--	--	378 (71.3)
Child age at baseline (years)	13.8	1.8	--
Parent age at baseline (years)	42.3	7.2	--
Parent's Highest Level of Education Attained			
Less than high school	--	--	21 (4)
High school diploma	--	--	74 (14)
Some college	--	--	134 (25.3)
College degree	--	--	109 (20.6)
Some graduate school	--	--	23 (4.3)
Graduate degree	--	--	35 (6.6)
Combined Family Income			
Less than $10,000/year	--	--	31 (5.8)
$10,000-$19,999/year	--	--	58 (10.9)
$20,000-$29,999/year	--	--	55 (10.4)
$30,000-$39,999/year	--	--	51 (9.6)
$40,000-$49,999/year	--	--	47 (8.9)
More than $50,000/year	--	--	148 (27.9)

N = 530 child-parent dyads
25.3% (*N* = 134) of participants did not report education level
26.4% (*N* = 140) of participants did not report combined family income

Procedure

Parents and adolescents participating in this study were enrolled in the TEENS (Teaching, Encouragement, Exercise, Nutrition, Support) Program, a 2-year, multidisciplinary weight loss program implemented by the Virginia Commonwealth University departments of Pediatrics, Exercise Science, Family Medicine, and Psychology. The program consists of a family-based life modification intervention designed to facilitate weight-loss in overweight and obese adolescents. Adolescents 11-18 years of age with BMI scores above the 85th percentile for their age and sex are eligible for program participation... Any adolescents who endorsed suicidal ideation or who presented with clinically significant distress were required to work with an outside psychologists before resuming participation in the TEENS program.

Adolescent participants in TEENS are required to exercise in the program's gym facilities three times per week and to attend a meeting with a dietician and behavioral specialists from the program on a biweekly basis. The adolescents and their parents met with the program dietician to track the family's dietary intake and consult about nutrition related issues. In these sessions, the dietician educated families about portion sizes, healthy food alternatives, meal planning, and avoiding high-risk eating habits. Adolescents and their parents met with behavioral specialists to provide behavioral support and to assess the adolescent's progress towards his or her diet and fitness goals, barriers to implementing lifestyle changes, and motivation to participate in the program. At least one parent is required to attend the biweekly meeting unless it is clinically indicated that the behavioral specialist should meet with the adolescent alone. TEENS participants exercise in the gym under the supervision of exercise science student interns. A typical supervision gym exercise session would include both cardiorespiratory and resistance training. Adolescent participants are also required to attend same-sex peer support groups led by

two behavioral specialists for 45 minutes twice per month. These groups were originally open-ended in format and intended to address issues relevant to obese adolescents, such as teasing. As of 2012, the groups were manualized into a 12 session protocol addressing topics such as mindful eating, teasing, and body image. As part of a protocol change in 2009, parents were also randomized to participate in a 12 week psycho-education group led by behavioral support specialists. Parent group sessions were manualized and topics discussed included: "toxic" (obesogenic) environment, reducing sedentary behavior, nutrition, increasing physical activity, portion control, family meals, healthy relationships with food, mindful eating, media influences, and healthy body image.

The current study examines TEENS data from the program's inception in December 2003 through February 2011. Parent-reported data used in the current study were collected as part of the program's intake process. During the baseline visits, the enrolled adolescent met with a multidisciplinary team consisting of behavioral support specialists, exercise science interns, and a registered dietician. The anthropomorphic measurements of the enrolled adolescent were collected at baseline, 3 months, and 6 months into the intervention. Parent adherence information was collected at six months into the intervention.

Measures

Demographic Questions. Parents answered demographic questions (Appendix 1) as part of the intake process. Specifically, parents reported their race, ethnicity, highest level of completed education, family income, and the race and ethnicity of their adolescent participating in the study.

Child Feeding Questionnaire. Parental feeding behaviors and concern regarding risk associated with the adolescent's weight were measured with the Child Feeding Questionnaire

(CFQ; Birch, Fisher, Grimm-Thomas, Markey, Sawyer, & Johnson, 2001). The 31 items on the CFQ represent two broad domains: parental use of control in feeding activities and parental perceptions and concern regarding the child's weight and feeding behaviors. The parental control domain consists of three subscales: restriction (8 items), pressure to eat (4 items), and parental monitoring of eating (3 items). The parental perceptions and concerns domain represents four subscales: responsibility for feeding (3 items), perceived weight of the parent, past and current, (4 items), perceived weight of the child, past and current, (6 items), and parental concern about child weight (3 items). All items in the CFQ are presented on a 5-point Likert-type scale. Examples of items from the CFQ include "How often are you responsible for deciding if your child has eaten the right kind of foods?" and "How concerned are you about your child becoming overweight?" For the purposes of this study, only the pressure to eat and parental concern subscales were used.

In their analysis of the internal consistency of the CFQ, Birch and colleagues (2001) reported alpha levels of 0.75 (concern about child weight) and 0.70 (pressure to eat) for the CFQ subscales that will be examined in this study. Within the sample for the present study, there is evidence of strong internal reliability for this measure, $\alpha = .91$. The concern about child weight subscale appears to have moderate internal consistency, $\alpha = .69$ and the internal reliability of the pressure to eat subscale was .51 within the current sample. Although the CFQ was normed on a predominately young, White sample, its use has been validated with parents of adolescents (Kaur, Li, Nazir, Choi, Resnicow, Birch, & Aluwalia, 2006). Additionally, with some modifications to the items, the CFQ has been validated among low-income Black and Hispanic families (Anderson, Hughes, Fisher, & Nicklas, 2005).

Family Environment Questionnaire. The home environment was assessed with the Family Environment Scale (FES; Moos & Moos, 1994). This 90-item self-report measure assesses the actual and perceived family environment and social climate of the home. The items on the FES are divided into three broad domains of family environment: family interpersonal relationships, growth of individual members, and organizational structure of the family. The three broad domains of the measure each contain three subscales, creating a total of nine subscales for this measure. Only two of the subscales (cohesion and conflict) were used in the TEENS intervention and were examined in the present study. The cohesion subscale assesses the degree to which family members help and support one another. Examples of items from this subscale include "There is a feeling of togetherness in our home" and "Family members really back each other up." The conflict subscales measures open expressions of anger and aggression in the home environment. Examples of items from this subscale include "Family members sometimes become so angry they throw things" and "Family members sometimes hit each other." Items in these subscales are presented as statements to which participants respond either true or false.

The FES was normed on a sample of 285 predominantly White families. Internal consistency among the 10 subscales ranges from of .64 to .79. The eight-week test-retest reliability for the measure ranged from .68 to .86 (Moos & Moos, 1994). Working with an exclusively African-American sample, Mandara and Murray (2002) reported internal consistency levels ranging from .20 to .75, and an average one year test-retest reliability of .52. Additionally, norms have been computed for use with Black adolescents 12 to 17 years old (Dancy & Handal, 1981). In their review of the literature, Alderfer and colleagues (2008) reported that internal consistency alphas published in the pediatric health psychology literature for the cohesion

subscale ranged from .61 to .77, and alpha levels for the conflict subscale ranged from .60 to .78. Evidence for the reliability of this measure within the current sample was weak. Internal consistency was calculated using the Kuder-Richardson Formula 20 (Moos & Moos, 1994). Evidence of the internal consistency of both the cohesion and conflict subscales was .06.

Adherence. Parental adherence to treatment protocol was assessed for the first six months of the adolescent's enrollment in the program. Specifically, parental adherence refers to nutrition education session attendance. In TEENS, an adherence percentage is also calculated based on the number of required meetings with the behavioral specialist the parent attends with his or her adolescent. However, in some cases, parents are asked not to attend these meetings when clinically indicated to facilitate honest communication between the adolescent and behavioral specialist. Because no systematic records were kept indicating if parents were asked to not attend these sessions, only nutrition attendance was considered as an indicator of parental adherence with treatment protocol in this study.

BMI. Baseline anthropometric measurements were completed at VCU's Clinical Research Services Unit (CRSU). Height, measured to the nearest 0.1cm, and weight measured to the nearest 0.1kg, was assessed to calculate BMI in kg/m^2. For the purposes of this study, absolute BMI were used as an indicator of weight. Compared to other methods utilized within the pediatric obesity literature to measure changes in weight (including BMI *z*-scores, BMI percentage, and BMI centiles), absolute BMI units have been identified as the best method for evaluating short-term changes in adiposity (Cole, Faith, Pietrobelli, & Heo, 2005). Additionally, absolute BMI was used in this study because BMI percentiles are not an effective way of comparing the weight of obese children and adolescents, all of whom would likely have very high BMI percentile scores (Daniels, 2009).

Body Fat Percentage. The adolescent's percentage body fat was measured by bioelectric impedance analysis (Quantum II, RJL Systems). Percentage body fat was measured at baseline, 3 months, and 6 months into the intervention.

Cholesterol. Given the cardiovascular side effects associated with adolescent obesity (Freedman et al., 1999), this metabolic measurement was included in the model to assess other health changes, in addition to weight loss, in the TEENS participants. The adolescent's fasting total cholesterol level was measured as part of a comprehensive anthropomorphic and metabolic assessment that included a venous blood draw at baseline, 3 months, and 6 months into the intervention. Total cholesterol was measured using a Roche automated clinical chemistry analyzer. The blood samples were collected at VCU's Clinical Research Services Unit.

Statistical Analyses

All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 19.0. Data were checked for acceptable levels of skewness and kurtosis. Additionally, data were checked for normality, univariate outliers, and multivariate outliers. *P*-value <0.05 were considered significant.

Specific Aim 1 was assessed using three separate repeated measures Analysis of Covariance (ANCOVA) models. The purpose of the first specific aim was to determine if parental participation in a psycho-education group affects the child's weight and health outcomes over the first six months of the intervention. Three separate outcome measures were assessed: BMI, percent body fat, and cholesterol. Using a repeated measures framework, scores on the dependent variables were assessed at baseline, 3 months, and 6 months into the intervention. For each of the three ANCOVA analyses, time was entered into the model as the repeated

independent variable. The purpose of the three preliminary ANCOVA analyses was to determine if the dependent variables changed significantly over time.

Once time was found to be a significant predictor of health outcome change, two additional ANCOVA models were analyzed in order to account for the effect of participation in the psycho-education group. In the first of these models, parent group membership was included as the between subjects factor, as well as the interaction between parent group membership and time. In the second of these models the number of sessions (between 0 and 12) in which the parent participated was entered into the model as a covariate in order to approximate the dosage effect for the amount of the psycho-education intervention information and attention the parent received. A time by number of sessions interaction was also included in this model. A significant effect for the time by number of session interaction term and the dosage by time interaction term would indicate support of the hypothesis for Aim 1.

Specific Aim 2 was assessed using three separate repeated measures ANCOVA tests. A separate analysis was conducted for each outcome variable (BMI, percent body fat, and cholesterol). Similar to the first research question, each of the ANCOVA analyses was conducted twice. For each of the preliminary ANCOVA analyses, time was entered as the only independent variable. Including time in the ANCOVA model made it possible to assess changes in the dependent variables while controlling for the effect of the covariates (Field, 2005). Using a repeated measures framework, scores on the dependent variables were assessed at baseline, 3 months, and 6months into the intervention.

Once time was found to be a significant predictor of health change, then additional parent reported variables were entered into each of the models as covariates. Specifically, the FES conflict and conflict subscales, CFQ parental concern and pressure to eat subscales, parental

adherence with nutrition visits, family income, parent education, parent race, and adolescent gender were entered as covariates. Again, three time points were entered into the model: baseline, 3 month, and 6 month assessments. Once all covariates and factors were entered into the model, a backward elimination process was used in order to find the most parsimonious model. Using an iterative process, non-significant items were dropped from the model until a model emerged which consisted only of significant predictors. The purpose of the ANCOVA analyses was to identify the main effect of the covariates in predicting changes in the child's weight and health outcomes over the first six months of the intervention.

Results

Descriptive Statistics

Descriptive statistics and preliminary analyses were computed in order to understand the relationship among the variables in the study. Descriptive statistics for the outcome variables of absolute BMI, percent body fat, and total cholesterol are summarized in Table 2. The average baseline BMI for adolescent participants was 37.7kg/m (SD = 7.01), the average baseline body fat percentage was 44.94% (SD = 13.05), and the average baseline total cholesterol level was 161.1 mg/dl (SD = 30.22). The average BMI percentile score for adolescent participants was 99.04 (SD = .89), which is within the obese range (> 95^{th} percentile) using the classification system for children and adolescents (Daniels, 2009). Descriptive statistics for parent responses on the CFQ and FES, as well as parent adherence with treatment protocol are summarized in Table 3.

Table 2.

Anthropometric and lipid measurements in obese adolescents participating in 6 months of a multidisciplinary lifestyle modification program

Variable	Baseline		3 month		6 month	
	M	*SD*	*M*	*SD*	*M*	*SD*
BMI (in kg/m)	37.7	7	36.211	6.13	36.522	7.03
Cholesterol (in mg/dl)	161.1	30.22	149.96	30.21	153.22	28.14
Percentage Body Fat	44.94	13.05	44.09	10.88	42.9	11.32

Table 3.

Descriptive Statistics of Parent-Reported Measures and Items

Variable	*M*	*SD*
FES cohesion subscale[a]	5.75	1.31
FES conflict subscale	3.28	1.32
CFQ Pressure subscale[b]	2.25	.72
CFQ Concern subscale	4.31	.68
Parent adherence	.22	.09

a. FES (Family Environment Scale)
b. CFQ (Child Feeding Questionnaire)

Intercorrelations among the scales and items examined in the study are summarized in Table 4. Results indicated several weak correlations among the variables. Several noteworthy relations are reported here. For example, the conflict scale of the FES was positively correlated with baseline adolescent total cholesterol levels (r (452) = .122, p <.01). The concern subscale of the CFQ was related to both absolute BMI (r (175) = .161, p < .05) and body fat percentage (r (172) = .152, p < .05) at 6 months. Additionally, the pressure to eat subscale of the CFQ was related to adolescent BMI at baseline (r (452) = .096, p < .05) and at 6 months (r (174) = .156, p < .05). Parent adherence with treatment protocol was related to adolescent BMI at 3 months (r (133) = .175, p < .05) and negatively correlated with adolescent BMI at 6 months (r (181) = -.157, p < .05). Parent adherence with treatment protocol was also associated with adolescent cholesterol levels at 3 months (r (132) = .175, p < .05).

Table 4.

Intercorrelations Between Scales and Items

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Child Age	--														
2. FES cohesion	.059	--													
3. FES conflict	.065	-.124**	--												
4. CFQ concern	-.087	-.087	.078	--											
5. CFQ pressure	-.095*	.022	.111*	.144**	--										
6. Parent adherence	-.14**	-.063	.021	.155	.089	--									
7. BMI baseline	.338**	.017	.082	.077	.096*	-.087	--								
8. BMI 3 months	.212*	.019	.033	.079	-.024	.175*	.977**	--							
9. BMI 6 months	.266**	-.011	-.071	.161*	.156*	-.157*	.956**	.988**	--						
10.Cholesterol baseline	-.012	-.059	.122**	.006	.040	.044	-.041	-.041	-.027	--					
11.Cholesterol 3 months	-.091	.033	.079	.070	-.024	.175*	.033	.061	-.019	.753**	--				
12.Cholesterol 6 months	.044	-.009	.110	.011	.078	-.036	.034	.114	.093	.815**	.847**	--			
13. Body fat % baseline	.196**	-.004	.052	.034	.054	-.068	.412**	-.035	.716**	-092*	.035	.003	--		
14. Body fat % 3 months	.285**	.039	.002	.095	.160	-.088	.459**	.474**	.436**	.063	.027	.248*	.716**	--	
15. Body fat % 6 months	.160*	.009	.102	.152*	.122	.092	.464**	.522**	.489**	-.079	.140	.023	.960**	.986**	--

Note. N = 530; * $p < .05$, ** $p < .01$; Pearson correlations

Hypothesis 1/Aim 1

For the first research aim, it was hypothesized that the health outcome changes for adolescents whose parents participated in the parent group would be significantly different than children whose parents who did not participate in the group. Due to changes in protocol over the course of TEENS, not all of the parents in the sample participated in the parent education group. Data from a total of 118 parents who participated in the new parent group protocol were examined to answer this research aim. Of those parents, 59 were randomized to a control (no parent group) condition, 58 were randomized to participate in the group, and one parent was not randomized into the parent group. The parent not randomized into the group began participating in the parent group for his or her eldest enrolled child before the randomization protocol was introduced. His or her second child enrolled in the program after the randomization protocol began, and the parent was considered "not randomized" because it would not make sense to randomize the parent for a second time for the second enrolled child. For the purposes of this study, the one non-randomized parent was included in the randomized parent condition. Of this subsample of parents, 20 (16.9%) identified as White and 85 (72%) identified as Black. The average number of parental education sessions attended by parents who participated in the parent group was 5.47 (SD = 4.56) out of a total of 12 sessions. A repeated-measures ANCOVA was computed for each outcome variable to determine the effect of parent group participation and the number of sessions attended on the child weight and health outcomes.

BMI. No significant main effect for parent group participation (F (1, 117.56) = .024, p > .05) was found. A significant effect for time was found (F (2, 113.53) = 3.90, p < .05). No significant effect was found for the time by parent group interaction term (F (2, 113.53) = 1.51, p > .05).

In the second repeated measures ANCOVA analysis examining the effect of the number of parent group sessions attended on adolescent absolute BMI, a significant main effect of time was found ($F(2, 113.72) = 5.16$, $p < .05$). No significant main effect for the number of parent group sessions attended was found (F (1, 115.5) = 2.33, $p > .05$). Additionally, the interaction between time and the number of parent group sessions attended was not found to be significant (F (2, 113.16) = 1.96, $p > .05$).

Considered together, these results indicate that adolescent BMI decreased over time regardless of whether or not parents participated in the parent group. Additionally, for adolescents whose parents were randomized to the group, the number of sessions the parent attended did not relate to changes in the adolescents' BMI across time points. Thus, adolescents' participation in the intervention over time was more likely related to changes in BMI, not parents' participation in parent group. For BMI, these findings did not support Hypothesis 1.

Cholesterol. No significant main effect for parent group membership was found (F (1, 120.19= .001, $p > .05$). No significant main effect for time was found (F (2, 113.45 = 2.32, $p > .05$). Finally, the interaction between time and parent group attendance was not significant (F (2, 113.45) = .64, $p > .05$).

In the model examining the relation between the number of parent group sessions attended and adolescent total cholesterol, no significant main effect of time was found ($F(2, 114.70) = 1.37$, $p > .05$). The number of parent group sessions attended was not significantly related to cholesterol levels at the three time points (F (1, 108.83) = .16, $p > .05$). Finally, the interaction between the number of session attended and time was not significant (F (2, 111.15) = .33, $p > .05$).

Thus, the effect of parental participation on child cholesterol was similar to that seen on BMI levels. Neither the parent's participation in the group nor the number of sessions attended was significantly related to changes in the child's cholesterol over time. Additionally, cholesterol levels did not vary significantly across the three time points in this model. Hypothesis 1 was not supported for changes in cholesterol levels.

Percent Body Fat. No significant main effect of parent group attendance was found (F (1, 135.94) = .22, $p > .05$). No significant main effect of time was found (F (2, 130.70) = 1.18, $p > .05$). Additionally, the interaction between parent group attendance and time was not significantly related to changes in body fat percentage (F (2, 130.70) = 1.55, $p > .05$).

In the model examining the relation between the number of parent group sessions attended and changes in percentage body fat, a significant effect of time was found (F(2, 133.77) = 2.996, $p = .053$). The number of parent group sessions attended by the parent was not significantly related to changes in body fat percentage (F (1, 116.27) = .29, $p > .05$). Finally, the interaction between time and the number of sessions attended by the parent was not significantly related to changes in body fat percentage (F (2, 125.59) = 1.34, $p > .05$).

These findings indicate that neither the parent's participation in parent group nor the number of sessions the parent attended was significantly related to changes in the adolescent's percent body fat. Additionally, body fat percentage only changed significantly over time when the effect of parent group membership was controlled for in the model. However, body fat percentage levels did change significantly over time when the number of sessions attended by the parent was included in the model. These findings do not support Hypothesis 1.

Hypothesis 2/Aim 2

The purpose of the second research aim was to test a model of the relation among the home environment, parent behavior and attitudes, demographic variables, and changes in the child's weight and health indicators during the first six months of the intervention. For each of the three outcome measures, preliminary ANCOVA analyses were conducted with time as the sole predictor variable. Following the preliminary analyses, indices of the home environment, parent behavior, parent attitudes, and demographics were entered into the model as factors and covariates. Family income and parent education were excluded from the model due to the paucity of responses.

BMI. The preliminary repeated measure ANCOVA analysis with time entered as the sole factor indicated a significant effect of time on absolute BMI, $F(2, 325.79) = 27.19$, $p < .001$. Secondary analyses were conducted with child race, child gender, parent race, and time entered as factors. Additionally, scores on CFQ pressure subscale, CFQ concern subscale, FES cohesion subscale, FES conflict subscale, and parent adherence at 6 months were entered into the model as covariates. To create the most parsimonious model, non-significant factors and covariates were dropped from the model using a backward elimination procedure.

Several significant between subject factors predictors emerged in the final model. Specifically, time was found to have a significant effect on BMI, F (2, 309.07) = 31.63, $p < .001$. Estimated marginal means estimates indicate that BMI scores decrease over the three time points. Post-hoc pairwise comparisons of the three time points indicate that baseline BMI scores (M = 35.63 kg/m, 95% CI [32.8 – 38.46]) are significantly higher than 3 month BMI (M = 35.01 kg/m, 95% CI [32.17 – 37.85]) and 6 month BMI scores (M = 34.69 kg/m, 95% CI [31.85 – 37.52]). Adolescent race was also significantly related to BMI, F (6, 437.25) = 2.65, $p < .05$.

Pairwise comparisons of the estimated marginal means of the race groups indicate that White children had significantly lower BMI across the three time points (M = 34.92 kg/m, 95% CI [33.64-36.21]) than Black children (M=37.62 kg/m, 95% CI [36.91-38.33]). Adolescent age was significantly related to BMI scores, F (1, 437.56) = 63.13, $p < .001$; BMI increased as age increased. The concern subscale of the CFQ was significantly related to BMI, F (1, 435.52) = 4.84, $p < .05$. Finally, the pressure subscale of the CFQ was significantly related to BMI, F (1, 437.88) = 3.97, $p < .05$. Higher scores on both the concern and pressure subscales of the CFQ were related to higher BMI scores.

The demographic variables of child race and age were significantly related to changes in absolute BMI over the first six months of the intervention. Black adolescents and older adolescents were more likely to have higher BMI than their White or younger peers. Parental concern for adolescent weight and parental use of pressure in the feeding relationship emerged as parent-level predictors of changes in BMI. No family-level predictors were found to be significantly related to changes in BMI. These findings do not support the theoretical framework of the model in that only demographic and parent-level concerns emerged as significant predictors of BMI change.

Cholesterol. Time was found to have a significant effect on total cholesterol levels when entered as the sole covariate, F (2, 353.11) = 24.23, $p < .001$. Similar to the BMI analyses, all covariates were entered into the model and a backwards elimination procedure was used to create the most parsimonious model. In the final model, time was found to have a significant effect on cholesterol, F (2,334.78) = 20.72, $p < .001$. Post-hoc comparisons of cholesterol levels across the three time points indicate significant differences between baseline (M = 160.1 mg/dl, 95% CI [157 -163]) and 3 month cholesterol levels (M = 154.7 mg/dl, 95% CI [150.9-158.4]), $p < .001$.

A significant difference was also found between baseline and 6 month cholesterol levels (*M*= 151.8 mg/dl, 95% CI [148.3 – 155.3]), $p < .001$. No significant differences in cholesterol levels were found between the 3 and 6 month measurements, $p > .05$. Adolescent gender was also significantly related to cholesterol levels, F (1, 444.7) = 6.07, $p < .05$. Pairwise comparisons indicated that male adolescents had significantly higher cholesterol levels (*M* = 159 mg/dl, 95% CI [154.3 – 163.6]) than female adolescents (*M* = 152 mg/dl, 95% CI [148.8 – 155.3]), $p < .001$. Finally, scores on the conflict subscale of the FES were significantly related to cholesterol, F (1, 448.9) = 7.07, $p < .05$; higher levels of perceived conflict were related to higher levels of cholesterol.

In contrast to our predictions, only demographic and family-level variables emerged as predictors of change in adolescents' total cholesterol levels. Parent-level attitudes and behaviors were not significantly related to cholesterol change. Levels of cholesterol do decrease significantly over time, suggesting that the intervention is successful in improving cholesterol levels.

Percent Body Fat. Time was first entered into the model as the sole covariate. A significant effect of time on body fat percentage was found, $F(2, 350.397) = 5.241$, $p < .05$. All covariates were entered into the model and a backwards elimination procedure was used to identify the most parsimonious model. In the final model, time was found to have a significant effect on percentage body fat, F (2, 472.17) = 6.62, $p = .001$. Pairwise comparisons of the three time points indicated that percentage body fat decreases over the first three months of the intervention. Baseline percentage body fat (*M* = 36.39%, 95% CI [34.17 – 38.61]) was significantly higher than 3 month body fat percentage levels (*M* = 35.07%, 95% CI [32.66 – 37.47]), $p < .05$. Baseline percentage body fat levels were also significantly higher than 6 month

percentage body fat (M = 34.77%, 95% CI [32.419 – 37.125]), p = .001. No significant differences were found between 3 month and 6 month percentage body fat, p > .05. The adolescent's gender was also significantly related to body fat percentage, F (1, 515.72) = 118.46, p < .001. Male participants had significantly lower percentages of body fat (M= 24.94%, 95% CI [22.577-27.308]) compared to their female peers (M = 45.88, 95% CI [43.62- 48.13]), p < .001. Parent race was found to be significantly related to adolescent percentage body fat, F (6, 551.72) = 12.22, p < .001. Adolescent participants with White parents had lower percentage body fat (M = 38.7%, 95% CI [37.5-39.9]) than participants with Black parents (M = 40.78%, 95% CI [40.02 – 41.55]), p < .05. Finally, adolescent age was significantly related to body fat percentage changes over the three time points, F (1, 526.2) = 40.599, p < .001.

Considered together, findings from the model predicting changes in percentage body fat do not support this study's hypotheses. Only demographic factors emerged as significant predictors of body fat change, specifically adolescent gender, parent race, and adolescent age. Body fat percentage levels decrease significantly over time, suggesting that the intervention is effectively changing the body composition of the adolescent participants. No indices of parent-level factors or home environment factors significantly predicted changes in this health outcome.

Discussion

The current study examined the relations among perceived family functioning, parental behaviors, parent attitudes, and adolescent health outcomes to identify predictors within the family system related to weight and health changes among adolescents participating in an obesity intervention. The climate of the home environment has been previously identified with weight status in children. Parental feeding practices and parental modeling of diet and physical activity have also been associated with childhood overweight and obesity. Finally, within the context of

weight-loss interventions, adherence to treatment protocol has been identified as a predictor of weight and health change over the course of the intervention. The purpose of the current study was to determine: (1) if there would be significant differences in adolescent absolute BMI, total cholesterol, and percentage body fat between adolescents whose parents participated in a psycho-education parent group intervention versus a control condition, and (2) to test the relation between the home environment, parent behavior, parent attitude, demographic variables, and adolescent health and weight outcomes to identify the best predictors of success TEENS.

Results did not support the first research aim, indicating that there were no differences in adolescents' BMI, cholesterol, or percentage body fat as a function of parental participation in the parent group versus not participating (control group). Additionally, results indicated that the number of parent group sessions attended was not significantly related to changes in the adolescent's BMI, cholesterol, or body fat percentage over the first six months of the intervention. Two significant relationships emerged: time was found to significantly predict changes in both BMI and percentage body fat in these models. Thus, the fact that the adolescent was enrolled in the intervention was related to significant changes in BMI and body fat. These findings suggest that participation in the parent group was not associated with the changes in the adolescent's health and weight outcomes. Although parents may benefit from the social support gained through attending groups with other parents concerned about their child's weight and health, this construct is not assessed in the current intervention protocol.

These findings (or lack thereof) are consistent with findings from the childhood obesity literature. Interventions aiming to change a child's weight, dietary intake, and physical activity by intervening with the parents have been found to be effective for children younger than eleven years (Golan & Crow, 2004; Janicke et al., 2008). Because participants in the TEENS

intervention are all at least thirteen years old, effecting change in adolescent weight through parent education may not be the most effective treatment.

One trend that was consistent across the three health indicators was that BMI, cholesterol, and percentage body fat all decreased significantly across the three time points. These findings support the efficacy of the TEENS intervention in improving participants' weight and health. Interestingly, no predictor of the home environment, parent behavior, parent attitude, or demographic variable was found to predict changes in any of the three health indicators. This trend indicates that aspects of the intervention not included in the model, such as physical activity or dietary changes, likely account for some of the changes in the health outcomes over the course of the intervention. Other confounding variables not related to the intervention may have influenced the changes in health indicators over time as well.

Several demographic factors emerged as significant predictors of weight and health change in this sample. Results indicated that adolescent gender was significantly related to changes in body fat percentage levels over time. Male adolescents were found to have less body fat than female adolescents. Developmentally, this finding seems logical considering participants in this age group have likely begun puberty. One would expect female participants to have higher body fat percentages than male participants. Gender differences were also associated with changes in cholesterol over time; male adolescents had higher cholesterol levels than their female peers. Age was also a significant predictor of body composition change: as adolescents grew older, percentage body fat increased. This is consistent with the finding that absolute BMI increased with age; one would expect body fat percentage and BMI levels to be positively associated. These findings can supplement the results of the indices of the family

system to identify traits within family, parents, and individual level to target in behavioral weight loss interventions.

Home Environment

In the current study, the perceived home environment was only related to changes in cholesterol. Specifically, those who perceived their homes to be high in conflict were likely to have high levels of cholesterol. The degree to which parents perceived their homes to be cohesive did not relate to their child's BMI, cholesterol, or percentage body fat. These findings are inconsistent with past literature indicating that the quality of the home environment is related to child weight and health (Garasky et al., 2009; Hooper, 2009; Mendelson et al., 1995; Zeller et al., 2009).

When considering the discrepancy between past literature about the home environment and the findings of the present study, it is important to note that the sample of the current study was primarily Black. Within the literature, there is mixed evidence for the validity of the FES in Black families (Hill, 1995). Normative data for the FES has been published for Black adolescents and the findings support the factor structure of the original FES normative sample. Additionally, no differences have been found on FES scores based on age or gender within Black samples (Dancy & Handal, 1981). However, Dancy and Handal's all Black sample consisted of primarily middle class families and may not generalize completely to the mostly low-SES sample of TEENS families. Moreover, racial differences in one's perception of one's family of origin have been found between Black and White participants using the Family Environment Scale (Clay, Ellis, Griffin, Amodeo, & Fassler, 2007). Because the FES was normed on White participants, it is likely that cultural differences may have contributed to the disparity between the current study's results and past research. It is also important to consider the fact that the

present study's sample was primarily low to lower middle class. Economic hardship has been found to mediate the relation between parenting practices and child developmental outcomes in Black families (McLoyd, 1990), and it is likely that SES shapes the climate of the home environment in ways that were not accounted for in the FES normative sample.

Drawing from the literature about the health effects of stress in the home environment, it makes sense that high levels of perceived conflict in the home were associated with elevated cholesterol levels. Research by Coleman and colleagues (1998) found that perceived stress was associated with cholesterol levels in a sample of adolescents, hypothesizing that chronic hyperarousal resulted in elevated cholesterol levels. High perceived levels of conflict in the home were also related to high levels of blood pressure in a sample of Black youth (Clark & Armstead, 2000). Curiously, past obesity research has found that high levels of perceived conflict are associated with elevated weight in children and adolescents (Garaksy et al., 2009; Zeller et al., 2009), yet this pattern was not found in the current sample. For African Americans in particular, over eating has been identified as a method of coping with chronic stressors related to racial discrimination or poverty (Kumanyika, Whitt-Glover, Gary, Prewitt, Odoms-Young, Banks-Wallace et al., 2007). Rather than pathologizing this coping strategy at the individual level, obesity interventions working with Black participants should evaluate systemic stressors driving overeating, and consequently overweight, in the Black community.

These findings inspire new questions about the role of the home environment in contributing to childhood obesity. Further work is needed to determine if associations between conflict and cohesion in predominantly White samples do not hold true for minority families. The current study also utilized parent-reported measures of the home environment to predict

changes in adolescent health. Perhaps the adolescent's own perception of his or her home environment would yield different results.

Parental Attitudes and Behavior

Based on the previous literature, one would expect parental concern about child weight and parental health behaviors to be related to child weight and health because of the significant role parents play in shaping their children's diet and exercise behaviors (Gable & Lutz, 2000). In the current study, parental concern about their adolescent's health and parental feeding style were only related to changes in adolescent BMI. Consistent with the past literature (Birch et al., 2003; Davison & Birch, 2001), both indices of parent level factors were associated with increased BMI levels.

Parental concern for their adolescent's health was significantly associated with adolescent BMI, but not cholesterol or percentage body fat. Considering that the sample of the current study consisted of treatment-seeking adolescents, it is reasonable to suggest that parents would be significantly concerned about their adolescent's weight if they enrolled their adolescent in a weight management program. This model only included baseline levels of parental concern for their child's weight; incorporating information about parental concern at 3 and 6 months into the intervention into the model could provide information about parent motivation and treatment buy-in. Also, identifying parents with low levels of concern for their adolescent's weight and intervening to maintain parent motivation could prevent families from prematurely terminating from the program (Braet et al., 2010). Parental use of pressure to eat in the feeding relationship was significantly associated with elevated adolescent absolute BMI, consistent with findings from the obesity literature (Berge, 2010). Additionally, parental use of pressure to eat has been associated with behaviors likely to encourage further weight gain such as eating unhealthy foods

(Fisher & Birch, 1999), ignoring internal satiety cues (Rhee, 2008), and eating in the absence of hunger (Birch et al., 2003). Within obesity interventions, psychologists could intervene with parents who endorse high levels of use of pressure and provide psycho-educational information about more effective methods of child feeding and parenting style.

It is important to remember that research in the child feeding literature is largely completed with preschool to pre-adolescent samples (Birch et al., 2001). In addition, the CFQ has been validated for use in adolescent samples (Kaur et al., 2006), but there is limited evidence for its validity with minority populations (Anderson et al., 2005). There is mixed evidence regarding the role of parent feeding practices on adolescent dietary intake and weight. While adolescents have more autonomy over what they eat and when, they likely internalize feeding practices and parent modeling of dietary preferences from a young age (Fisher et al., 2002). Moreover, Sato and colleagues (2011) note that parental attitudes about food are not limited to meal times, and can consist of comments regarding food or weight made at any part of the day. In light of these findings, using the adolescent's own report of feeding styles used by parents could produce more accurate results for this population.

Previous research has identified associations between parent adherence with treatment protocol and the child's weight loss in an obesity intervention (Golan, 2006). However, parent adherence was not associated with any of the health outcome variables in the present study. Following the recommendation of Heinberg and colleagues (2009), the present study examined parental adherence with treatment protocol as a continuous variable, rather than discrete, but no associations were found. It is likely that parental adherence was not significantly related to the adolescent's health indicators because parents in this sample had low adherence rates, attending

on average less than 25% of their scheduled visits with the program dietician. Moreover, parents who were assigned to attend parent group attended on average less than half of the sessions.

These findings do not necessarily indicate that the TEENS parent group is ineffective. Rather, these findings suggest that parental involvement in the psycho-education group is not associated with the adolescent weight and health indicators. Further work could examine only parents who attended at least 75% of their scheduled visits to see if increased adherence was associated with changes in adolescent health indicators. These low adherence and participation rates may not be indicative of parental indifference about the TEENS intervention. The current sample consisted of many low SES families; and, transportation to the TEENS building and busy work schedules proved to be insurmountable barriers for many parents. Future work with low income, minority populations could make extra efforts to ensure that their intervention is easily accessible to their participants in order to ensure maximum participation. Situating interventions in public schools or churches has been an effective way to reach low SES Black families (Fitzgibbon, Stolley, Schiffer, Braunschweig, Gomez, Van Horn, & Dyer, 2010).

Limitations

Several limitations should be considered when evaluating the findings of this study. Participants in this study consisted of treatment seeking adolescents and their parents. Families participated in this program with the explicit goal of decreasing their child's weight over the course of the intervention. Results found in this sample cannot be generalized to all obese adolescents.

The final models that emerged in this study are limited by the fact that family income and parental education were excluded from the analyses because of significant participant non-response on those items of the demographic questionnaire. Obesity prevalence rates have been

found to vary as a function of race and SES (Delva et al., 2007; Gordon-Larsen, 2003). Moreover, low-SES parents are limited in the diet and physical activity behaviors they can provide for the children due to constraints of money, time, transportation, safety, and convenience (Franko & George, 2008). Excluding these indices of SES from the model obscures the effect of this demographic variable on changes in the health outcome, which is inconsistent with the ecological theoretical framework guiding this study.

Another limitation of this study relates to the operational definition of parental adherence utilized in this model. In this context, parental adherence was defined as the parent's attendance at required parent-child visits with the staff dietician. This conceptualization of adherence did not include parent attendance at required visits with behavioral specialists due to clinically relevant instances when the behavioral specialist wished to meet with the child alone for part or all of the session. Including the number of required behavior specialist sessions the parent was asked to attend would have functioned as a more comprehensive measure of parental adherence with treatment protocol. Including the adolescent gym visit attendance could also serve as a proxy of parental adherence with the treatment protocol. However, this assumes that parents are bringing their children to the gym. In some cases, participants in the TEENS intervention took public transportation or other means to bring themselves to the gym.

Additionally, this study did not account for the effects of the exercise component of the TEENS intervention. While time was found to be a significant predictor of some health outcomes, it is unknown if exercising in the gym regularly could account for some of the effects found across the three time points. The adolescent's adherence with gym visits was also excluded from the current study. Including this variable may serve as an effective proxy for adolescent behavior and motivation to comply with treatment protocol. Additionally, the current

study did not include any physical fitness indicators or information about the frequency with which the participant engages in physical activity. Studying obesity risk factors without considering physical activity presents a limited picture of the factors contributing to elevated weight (Blair & Church, 2004).

Finally, for some participants there was confusion about how to complete the Family Environment Scale. For this measure, participants are asked to indicate whether certain statements are accurate or inaccurate for their families. Some parents were unsure whether they should consider their family of origin or current family when answering the question. This misunderstanding likely contributed to systematic error in the responses to this measure.

Future Directions

The current study examined factors in the home environment associated with adolescent weight and health change in order to identify specific behaviors and attitudes obesity programs could target through behavior change and psycho-education efforts. This study also examines pediatric obesity within a predominantly Black sample, a group at increased risk for obesity (Delva et al., 2007). There are several ways in which future work could build upon the findings of the current study.

In order to better understand the effect of participation in the parent group on adolescent weight and health, parents' diet and exercise related behaviors could be measured before and after the parent group intervention. Changes in the frequency with which parents engage in healthy diet or exercise behaviors would likely indicate that participation in the group has created changes in parent behavior. One could assume that changes in parent behavior would also affect the obese adolescent's dietary intake and physical activity levels. Moreover, future studies could examine the BMI of parents before and after participating in the group as a predictor of changes

in the child's weight and health outcomes. Encouraging parents to adopt lifelong healthy diet and exercise behaviors would provide excellent modeling for children in the intervention, and promote healthy changes for the whole family (Hudson, 2008).

This study related baseline parent-reported measures to changes in adolescent BMI, cholesterol, and body fat percentage. Future work could conduct interventions designed to modify parent's feeding practices or parenting style in order to determine if the changes in these family system factors predict changes in child weight. Longitudinal research could also determine how changes in these family systems affect the weight, dietary intake, and physical activity of the adolescent as he or she matures.

Additionally, future studies should continue to examine the reliability of measures such as the FES and CFQ in both minority and low SES samples (Anderson et al., 2005; Spruijt-Metz et al., 2002). Future studies could identify ways to modify these widely used questionnaires to ensure more accurate findings with non-White or low income samples. Validating these measures with diverse samples would help to identify factors driving disparate obesity prevalence rates.

Research aiming to examine childhood obesity within the Black community should look to extended family structures beyond the nuclear family. Within the Black community, extended family and kin structures function as additional means of social and financial support (Stewart, 2007). Within the TEENS intervention, grandparents, step-parents, or other family members occasionally served as the identified caretaker for the participant. The current study, however, did not include the relation of the identified caregiver to the participant with the analyses. Because perceptions of the climate of the home have been found to vary in Black samples with families led by single parents, two parents, and extended family members (Tolson & Wilson,

1990), it would be important collect data on the structure of the participant's family. Further work in this area could determine if there are differences in health behavior outcomes for children whose identified caregiver was a member of the extended family versus children whose parents participated in the intervention. In addition, future obesity interventions could investigate the role of extended kin structures as a means of social support for facilitating health behavior change. Obesity programs could work within Black church congregations or community centers to disseminate diet and exercise information or conduct weight modification interventions (Kumanyika et al., 2007).

Finally, future research could diversify the pediatric obesity literature by examining factors associated with obesity in other minority populations. Like Black children, Native American and Hispanic children are also more likely to be overweight compared to their White peers. Asian American adolescents, however, have been found to be less likely to be overweight when compared to White, African American, and Latino peers (Gordon-Larsen et al., 2003). When studying minority populations, it is also important to consider the effects of acculturation of both the parents and the obese child. A positive association has been found between the degree of acculturation and overweight in minority children (Franko & George, 2008). Increasing the diversity of participants within the obesity literature will help identify culturally bound factors contributing to differential rates of pediatric obesity across cultures.

Conclusion and Summary

The relation between the perceived home environment, parent behavior, parent attitudes, demographics, and adolescent health and weight outcomes were examined in order to test a model of family systems predictors of adolescent success in a multidisciplinary weight loss intervention. Within the childhood obesity literature, these variables have been identified as

significant predictors of weight. The hypotheses of the current study were not supported with this sample; however, several significant relationships did emerge. Adolescent age, parental concern regarding their child's weight, and parental use of pressure to eat in the feeding relationship were associated with BMI change. Adolescent gender and perceived conflict in the home were found to be related to changes in cholesterol. Adolescent gender, parent race, and child age were related to changes in body fat percentage. These results can guide other obesity programs by identifying specific parent behaviors and home environment factors related to child weight that could be modified through behavioral interventions. The findings also examine pediatric obesity within a predominantly Black sample, a population largely underrepresented in the literature.

List of References

List of References

Alderfer, M.A., Fiese, B.H., Gold, J.I., Cutuli, J.J., Holmbeck, G.N., Goldbeck, L., Chambers,C.T. et al. (2008). Evidence-based assessment in pediatric psychology: Family measures. *Journal of Pediatric Psychology, 33*(9), 1046-1061.

Anderson, C.B., Hughes, S.O., Fisher, J.O., & Nicklas, T.A. (2005). Cross-cultural equivalence of feeding beliefs and practices: The psychometric properties of child feeding questionnaire among blacks and Hispanics. *Preventative Medicine, 41,* 521-531.

Alleyne, S.I., & LaPoint, V. (2004). Obesity among black adolescent girls: Genetic, psychosocial, and cultural influences. *Journal of Black Psychology, 30*, 344-365. Alto, CA: Consulting Psychologists Press.

Baumrind, D. (1971). Current patterns of parental authority. *Developmental Psychology Monograph, 4,* 101-103.

Beck, S. & Terry, K. (1985). A comparison of obese and normal-weight families' psychological characteristics. *American Journal of Family Therapy*, *13*, 55-59.

Berge, J. (2010). A review of familial correlates of child and adolescent obesity: What has the 21st century taught us so far? *International Journal of Adolescent Medicine and Health, 24*(4), 457-483.

Berge, J.M., Wall, M., Bauer, K.W., & Neumark-Sztainer, D. (2010). Parenting characteristics in the home environment and adolescent overweight: A latent class analysis. *Obesity, 18*(4), 818- 825.

Birch, L.L., Fisher, J.O., & Davison, K.K. (2003). Learning to overeat: Maternal use of restrictive feeding practices promotes girls' eating in absence of hunger. *American Journal of Clinical Nutrition, 78*(2), 215-220.

Birch, L.L., Fisher, J.O., Grimm-Thomas, K., Markey, C.N., Sawyer, R., & Johnson, S.L. (2001). Confirmatory factor analysis of the child feeding questionnaire: A measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite, 36,* 201-210.

Blair, S.N., & Church, T.S. (2004). The fitness, obesity, and health equation: Is physical activity the common denominator? *The Journal of the American Health Association, 292*(10) 1232-1233.

Braet. C., Jeannin, R., Mels, S., Moens, E. & Van Winckel, M. (2010). Ending prematurely a weight loss programme: The impact of child and family characteristics. *Clinical Psychology and Psychotherapy, 17,* 406-417.

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press.

Caprio. S., Daniels, S.R., Drewnowski, A., Kaufman, F.R., Palinkas, L.A., Rosenbloom A.L., & Schwimmer, J.B. (2008). Influence of race, ethnicity, and culture on childhood obesity: Implications for prevention and treatment. *Obesity, 16,* 2566-2577.

Cardel, M., Willig, A.L., Dulin-Keita, A., Casazza, K., Beasley, T.M., & Fernandez, J.R. (2012). Parental feeding practices and socioeconomic status are associated with child adiposity in a multi-ethnic sample of children. *Appetite, 58,* 347-353.

Centers for Disease Control and Prevention (2009). Overweight and Obesity. Retrieved 11/27/2010 from http://www.cdc.gov/obesity/childhood/index.html.

Chandler-Laney, P., Hunter, G.R., Ard, J.D., Roy, J.L., Brock, D.W., & Gower, B.A. (2009). Perception of others' body size influences weight loss and regain for European American but not African American women. *Health Psychology, 28*(4), 414-418.

Chen, J., & Kennedy, C. (2004). Family functioning, parenting style, and Chinese children's weight status. *Journal of Family Nursing, 10,* 262-279.

Clark, R., & Armstead, C. (2000). Preliminary study examining relationship between family environment and resting mean arterial pressure in African-American youth. *Journal of Adolescent Health, 27,* 3-5.

Clay, C.M., Ellis, M.A., Griffin, M.L., Amodeo, M., & Fassler, I.R. (2007). Black women and white women: Do perceptions of childhood family environment differ? *Family Process, 46*, 243-256.

Cole, T.J., Faith, M.S., Pietrobelli, A., & Heo, M. (2005). What is the best measure of adiposity change in growing children: BMI, BMI %, BMI z-score, or BMI centile? *European Journal of Clinical Nutrition, 59*, 419-425.

Coleman, C.A., Friedman, A.G., & Burright, R.G. (1998). The relationship of daily stress and health-related behaviors to adolescents' cholesterol levels. *Adolescence, 33*(130), 447-461.

Connell, C.M., Gilreath, T.D., Aklin, W.M., & Brex, R.A. (2010). Social-ecological influences on patterns of substance use among non-metropolitan high school students. *American Journal of Community Psychology, 45*, 36-48.

Cusatis, D.C., & Shannon, B.M. (1996). Influences on adolescent eating behavior. *Journal of Adolescent Health, 18*, 27-34.

Dancy, B.L., & Handal, P.J. (1981). Effect of gender and age on family climate scores of Black adolescents and preliminary norms. *Psychological Reports, 48*(3), 755-757.

Daniels, S.R. (2009). The use of BMI in the clinical setting. *Pediatrics, 124*, S35 – S41.

Davison, K.K., & Birch, L.L. (2001). Childhood overweight: A contextual model and recommendations for future research. *Obesity Reviews, 2*, 159-171.

Deckelbaum, R.J., & Williams, C.L. (2001). Childhood obesity: The health issue. *Obesity Research, 9*(4S), 239S-243S.

Delva, J., Johnson, L.D., & O'Malley, P.M. (2007). The epidemiology of overweight and related lifestyle behaviors: Racial/ethinic and socioeconomic status differences among American youth. *American Journal of Preventative Medicine, 33*(4S), S178-S186.

Dhingra, A., Brennan, L., & Walkley, J. (2010). Predicting treatment initiation in a family-based adolescent overweight and obesity intervention. *Obesity, 19*(6), 1307-1310.

Dietz, W.H., & Gortmaker, S.L. (2001). Preventing obesity in children and adolescents. *Annual Review of Public Health, 22,* 237-253.

Doolen, J., Alpert, P.T., & Miller, S.K. (2009). Parental disconnect between perceived and actual weight status of children: A metasynthesis of the current research. *Journal of the American Academy of Nurse Practitioners, 21,* 160-166.

Eisenberg, M.E., Neumark-Sztainer, D., & Story, M. (2003). Associations of weight-based teasing and emotional well-being among adolescents. *Archives of Pediatrics & Adolescent Medicine, 157,* 733-738.

Epstein, L.H., Paluch, R.A., Roemmich, J.N., & Beecher, M.D. (2007). Family-based obesity treatment, then and now: Twenty-five years of pediatric obesity treatment. *Health Psychology, 26*(4), 381-391.

Epstein, L.H., Valoski, A., Wing, R.R., & McCurley (1994). Ten-year outcomes of behavioral family-based treatment for childhood obesity. *Health Psychology, 13*(5), 373-383.

Epstein, L.H., Wing, R.R., Koeske, R., & Valoski, A (1987). Long-term effects of family-based treatment of childhood obesity. *Journal of Consulting and Clinical Psychology, 55*(1), 91-95.

Field, A. (2005). *Discovering Statistics Using SPSS* (2nd Ed.). London: Sage Publications, Ltd.

Fisher, J.O., & Birch, L.L. (1999). Restricting access to foods and children's eating. *Appetite, 32*(3), 405-419.

Fisher, J.O., Mitchell, D.C., Smiciklas-Wright, & Birch, L.L. (2002). Parental influences on young girls' fruit and vegetable micronutrient, and fat intakes. *Journal of the American Dietetic Association, 102*(1), 58-64.

Fitzgibbon, M.L., Stolley, M.R., Schiffer, L.A., Braunschweig, C.L., Gomez, S.L., Van Horn, L., & Dyer, A.R. (2010). Hip hop to health jr. obesity prevention effectiveness trial: Postintervention results. *Obesity,* 1-10.

Franko, D. L., & Edwards George, J. B. (2009). Overweight, eating behaviors, and body image in ethnically diverse youth. In L. Smolak & J. K. Thompson (Eds.), *Body image, eating disorders, and obesity in youth: Assessment, prevention, and treatment* (pg. 97-112). Washington, D.C.: American Psychological Association.

Freedman, D.S., Dietz, W.H., Srinivasan, S.R., & Berenson, G.S. (1999). The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa heart study. *Pediatrics, 103*(6), 1175-1182.

Gable, S., & Lutz, S. (2000). Household, parent, and child contributions to childhood obesity. *Family Relations, 49*(3), 293-300

Galloway, A.T., Fiorito, L., Lee, Yl, & Birch, L.L. (2005). Parental pressure, dietary patterns, and weight status among girls who are "picky eaters." *Journal of the American Dietetic Association, 105*(4), 541-548.

Garasky, S., Stewart, S.D., Gunderson, C., Lohman, B.J., & Eisenmann, J.C. (2009). Family stressors and child obesity. *Social Science Research, 38*(4), 755-766.

Golan, M. & Crow, S. (2004). Parents are key players in the prevention and treatment of weight-related problems. *Nutrition Reviews, 62*(1), 35-50.

Golan, M. (2006). Parents as agents of change in childhood obesity – from research to practice. *International Journal of Pediatric Obesity, 1*(2), 66-76.

Golan, M., & Weizman, A. (2001). Familial approach to the treatment of childhood obesity: Conceptual model. *Journal of Nutrition Education, 33*(2), 101-107.

Gordon-Larsen, P., Adair, L.S., & Popkin, B.M. (2003). The relationship of ethnicity, socioeconomic factors, and overweight in US adolescents. *Obesity Research, 11*(1), 121-129.

Haas, J.S., Lee, L.B., Kaplan, C.P., Sonneborn, D., Phillips, K.A., & Liang, S (2003). The association of race, socioeconomic status, and health insurance status with the prevalence of overweight among children and adolescents. *American Journal of Public Health, 93*, 2105–2110.

Harkaway, J.E. (2000). Obesity and systems research: The complexity of studying complexities. *Family, Systems, & Health 18*(1), 55- 59.

Heinberg, L.J., Kutchman, E.M., Berger, N.A., Lawhun, S.A., Cuttler, L., Seabrook, R.C., & Horwitz, S.M. (2009). Parent involvement is associated with early success in obesity treatment. *Clinical Pediatrics, 49,* 457-465.

Hill, N.E. (1995). The relationship between family environment and parenting style: A preliminary study of African American families. *Journal of Black Psychology, 21*(4), 408-423.

Hooper, L.M., Burnham, J.J., & Richey, R. (2009). Select parent and family system correlates of adolescent current weight status: A pilot study. *The Family Journals, 17*(14), 14-21

Hudson, C.E. (2008). An integrative review of obesity prevention in African American children. *Issues in Comprehensive Pediatric Nursing, 31*, 147-170.

Janicke, D.M., Sallinen, B.J., Perri, M.G., Lutes, L.D., Huerta, M., Silverstein, J.H., & Brumback, B. (2008). Comparison of parent-only versus family-based interventions for overweight children in underserved rural settings: Outcomes from project STORY. *Archives of Pediatrics and Adolescent Medicine, 162*(12), 1119-1125.

Janicke, D.M., Sallinen, B.J., Perri, M.G., Lutes, L.D., Silverstein, J.H., & Brumback, B. (2009). Comparison of program costs for parent-only and family-based interventions for pediatric obesity in medically underserved rural settings. *The Journal of Rural Health, 25*(3), 326-330.

Jackson, D., Mannix, J., Faga, P., & McDonald, G. (2005). Overweight and obese children: Mothers' strategies. *Journal of Advanced Nursing, 52* (1), 6-13.

Kaur, H., Li, C., Niaman, N., Choi, W.S., Resnicow, K., Birch, L., & Ahluwalia, J. (2006). Confirmatory factor analysis of the child-feeding questionnaire among parents of adolescents. *Appetite, 47*, 36-45.

Keery, H., Eisenberg, M.E., Boutelle, K., Neumark-Sztainer, D., & Story, M. (2006). Relationships between maternal and adolescent weight-related behaviors and concerns: The role of perception. *Journal of Psychosomatic Research, 61*, 105-111.

Kitzman, K.M., Dalton, W.T., & Buscemi, J. (2008). Beyond parenting practices: Family context and the treatment of pediatric obesity. *Family Relations, 57*(1), 13-23.

Kitzman-Ulrich, H., Wilson, D.K., St. George, S.M., Lawman, H., Segal, M., & Fairchild, A. (2010). The integration of a family systems approach for understanding youth obesity, physical activity, and dietary programs. *Clinical Child and Family Psychology Review, 13*, 231-253.

Kral, T., & Rauh, E. (2010). Eating behaviors of children in the context of their family environment. *Physiology & Behavior, 100*, 567-573.

Kremers, S.P.J., Brug, J., de Vries, H., & Engles, R.C.M. (2003). Parenting style and adolescent fruit consumption. *Appetite, 41*, 43-50.

Kumanyika, S.K. (2008). Environmental influences on childhood obesity: Ethnic and cultural influences in context. *Physiology & Behavior*, 61-70.

Kumanyika, S.K., Whitt-Glover, M.C., Gary, T.L., Prewitt, E., Odoms-Young, A.M., Banks-Wallace, J., et al. (2007). Expanding the obesity research paradigm to reach African American communities. *Preventing Chronic Disease, 4*(4), 1-22.

Langille, J.D., & Rogers, W.M. (2010). Exploring the influence of a social ecological model on school-based physical activity. *Health Education & Behavior, 37*, 879-894.

Lindsay, A.C., Sussner, K.M., Kim, J., & Gortmaker, S.L. (2006). The role of parents in preventing childhood obesity. *The Future of Children, 16*(1), 169-186.

Mandara, J., & Murray, C.B. (2002). Development of an empirical typology of African American family functioning. *Journal of Family Psychology, 16*, 318-337.

Maynard, P.E., & Olson, D.H. (1987). Circumplex model of family systems: A treatment tool in family counseling. *Journal of Counseling and Development, 65*, 502 – 504.

Mazzeo, S., Gow, R., Stern, M., & Gerke, C. (2008). Developing an intervention for parents of overweight children. *International Journal of Child and Adolescent Health, 1*(4), 355-363.

McGuire, M.T., Hannan, P.J., Neumark-Sztainer, D., Cossrow, N.H., & Story, M. (2002). Parental correlates of physical activity in a racially/ethnically diverse adolescent sample. *Journal of Adolescent Health, 30*(4), 253-261.

McLoyd, V.C. (1990). The impact of economic hardship on black families and children: Psychological distress, parenting, and socioemotional development. *Child Development, 61*(2), 311-346.

Mellin, A.E., Neumark-Sztainer, D., Story, M., Ireland, M., & Resnick, M.D. (2002). Unhealthy behaviors and psychosocial difficulties among overweight adolescents: The potential impact of familial factors. *Journal of Adolescent Health, 31,* 145-153.

Mendelson, B.K., White, D.R., & Schliecker, E. (1995). Adolescents' weight, sex, and family functioning. *International Journal of Eating Disorders, 17,* 73-79.

Moos, R. & Moos, B. (1994). *Family Environment Scale Manual: Development, Applications, Research* (3rd Ed.). Palo Alto, CA: Consulting Psychologist Press.

Morrissey-Kane, E., & Prinz, R.J. (1999). Engagement in child and adolescent treatment: The role of parental cognitions and attributions. *Clinical Child and Family Psychology Review, 2*(3), 183-189.

Neumark-Sztainer, D., Bauer, K.W., Friend, S., Hannan, P.J., Story, M., & Berge, J.M. (2010). Family weight talk and dieting: How much do they matter for body dissatisfaction and disordered eating behaviors in adolescent girls? *Journal of Adolescent Health, 47,* 270-276.

Nock, M.K. & Photos, V. (2006). Parent motivation to participate in treatment: Assessment and prediction of subsequent participation. *Journal of Child and Family Studies, 15*(3), 345-358.

Ogbu, J. U. (1985). A cultural ecology of competence among inner-city blacks. In M.B. Spencer, G.K. Brookins, & W.R. Allen (Eds.), *Beginnings: The social and affective development of Black children* (pp.45-66). Hillsdale, NJ: Lawrence Erlbaum Associates.

Ogden, C.L., Carroll, M.D., Curtin, L.R., Lamb, M.M., & Flegal, K.M. (2010). Prevalence of high body mass index in US children and adolescents, 2007-2008. *Journal of the American Medical Association, 303*(3), 242-249.

Ogden, C.L., Carroll, M.D., Kit, B.K., & Flegal, K.M. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *Journal of the American Medical Association, 307*(5), 483-490.

Pliner, P., & Loewen, E.R. (1997). Temperament and food neophobia in children and their mothers. *Appetite, 28*, 239-254.

Porter, Jerlym (manuscript in press). Relations among teasing, body image, self-esteem, and depression in treatment-seeking obese adolescents.

Puder, J.J., & Munsch, S. (2010). Psychological correlates of childhood obesity. *International Journal of Obesity, 34*, S37-S43.

Repetti, R.L., Taylor, S.E., & Seeman, T.E. (2002). Risky families: Family social Environments and the mental and physical health of offspring. *Psychological Bulletin, 128*(2), 330-366.

Rhee, K. (2008). Childhood overweight and the relationship between parent behaviors, parenting style, and family functioning. *The Annals of the American Academy of Political and Social Science, 615*, 12-37.

Rhee, K.E., De Lago, C.W., Arscott-Mills, T., Mehta, S.D., & Davis R.K. (2005). Factors associated with parental readiness to make changes for overweight children. *Pediatrics, 116*, 94-101.

Sallis, J.F., Prochaska, J.J., & Taylor, W.C. (1999). A review of correlates of physical activity and children and adolescents. *Medicine Science in Sports and Exercise, 32*(5), 963-975.

Sato, A.F., Jelalian, E., Hart, C.N., Llyd-Richardson, E.E., Mehlenbeck, R.S., Neill, M., & Wing, R.R. (2011). Associations between parent behavior and adolescent weight control. *Journal of Pediatric Psychology, 34*(4), 451-460.

Spruijt-Metz, D., Lindquist, C.H., Birch, L.L., Fisher, J.O., & Goran, M.I. (2002). Relation between mothers' child-feeding practices and children's adiposity. *The American Journal of Clinical Nutrition, 75*(3), 581-586.

Stern, M., Mazzeo, S.E., Gerke, C.K., Porter, J.S., Bean, M.K., & Laver, J.H. (2007). Gender, ethnicity, psychosocial factors, and quality of life among severely overweight, treatment-seeking adolescents. *Journal of Pediatric Psychology, 32*(1), 90-94.

Stern, M., Mazzeo, S.E., Porter, J., Gerke, C., Bryan, D., & Laver, J. (2006). Self-esteem, teasing and quality of life: African American adolescent girls participating in a family-based pediatric overweight intervention. *Journal of Clinical Psychology in Medical Settings, 13*(3), 217-220.

Stewart, P. (2007). Kinship and social support research: Who is kin? Family definition and African American families. *Journal of Human Behavior in the Social Environment, 15*(2/3), 163-181.

Story, M., Neumark-Sztainer, & French, S. (2002). Individual and environmental influences on adolescent eating behaviors. *Supplement to the Journal of The American Dietetic Association, 102*(3), S40-S51.

Tolson, T.F.J., & Wilson, M.N. (1990). The impact of two- and three-generational Black family structure on perceived family climate. *Child Development, 61*, 416-428.

Topham, G.L., Hubbs-Tait, L., Rutledge, J.M., Page, M.C., Kennedy, T.S., Shriver, L.H., & Harrist, A.W. (2011). Parenting styles, parental response to child emotion, and family emotional responsiveness are related to child emotional eating. *Appetite, 56,* 261-264.

Uzark, K.C., Becker, M.H., Dielman, T.E., Rocchini, A.P., & Katch, V. (1988). Perceptions held by obese children and their parents: Implications for weight control intervention. *Health Education & Behavior*, 15, 185-198.

Walcott-McQuigg, J.A., Sullivan, J., Dan, A., & Logan, B. (1995). Psychosocial factors influencing weight control behavior of African American women. *Western Journal of Nursing Research, 17*(5), 502-520.

Wang, Y., Liang, H., Tussing, L., Braunschweig, C., Caballero, B., & Flay, B. (2007). Obesity and related risk factors among low socio-economic status minority students in Chicago. *Public Health Nutrition, 10*(9), 927-938.

Whittemore, R., Melkus, G.D., & Grey, M. (2010). Applying the social ecological theory to type 2 diabetes prevention and management. *Journal of Community Health Nursing, 21*(2), 87-99.

Wrotniak, B.H., Epstein, L.H., Paluch, R.A., & Roemmich, J.N. (2005). The relationship between parent and child self-reported adherence and weight loss. *Obesity Research, 13* (6), 1089-1096.

Young, R.L., Schwartz, K.L., Monsur, J.C., West, P.W., & Neale, A.V. (2008). Primary care of overweight children: the importance of parent weight and attitudes about overweight: a MetroNet Study. *Journal of the American Board of Family Medicine, 21*(4), 361-363.

Zeller, M.H., Reiter-Purtill, J., Modi, A.C., Gutzwiller, J., Vannatta, K., & Davis, W.H. (2007). Controlled study of critical parent and family factors in the obesogenic environment. *Obesity, 15*(1), 126 – 136.

Appendix 1

Demographic Information

Personal and Family Information

Subject Name:_____ Date:_____

Parent or Legal Guardian Name: _____

Subject: Check the box for the racial or ethnic group with which you identify:
□ White
□ Black (includes Jamaican, Bahamians and other Caribbeans of African descent)
□ Hispanic (includes persons of Mexican, Puerto Rican, Central or South/American or other Spanish origin or culture)
□ Asian (includes Pakistanis & Indians)
□ Native American (includes Alaskans)
□ Middle Eastern
□ Pacific Islander
□ Other (specify) _____

Parent/Guardian: Check the box for the racial or ethnic group with which you identify:
□ White
□ Black (includes Jamaican, Bahamians and other Caribbeans of African descent)
□ Hispanic (includes persons of Mexican, Puerto Rican, Central or South/American or other Spanish origin or culture)
□ Asian (includes Pakistanis & Indians)
□ Native American (includes Alaskans)
□ Middle Eastern
□ Pacific Islander
□ Other (specify) _____

Parents' highest level of completed education:
□ Less than high school diploma
□ High school diploma
□ Some college
□ College degree
□ Some graduate school
□ Graduate degree

Family income level:
□ Less than $10,000 per year
□ $10,000 - $20,000 per year
□ $20,000 - $30,000 per year
□ $30,000 - $40,000 per year
□ $40,000 - $50,000 per year
□ More than $50,000 per year

Appendix 2

Family Environment Scale (FES)

Directions: The following statements are about families. Please indicate which statements are *True* of your family and which are *False*. Please select the answer that best applies to your family (the family you grew up in) by entering it to the left of the number of the statement. If you think the statement is *True* or mostly *True* of your family, write T to the left of the statement. If you think the statement is *False* or mostly *False* of your family, write F.

You may feel that some of the statements are *True* for some family members and *False* for others. Write T if the statement is *True* for most members. Write F if the statement is *False* for most members. If the members are equally divided, decide what is the stronger impression and answer accordingly. Remember, we would like to know what your family is like to you. So *do not* try to figure out how other members see your family, but *do* give us your general impression of your family for each statement.

_____ 1. Family members really help and support one another.

_____ 2. Family members often keep their feelings to themselves.

_____ 3. We fight a lot in our family.

_____ 4. We often seem to be killing time at home.

_____ 5. We say anything we want around our home.

_____ 6. Family members rarely become openly angry.

_____ 7. We put a lot of energy into what we do at home.

_____ 8. It's hard to "blow off steam" at home without upsetting somebody.

_____ 9. Family members often become so angry they throw things.

_____ 10. There is a feeling of togetherness in our home.

_____ 11. We tell each other about our personal problems.

_____ 12. Family members hardly ever lose their tempers.

_____ 13. We rarely volunteer when something has to be done at home.

_____ 14. If we feel like doing something on the spur of the moment, we often just pick up and go.

_____ 15. Family members often criticize each other.

_____ 16. Family members really back each other up.

_____ 17. Someone usually gets upset if you complain in our family.

_____ 18. Family members sometime hit each other.

_____ 19. There is very little group spirit in our family.

_____ 20. Money and paying bills is openly talked about in our family.

_____ 21. If there's a disagreement in our family, we try hard to smooth things over and keep the peace.

_____ 22. We really get along well with each other.

_____ 23. We are usually careful about what we say to each other.

_____ 24. Family members often try to one-up or out-do each other.

_____ 25. There is plenty of time and attention for everyone in our family.

_____ 26. There are a lot of spontaneous discussions in our family.

_____ 27. In our family, we believe you don't ever get anywhere by raising your voice.

Appendix 3

Child Feeding Questionnaire

Please answer the following questions using the scales below. Circle the number that best reflects what you think. Answer each question as honestly as you can. There are no right or wrong answers, just your answers. Thank you so much for your time.

1. When your child is at home, how often are you responsible for feeding him/her?

Never	Seldom	Half the time	Most of the time	Always
1	2	3	4	5

2. How often are you responsible for deciding what your child's portion sizes are?

Never	Seldom	Half the time	Most of the time	Always
1	2	3	4	5

3. How often are you responsible for deciding if your child has eaten the right kind of foods?

Never	Seldom	Half the time	Most of the time	Always
1	2	3	4	5

4. Which of the following best describes **your weight as a child:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

5. Which of the following best describes **your weight as an adolescent:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

6. Which of the following best describes **your current weight:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

7. Which of the following best describes **your child's weight in his/her first year of life:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

8. Which of the following best describes **your child's weight as a toddler:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

9. Which of the following best describes **your child's weight as a preschooler:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

10. Which of the following best describes **your child's weight from Kindergarten through second grade:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

11. Which of the following best describes **your child's weight from 3rd through 5th grade:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

12. Which of the following best describes **your child's weight from 6th through 8th grade:**

Very underweight	Underweight	Normal	Overweight	Very overweight
1	2	3	4	5

13. How concerned are you about your child eating too much when you are not around him/her?

Unconcerned	A little concerned	Concerned	Fairly concerned	Very concerned
1	2	3	4	5

14. How concerned are you about your child having to diet to maintain a desirable weight?

Unconcerned	A little concerned	Concerned	Fairly concerned	Very concerned
1	2	3	4	5

15. How concerned are you about your child becoming overweight?

Unconcerned	A little concerned	Concerned	Fairly concerned	Very concerned
1	2	3	4	5

16. I have to be sure that my child does not eat too many sweets (for example, candy, ice cream, cake or pastries).

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

17. I have to be sure that my child does not eat too many high-fat foods.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

18. I have to be sure that my child does not eat too much of his/her favorite foods.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

19. I intentionally keep some foods out of my child's reach.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

20. I offer sweets (for example, candy, ice cream, cake or pastries) to my child as a reward for good behavior.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

21. I offer my child his/her favorite foods in exchange for good behavior.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

22. If I did not guide or regulate my child's eating, he or she would eat too many junk foods.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

23. If I did not guide or regulate my child's eating, he or she would eat too much of his/her favorite foods.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

24. My child should always eat all the foods on his/her plate.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

25. I have to be especially careful to make sure my child eats enough.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

26. If my child says, "I'm not hungry," I try to get him/her to eat anyway.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

27. If I did not guide or regulate my child's eating, he or she would eat much less than he/she should.

Disagree	Slightly disagree	Neutral	Slightly agree	Agree
1	2	3	4	5

28. How much do you keep track of the sweets (for example, candy, ice cream, cake or pastries) that your child eats?

Never	Rarely	Sometimes	Mostly	Always
1	2	3	4	5

29. How much do you keep track of the snack food (for example, potato chips, Doritos, cheese puffs) that your child eats?

Never	Rarely	Sometimes	Mostly	Always
1	2	3	4	5

30. How much do you keep track of the high-fat foods your child eats?

Never	Rarely	Sometimes	Mostly	Always
1	2	3	4	5

Vita

Jacqueline Diana Woods was born on December 13, 1987 in Alexandria, Virginia, and is an American citizen. She graduated from Stone Bridge High School, Ashburn, Virginia in 2005. She received her Bachelor of Arts in Psychology and History from the College of William and Mary, Williamsburg, Virginia in 2009.