Spring 2020

The Moderating Effects of Parenting Factors and Perceived Stress on African American Adolescent Weight Related Outcomes

Colby Kipp

THE MODERATING EFFECTS OF PARENTING FACTORS AND PERCEIVED STRESS ON AFRICAN AMERICAN ADOLESCENT WEIGHT RELATED OUTCOMES

by

Colby Kipp

Bachelor of Science
Brigham Young University, 2016

Submitted in Partial Fulfillment of the Requirements

For the Degree of Master of Arts in

Psychology

College of Arts and Sciences

University of South Carolina

2020

Accepted by:

Dawn Wilson, Director of Thesis

Nicole Zarrett, Reader

Guillermo Wippold, Reader

Cheryl L. Addy, Vice Provost and Dean of the Graduate School

ABSTRACT

African American adolescents experience a higher prevalence of obesity than non-minorities with approximately 40% being overweight or obese. Chronic stress, both among parents and adolescents, may be important to consider when assessing the factors that influence adolescent weight status. Baseline data were collected from one hundred forty eight African American adolescents ($M_{age} = 12.93$, *SD* = 1.75; $M_{BMI\%} = 96.7$, *SD* = 3.90) and their caregivers ($M_{age} = 44.45$, *SD* = 8.65; $M_{BMI} = 37.63$, *SD* = 8.21) enrolled in the Families Improving Together (FIT) for Weight Loss trial. Adolescents self-reported their perceptions of their caregiver's parenting style and feeding practices. Both caregivers and adolescents self-reported their perceptions of chronic stress. Weight and height were measured and used to calculate BMI for parents and adolescents at baseline and 16 weeks post-intervention. The current study tested the hypothesis that positive parenting practices (authoritative parenting, parental responsibility, and monitoring) would buffer the negative effects of parent and adolescent perceived stress on adolescent BMI over 16 weeks under high, but not low, stress conditions. Other parenting practices associated with control (concern for child's weight, restriction and pressure to eat) were predicted to exacerbate the effects of parent and adolescent stress on adolescent BMI. Thus, it was hypothesized that these negative parenting practices would interact with parent and adolescent stress to exacerbate adolescent BMI over 16 weeks under high, but not low, stress conditions. As expected, results indicated that parental pressure to eat exacerbated the relationship between parent perceived stress and

adolescent BMI, such that under high perceived stress, higher parental pressure to eat predicted higher adolescent BMI while lower parental pressure to eat predicted lower adolescent BMI. Additionally, it was found that parental monitoring moderated the relationship between adolescent perceived stress and adolescent BMI. The results of this study indicate the moderating effect of various parenting practices on the relationship between parent and adolescent chronic stress and adolescent BMI among African American families. The findings of this study can inform future family health promotion programs that incorporate parenting practices and stress management techniques to target health outcomes of ethnic minority populations in the United States.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

The percentage of adolescents affected by obesity in the United States has tripled in the past 40 years, with nearly 1 in 5 youth being obese (Fryar, Carroll, & Ogden, 2014; Hales, Carroll, Fryar, & Ogden, 2017; Ogden et al., 2016). This is a major public health concern as obesity experienced in adolescence often persists into adulthood, accompanied by detrimental physical, psychological, and social consequences (Gordon-Larsen, The, & Adair, 2010; Halfon, Larson, & Slusser, 2013; Juonala et al., 2011). Adolescence is a critical stage in the life course when risk for poor lifestyle habits may be established (Elder, 1998). During this time adolescents may exhibit more autonomy in their decisions regarding health-related behaviors while still being influenced by parenting style and parenting practices (Dietz & Gortmaker, 2001; Gordon-Larsen, Adair, Nelson, & Popkin, 2004; H. Lee, Harris, & Lee, 2013). Additionally, socioeconomic inequities in obesity tend to increase during adolescence and into young adulthood, influencing the risk of chronic disease among minority and low income populations (Harris, Gordon-Larsen, Chantala, & Udry, 2006; H. Lee et al., 2013).

African American adolescents experience a higher prevalence of obesity than non-minorities with approximately 40% being overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). Socially disadvantaged and/or minority populations may have a greater risk of living in an obesogenic environment (characterized by readily available, energy-dense food and environments that discourage physical activity), thus contributing to

differences in prevalence rates (Brogan et al., 2012; Casagrande, Whitt-Glover, Lancaster, Odoms-Young, & Gary, 2009; Lovasi, Hutson, Guerra, & Neckerman, 2009). Beyond this, understanding this health inequity is complex and many factors may be involved, notably chronic stress and various parenting practices may be associated with obesity health-related behaviors.

Chronic stress refers to stress that is abnormally persistent due to constant demands embedded in daily living environments (Baum, Garofalo, & Yali, 1999). Some researchers have classified chronic stress as a modifiable risk factor that may be moderated by racial inequities in weight related outcomes such as obesity (Richardson, Arsenault, Cates, & Muth, 2015; Tomiyama, Puterman, Epel, Rehkopf, & Laraia, 2012). Ethnic minority populations, including African American adolescents have been found to experience greater chronic stress due to perceived racial discrimination and/or marginalization (Chae, Lincoln, & Jackson, 2011; Dunkel Schetter et al., 2013; Ong, Fuller-Rowell, & Burrow, 2009). Notably, researchers have increasingly called for longitudinal analyses to understand the role of chronic stress in racial inequities in health (Tomiyama et al., 2012). In a recent longitudinal study, higher levels of stress predicted significantly greater body mass index (BMI) in adolescents, with the effect being stronger in African American girls (Tomiyama et al., 2012). This higher level of chronic stress may have implications for understanding racial health inequities related to weight status among African American adolescents (Dunkel Schetter et al., 2013; Tomiyama et al., 2012).

Chronic stress, among both parents and adolescents may be important to consider when assessing the factors that influence adolescent weight status (Parks, Kazak,

Kumanyika, Lewis, & Barg, 2016), especially among African American families, whose parents have reported higher stress levels on average compared to White parents (Berge et al., 2017; Hurley, Black, Papas, & Caufield, 2008). However, African American families have been underrepresented in longitudinal analyses investigating chronic stress and weight related outcomes. Previous research on the relationship between parent perceived stress and adolescent BMI has been mixed, with some studies finding a positive association between the two (Fahrenkamp & Sato, 2017; Isasi et al., 2017; Shankardass et al., 2013; Zeller et al., 2012), while others report no significant association (Guilfoyle, Zeller, & Modi, 2010; Walton, Simpson, Darlington, & Haines, 2014). Previous research has shown a positive association between adolescent perceived chronic stress and adolescent body mass index (BMI; De Vriendt, Moreno, & De Henauw, 2009; Nguyen-Rodriguez, Chou, Unger, & Spruijt-Metz, 2008). However African American populations have been underrepresented, with only one study including about 50% African American adolescents (Tomiyama et al., 2012) and one study including approximately 25% in their sample (van Jaarsveld, Fidler, Steptoe, Boniface, & Wardle, 2009).

While chronic stress may be influential to adolescent BMI, parenting factors are also important in understanding adolescent weight status (Haines et al., 2016). Past research has consistently found a relationship between parenting style and adolescent BMI (Fuemmeler et al., 2012; Sokol, Qin, & Poti, 2017) in primarily White samples. Parenting styles are characterized by the degree of responsiveness (warmth) and demandingness (control) that parents practice with their children. Four types of parenting style have been established: authoritative (high warmth, moderate control), authoritarian

(low warmth, high control), permissive (high warmth, low control), and neglectful (low warmth, low control; Baumrind, 1971). Previous evidence suggests that an authoritative parenting style is associated with healthier BMI in youth (Berge, Wall, Loth, & Neumark-Sztainer, 2010; Kim et al., 2008; Sleddens, Gerards, Thijs, De Vries, & Kremers, 2011), but few studies have investigated the potential moderating effects of parenting style on the relationship between perceived chronic stress and adolescent obesity. In addition, few studies have solely focused on African American youth (Loncar, Wilson, & Zarrett, 2019).

Related to parenting style, parent feeding practices are characterized by parental behaviors that affect adolescent eating habits and thus potentially weight related outcomes (Hubbs-Tait, Kennedy, Page, Topham, & Harrist, 2008). Commonly measured parent feeding practices include perceived responsibility for adolescent eating, concern about adolescent weight, restriction of adolescent access to food, pressuring adolescent to eat, and monitoring adolescent food intake (Birch et al., 2001). Research has demonstrated that parenting practices related to authoritative parenting, such as providing autonomy to adolescents for their health behaviors and creating a healthful home environment have been associated with healthier adolescent BMI (Holland et al., 2014; Shloim, Edelson, Martin, & Hetherington, 2015; Vollmer & Mobley, 2013). Additionally, parenting practices related to nurturance and monitoring have been associated with healthier adolescent BMI while parent feeding practices related to control (i.e. concern about child weight and restriction) have been associated with higher adolescent BMI (Loncar et al., 2019). Given the strong impact that parenting style and parenting practices can have on adolescent weight-status (Schofield, Conger, Gonzales,

& Merrick, 2016), the current study set out to examine the degree to which these positive parenting practices can buffer the negative effects of chronic stress (De Vriendt et al., 2009; Tajik, Zulkefli, Baharom, Minhat, & Latiff, 2014).

Chronic stress has the potential to negatively affect parenting practices, leading to deleterious adolescent health outcomes (Guajardo, Snyder, & Petersen, 2009; Tate, Wood, Liao, & Dunton, 2015). In particular, parenting style has been found to be related to parent perceived stress, such that lower perceived parent stress has been associated with higher authoritative parenting and higher perceived parent stress has been associated with higher levels of the other three parenting styles: authoritarian, permissive, and neglectful (Heerman, Lounds-Taylor, Mitchell, & Barkin, 2018; Hughes, Power, Liu, Sharp, & Nicklas, 2015; Tovar et al., 2012). Some studies have found associations between parent feeding practices and parent stress, but the findings are mixed and most of the research has been focused on young children and infants (Berge et al., 2017; El-Behadli, Sharp, Hughes, Obasi, & Nicklas, 2015; Hurley et al., 2008; Mitchell, Brennan, Hayes, & Miles, 2009).

Previous research has demonstrated that perceived chronic stress, parenting style, and parent feeding practices are related to adolescent BMI. However, research investigating the moderating effects of parenting practices on parent and adolescent stress is limited, with few studies specifically focusing on African American families. The proposed study aims to expand on past research in a number of ways, primarily by investigating the relationship between parenting factors, parent and adolescent perceived stress, and adolescent BMI among African American adolescents using a longitudinal study design. In addition, the current study will test the hypothesis that positive parenting

practices (authoritative parenting, parental responsibility, and monitoring) will buffer the negative effects of parent and adolescent perceived stress on adolescent BMI under high, but not low, stress conditions. Other parenting practices associated with control (concern for child's weight, restriction and pressure to eat) may exacerbate the effects of parent and adolescent stress on adolescent BMI. Thus, it is hypothesized that these negative parenting practices will worsen the effects of parent and adolescent stress on adolescent BMI under high, but not low, stress conditions.

1.1 Theoretical Background

Stress, Coping and Health Inequities. For the purposes of this study, the term "stress" is described as a negative, adverse, or overwhelming experience (Glanz & Schwartz, 2008). Chronic stress refers to ongoing demands that come from various life difficulties that threaten to exceed the resources that an individual perceives to possess (Dunkel Schetter et al., 2013; Gottlieb, 1997). These demands often co-occur and accumulate, coming from myriad of life areas including work, health, parenting, family, finances, housing, and marriage (Dunkel Schetter & Dolbier, 2011). A key element of chronic stress is the individual's perspective and evaluation of potential harm (Cohen, Kessler, & Gordon, 1997; Lazarus & Folkman, 1984). According to Lazarus and Folkman (1984), stress is present when a person experiences a stressor that either matches or exceeds their ability to manage that situation. When a situation/stressor is beyond the perceived coping level, the individual experiences negative emotion that could lead to unhealthy behavior, such as poor diet quality, physical inactivity, and prolonged screen time (Hruby et al., 2016; Lazarus & Folkman, 1984).

It is important to note that perceived chronic stress is circumstantial and contextual, making it variable between individuals, and even across ethnic groups (Kumanyika, 2008). African Americans have been shown to exhibit higher levels of perceived chronic stress than Whites (Chae et al., 2011; Kim, Bursac, DiLillo, White, & West, 2009), stemming from racial discrimination and prolonged marginalization (Dunkel Schetter et al., 2013; Ong et al., 2009). Related to chronic stress in minority populations, Geronimus has proposed a "weathering" hypothesis that relates stress to health outcomes (Geronimus, 1992). This theory purports that due to socioeconomic adversity, marginalization, chronic stress and stigma, African American individuals develop negative health outcomes beginning in young adulthood (Geronimus, 2001; Geronimus & Thompson, 2004). Although this theory is mostly applied to females, Geronimus and colleagues have found that when compared to White adults, African American adults have an increased allostatic load, which refers to the physical wear and tear on the body associated with repeated and prolonged activation of stress systems in the body like the sympathetic nervous system (Baum et al., 1999; Geronimus, Hicken, Keene, & Bound, 2006). In order to understand health inequities among African Americans adolescents is seems crucial to consider the role of perceived chronic stress.

Within the context of stress and coping frameworks perceived stress has also been studied from a stress-buffering hypothesis perspective. The stress-buffering hypothesis purports that the presence of social support and resources helps to buffer, or shield, an individual from the negative effects of stress, but only under high stress conditions (Cohen & Wills, 1985). Furthermore, the buffering hypothesis holds that those with little or no social support will have harmful effects on their health caused by health-related

stressors, while these effects will be reduced for those with more social support (Baek, Tanenbaum, & Gonzalez, 2014; Cohen & McKay, 1984) This theory has been tested in various populations and with many different health outcomes, including diabetes, high blood pressure, and weight gain (Baek et al., 2014; Bowen et al., 2014; Darling, Fahrenkamp, Wilson, Karazsia, & Sato, 2016). One cross-sectional study of young college students found that among males, higher levels of social support significantly decreased the strength of the relationship between stress eating and change in BMI, indicating that social support may serve as a buffer to overeating (Darling et al., 2016). Given that parents can be a primary form of social support among African American adolescents (McMahon, Felix, & Nagarajan, 2011), their influence may act as a buffer against the negative effects of stress under high stress conditions. The current study will utilize the stress-buffering hypothesis to test the moderating effects of positive parenting practices on perceived chronic stress when predicting adolescent BMI over time.

Family Systems Theory. Incorporating family-based approaches into adolescent obesity treatment has become increasingly common as the family system may have substantial influence on health behaviors among adolescents (Kaplan, Arnold, Irby, Boles, & Skelton, 2014; Kitzman-Ulrich et al., 2010; Wilson et al., 2015; Wilson, Sweeney, Kitzman-Ulrich, Gause, & St. George, 2017). Family systems theory (FST) purports that instead of focusing on the individual in isolation, the family context should be considered when trying to understand and explain individual behavior (Broderick, 1993). Furthermore, FST proposes that a change in behavior of one member of the family will affect the behavior of the other members, as the family acts as an interrelated system (Bowen, 1978). FST additionally argues that family functioning is determined by the

types of interactions among the members of the family (Broderick, 1993). In particular, characteristics of authoritative parenting style, such as nurturing and supportive parent-adolescent interactions have been associated with many desirable youth health outcomes, including healthy weight status (Biglan, Flay, Embry, & Sandler, 2012; Kitzman-Ulrich et al., 2010; Parletta, Peters, Owen, Tsiros, & Brennan, 2012; Wilson et al., 2017).

African American families face many barriers for engaging adolescents in behaviors that will reduce obesity, such as healthy eating and physical activity (Jones et al., 2014). Chronic stress may act as a substantial barrier to engagement in health promoting behaviors among African American individuals, thus contributing to the racial health inequities observed (Jackson, Knight, & Rafferty, 2010). For example, higher perceived stress among adolescents has been associated with lower fruit and vegetable intake, more snacking, higher waist circumference, and higher BMI (Cartwright et al., 2003; van Jaarsveld et al., 2009). Family-based treatment programs designed to effect adolescent weight-status have found success in training parents to develop authoritative parenting skills and other positive parenting techniques (Kitzman-Ulrich et al., 2010; Law, Wilson, St. George, Kitzman-Ulrich, & Kipp, 2019; Wilson et al., 2015). However, few programs designed to incorporate parent training have taken into account the role of chronic stress. Using FST as an integrated model with the stress-buffering framework, this study will test for interactions between chronic stress and parenting factors that may account for BMI in adolescents using a longitudinal study design (McCurdy, Gorman, & Metallinos-Katsaras, 2010). This knowledge may be helpful for the development of future family-based prevention and intervention efforts designed to reduce adolescent BMI among African American families.

1.2 Stress, Parenting and Obesity

Perceived Stress and Adolescent Obesity. Researchers have increasingly been interested in investigating the relationship between perceived chronic stress and obesity (Tomiyama, 2019). While some studies have found a relationship between perceived chronic stress and adolescent BMI, the findings have been mixed and a majority of the studies do not investigate this relationship among African American families. It is important to investigate the potential role of stress among these families as it may impact health outcomes and influence racial health inequities (Dunkel Schetter et al., 2013).

A handful of studies have investigated the relationship between maternal perceived stress during infancy and obesity in young children. One longitudinal analysis of German mothers of newborn infants found that postnatal maternal perceived stress during the first year after birth had a positive relationship with children's BMI z-scores up to the age of five years (Leppert et al., 2018). In a cross-sectional study of low-income Hispanic mothers, higher perceived stress was significantly associated with greater infant overweight risk (Watt, Appel, Roberts, Flores, & Morris, 2013). While parent stress during infancy may be associated with subsequent obesity in children, one meta-analysis that reviewed studies from 5 different countries found that the risk of obesity was higher for children whose mothers experienced higher stress between toddlerhood and adolescence (Tate et al., 2015).

Previous findings suggest that there is a positive relationship between parental report of perceived stress and adolescent obesity (Wilson & Sato, 2014; Zeller et al., 2012). One longitudinal study with a primarily Hispanic sample (2.7% African American), found that after controlling for age and sex of participants, perceived stress in

parents at baseline was associated with an increase in predicted child BMI attained by age 10 as well as child BMI trajectory over a 4-year period (Shankardass et al., 2013). However, only about 3% of the sample included African American youth. In a sample of Latino families, Isasi and colleagues (2017) found that the prevalence of obesity in youth increased with the number of caregiver stressors. They also found that adolescents whose caregivers reported three or more stressors were more likely to be obese than adolescents whose caregivers reported no stressors, independent of food home environment, child diet quality, and child physical activity (Isasi et al., 2017). In a study of primarily African American adolescents, the number of parent stressors was directly related to youth obesity and parent-perceived stress was directly related to youth fast food consumption, which has been associated with obesity risk (Davis & Carpenter, 2009; Parks et al., 2012).

Some studies, however, have not found a relationship between parent perceived stress and youth BMI. One study found that the level of parenting stress was not associated with children's risk of being overweight or obese, but this study only included children between the ages of two and five and only about 20% were African American (Walton et al., 2014). Additionally, in a cross-sectional study that included approximately 50% African American adolescents, parenting stress was not significantly associated with youth BMI (Guilfoyle et al., 2010).

Along with parent perceived stress, the stress of the adolescent may be an important factor to investigate when attempting to understand the mechanisms of adolescent obesity. Lohman and colleagues (2009), in their cross-sectional study which included about 40% African American adolescents (10-13 years old), found that

increased levels of adolescent stress, but not maternal or family stress, was associated with a greater likelihood of being overweight or obese (Lohman, Stewart, Gundersen, Garasky, & Eisenmann, 2009). This relationship has also been investigated longitudinally. Van Jaarsveld and colleagues measured BMI, waist circumference, and perceived stress for 5 consecutive years in an adolescent sample (ages 11-16) from the United Kingdom, with approximately 25% Black individuals (van Jaarsveld et al., 2009). Although they did not find evidence that higher perceived stress was associated with greater weight gain over the 5 years, they reported that BMI and waist measurements were significantly higher among adolescents that reported moderate to high stress compared to those that reported lower stress over the 5-year period.

In a national longitudinal study that included African American (~50%) and White (~50%) female adolescents (ages 10-19), it was found that higher levels of perceived stress during the 10 years predicted significantly greater increases in BMI over time compared to lower levels of stress (Tomiyama et al., 2012). Additionally, this relationship was significantly stronger for African American compared to White adolescents. This study gives evidence that perceived stress has a role in early racial health inequities related to weight status. Furthermore, these findings highlight the need for further longitudinal analysis of the stress-obesity link in African American samples exclusively.

Parenting Style, Stress, and Adolescent Obesity. The current study proposes to examine a moderating relationship between parent and adolescent stress and parenting style on adolescent BMI. However, little research has examined the moderating effects of parenting style and perceived stress on adolescent obesity in African American families.

Past research has consistently supported a main effect relationship between parenting style and child BMI. However, much of the prior research investigating this relationship has largely focused on younger samples of children (Loncar et al., 2019). In a number of studies, authoritative parenting (high warm, moderate control) has been associated with lower adolescent BMI (Berge et al., 2010; Kim et al., 2008; Sleddens et al., 2011). One review found that children (2-17 years old) with authoritative parents were more likely to eat nutritiously, engage in physical activity more often, and have healthier BMIs when compared to children with non-authoritative parents (Sleddens et al., 2011). In a cross-sectional study of primarily White 13-15 year old youth, investigators found that maternal authoritative parenting was a significant predictor of healthier adolescent BMI (Kim et al., 2008). Among one of the few longitudinal studies, Berge and colleagues (2010) found that maternal authoritative parenting style was predictive of a lower adolescent BMI after a 5-year follow up of a sample consisting of about 18% African Americans. Not only do these studies rarely include African American adolescents in their analyses, they do not test the possible interaction between authoritative parenting and chronic stress when predicting adolescent BMI and few longitudinal studies exist.

Some research has supported a main effect relationship between parenting style and parent stress. However the findings have been mixed and have not adequately represented African American adolescents and their families. In a cross-sectional study of Latino parent-toddler dyads, higher parent perceived stress was associated with a lower authoritative parenting style (Heerman et al., 2018). One study of a diverse, minority sample found that mothers with higher stress scores were more likely to express high demanding/low responsive (Authoritarian) parenting style (Tovar et al., 2012).

While the studies reviewed above highlight a connection between authoritative parenting style, stress, and youth BMI, they do not evaluate these relationships longitudinally and do not focus on the possible buffering effect of authoritative parenting. Thus, the current study hypothesizes that authoritative parenting (Gray & Steinberg, 1999) will buffer the effects of parent and adolescent perceived stress on adolescent BMI, as the nurturing parental support may reduce the overburden of the perceived stressors. As African American adolescents are at high risk for deleterious health outcomes, knowledge about this relationship has the potential to inform family-based prevention and intervention for adolescent obesity.

Parent Feeding Practices, Stress, and Adolescent Obesity. The most commonly studied parent feeding behaviors include responsibility for adolescent eating, concern about adolescent weight, restriction of adolescent access to food, pressuring adolescent to eat, and monitoring adolescent food intake (Child Feeding Questionairre [CFQ]; Birch et al., 2001). For the purposes of this study, parent feeding practices are separated into two domains: feeding practices that are related to nurturance (responsibility and monitoring) and feeding practices that are related to control (concern for adolescent weight, pressure to eat, and restriction of unhealthy foods; Loncar et al., 2019).

Many studies have found associations between parent feeding practices and adolescent weight-status (Holland et al., 2014; Shloim et al., 2015; Vollmer & Mobley, 2013). However, few studies have investigated the relationship between parent feeding practices and parent stress, with few focusing on African American adolescents (El-Behadli et al., 2015; Hurley et al., 2008; Mitchell et al., 2009). In addition, to the best of

our knowledge, no study has evaluated the potential moderating effects of parent feeding practices on stress and adolescent BMI longitudinally.

The first of the two feeding practices related to nurturance, perceived responsibility, encompasses the parents' perception of their responsibility to feed their child, such as providing nutritious foods and portioning out food at home (Birch et al., 2001; Kaur et al., 2006). Parent responsibility is related to authoritative parenting as it can be classified as a nurturing parenting practice. Only a handful of studies have investigated the relationship between adolescent BMI and parent responsibility. In one cross-sectional study that included about 55% African American families, Kaur and colleagues did not find a significant relationship between parent responsibility and adolescent BMI (Kaur et al., 2006). One randomized-controlled trial, which included about 17% African Americans in the sample, found that increases in parental perceived responsibility were associated with decreases in adolescent BMI (Holland et al., 2014). Based on this last finding, it is reasonable to investigate the interaction between perceived stress and parental responsibility, as responsibility may buffer the effects of perceived stress on adolescent BMI.

Monitoring is a parental feeding behavior that encompasses the oversight a parent exhibits over their youth's eating (Birch et al., 2001). This could take the form of tracking adolescents' consumption of unhealthy foods or having some control over the home food environment (Kaur et al., 2006). Two studies have found that greater parental monitoring was related to higher adolescent weight (Schmidt et al., 2017; Towner, Reiter-Purtil, Boles, & Zeller, 2015). However, many studies that have included African American adolescents found no association between parental monitoring and adolescent BMI

(Burton, Wilder, Beech, & Bruce, 2017; Hennessy, Hughes, Goldberg, Hyatt, & Economos, 2010; Kaur et al., 2006). The literature on parental monitoring has often classified it as a controlling feeding practice (Towner et al., 2015). However, it has been reported in overweight African American adolescents that parental monitoring was significantly associated with higher adolescent self-efficacy for eating a healthy diet, making it a potentially beneficial for adolescent BMI (Loncar et al., 2019). Findings about the association between parental monitoring and adolescent BMI have been mixed, possibly because they did not consider the interaction between monitoring and perceived stress when predicting adolescent BMI, which may be crucial among families under high stress conditions.

Parent feeding practices that are commonly associated with control include concern for adolescent weight, pressure to eat, and restriction of unhealthy foods among youth. These parenting practices may be associated with higher levels of perceived stress and with higher adolescent BMI. For example, parental concern relates to the level to which a parent is concerned about their child becoming overweight or losing control of their eating (Birch et al., 2001; Kaur et al., 2006). Among African American families, it has been found that greater parental concern was related to higher adolescent BMI (Burton et al., 2017; Loncar et al., 2019). Additionally, one study found that less parental concern for adolescent weight and eating behaviors was associated with healthier adolescent weight (Holland et al., 2014). Because some research has found that parental concern for adolescent weight to be associated with higher adolescent BMI, this parent feeding practice may exacerbate the relationship between perceived stress and adolescent BMI.

Restriction is a parent feeding behavior that relates to the extent a parent restricts their youth's consumption of and access to certain foods (Birch et al., 2001). Some research has found that lower parental restriction is related to lower adolescent BMI. For example, a recent randomized controlled trial found that lower parental restriction in adolescents' diets was associated with lower BMI in a sample of overweight and obese adolescents (Holland et al., 2014). However, recent research suggests that greater parental restriction is related to greater adolescent BMI (Burton et al., 2017; Towner et al., 2015). Regarding the relationship between parental restriction and parent stress, a few studies have found significant associations. In one study of mothers of infants, parent stress was positively associated with restrictive feeding (Hurley et al., 2008), however interaction effects of stress and restrictive feeding on infant weight status were not assessed. Additionally, in a sample of about 120 mothers with children (5-7 years old), restrictive feeding practices were positively associated with maternal perceived stress (Mitchell et al., 2009). However, this study did not investigate youth BMI as an outcome and the sample did not include African American adolescents. Because restrictive feeding has been found to be associated with higher adolescent BMI in African Americans, it is predicted that an interaction between restriction and perceived stress will negatively impact adolescent BMI.

Pressure to eat is a parent feeding practice that encompasses a parents' tendency to pressure their child to eat more food, typically during mealtimes (Birch et al., 2001). Investigation about the relationship between parental pressure to eat and adolescent BMI has been mixed. A few studies involving African American youth have found that higher parental pressure to eat was related to lower adolescent BMI (Burton et al., 2017;

Hennessy et al., 2010). However, the majority of recent studies have found parental pressure to eat at mealtimes was not significantly associated with adolescent BMI (Holland et al., 2014; Kaur et al., 2006; Loth, Maclehose, Fulkeson, Crow, & Sztainer, 2013; Towner et al., 2015). Some investigation has been conducted regarding the association of pressure to eat and parent stress. Berge and colleagues (2017) found that greater parent stress earlier in the day was associated with 45% greater odds of parents engaging in pressure to eat feeding practices at dinner the same night. However, this study had a small percentage of African American families and did not investigate the interaction between pressure to eat and perceived stress on adolescent BMI outcomes (Berge et al., 2017). In another sample of children (5-7 years old), pressure to eat was found to be positively correlated with maternal stress, such that mothers who exhibited more pressure to eat at mealtimes tended to report higher perceived stress (Mitchell et al., 2009). Again, this study did not investigate youth BMI as an outcome and the sample did not include African American adolescents.

In summary, the current study will examine whether parent feeding practices related to nurturance (responsibility and monitoring) will buffer the effects of parent and adolescent perceived stress on adolescent BMI over time. In addition, the interaction relationship between parent feeding practices commonly related to control (concern for adolescent weight, pressure to eat, and restriction of unhealthy foods) and perceived stress will be examined on adolescent BMI over time.

1.3 Study Purposes and Hypotheses

As African American adolescents are at high risk for deleterious health outcomes, knowledge about how parenting style and parent feeding practices interact with perceived

stress has the potential to inform family-based prevention and intervention efforts that are tailored at reducing adolescent BMI among African American families. Perceived stress appears to be an important factor to consider as it has been theorized to influence adolescent BMI, but little investigation has been conducted to investigate whether positive parenting moderates the effects of stress on adolescent BMI among African American families.

The current study expands the current literature by investigating the relationship between parenting style and parent feeding practices, perceived chronic stress and adolescent BMI among African American adolescents longitudinally. Due to the differing perspectives of chronic stress between adolescent and parent, the current study will assess both types of stress and the moderating effects of parenting factors on adolescent BMI. Specifically, this study aims to better understand the longitudinal relationships between parent and adolescent stress and adolescent BMI from baseline to 16 weeks.

Aim 1a. This study will test the moderating effects of authoritative parenting and *parent perceived stress* on adolescent zBMI. It is hypothesized that:

1. Authoritative parenting will buffer the effects of parent perceived stress when predicting adolescent zBMI over time, such that under high perceived stress conditions (but not low), high levels of authoritative parenting will be associated with lower zBMI at 16 weeks in adolescents when compared to low authoritative parenting (see Figure 2.1 & 2.2).

Aim 1b. The present study will test how parent feeding practices may buffer or exacerbate the effects of *parent perceived stress* on adolescent BMI in African American families. It is hypothesized that:

2. Parent feeding practices commonly related to nurturance (responsibility and monitoring) will buffer the effects of parent perceived stress when predicting adolescent zBMI over time, such that under high perceived stress (but not low), higher levels of nurturing parent feeding practices will be associated with lower zBMI at 16 weeks in adolescents when compared to low nurturing parent feeding practices (see Figure 2.3 & 2.4).
3. Parent feeding practices commonly related to control (concern for adolescent weight, pressure to eat, and restriction of unhealthy foods) will interact with high parent perceived stress when predicting adolescent zBMI over time, such that under high perceived stress (but not low), higher levels of controlling parent feeding practices will be associated with higher zBMI at 16 weeks in adolescents when compared to low controlling parent feeding practices (see Figure 2.5 & 2.6).

Aim 2a. This study will test the moderating effects of authoritative parenting and *adolescent perceived stress* on adolescent zBMI. It is hypothesized that:

4. Authoritative parenting will buffer the effects of adolescent perceived stress when predicting adolescent zBMI over time, such that under high adolescent perceived stress (but not low), high levels of authoritative parenting will be associated with lower adolescent zBMI at 16 weeks when compared to low authoritative parenting (see Figure 2.7 & 2.8).

Aim 2b. The present study will also assess how parent feeding practices may buffer or exacerbate the effects of *adolescent perceived stress* on adolescent BMI in African American families. It is hypothesized that:

5. Parent feeding practices commonly related to nurturance (responsibility and monitoring) will buffer the effects of adolescent perceived stress when predicting adolescent zBMI over time, such that under high perceived stress (but not low), higher levels of nurturing parent feeding practices will be associated with lower zBMI at 16 weeks in adolescents when compared to low nurturing parent feeding practices (see Figure 2.9 & 2.10).
6. Parent feeding practices commonly related to control (concern for adolescent weight, pressure to eat, and restriction of unhealthy foods) will interact with high adolescent perceived stress when predicting adolescent zBMI over time, such that under high perceived stress (but not low), higher levels of controlling parent feeding practices will be associated with higher zBMI at 16 weeks in adolescents when compared to low nurturing parent feeding practices (see Figure 2.11 & 2.12).

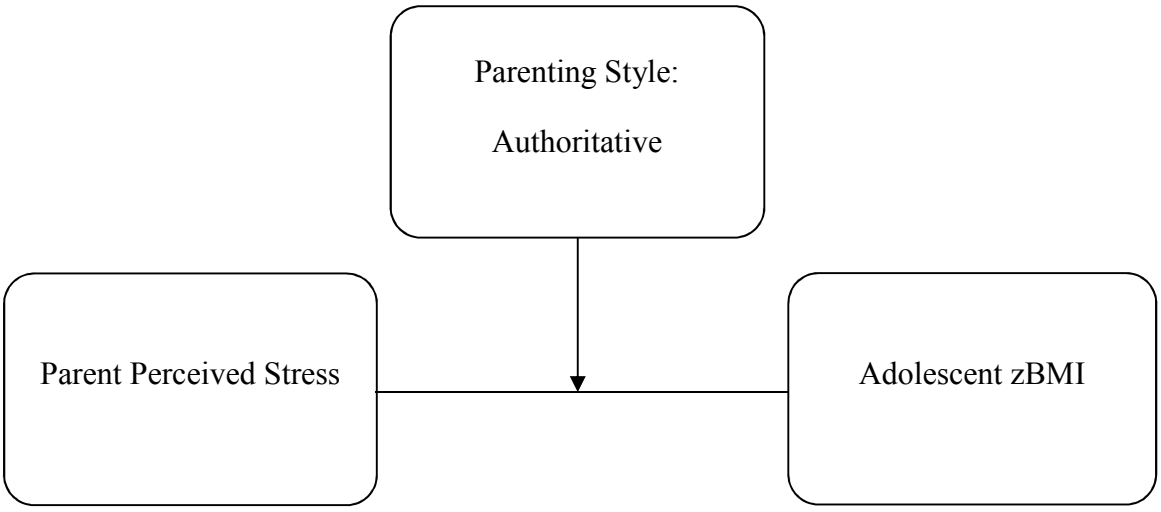

Figure 2.1. Conceptual diagram for moderating relationship between authoritative parenting and parent perceived stress on adolescent zBMI.

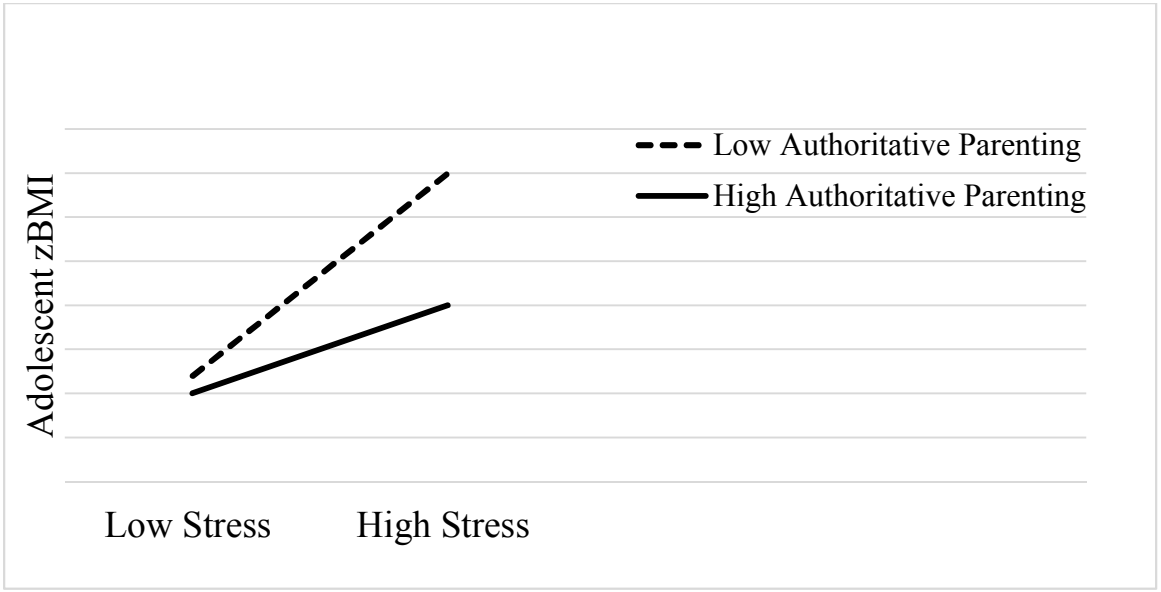

Figure 2.2. Hypothesized interaction between authoritative parenting and parent perceived stress on adolescent zBMI.

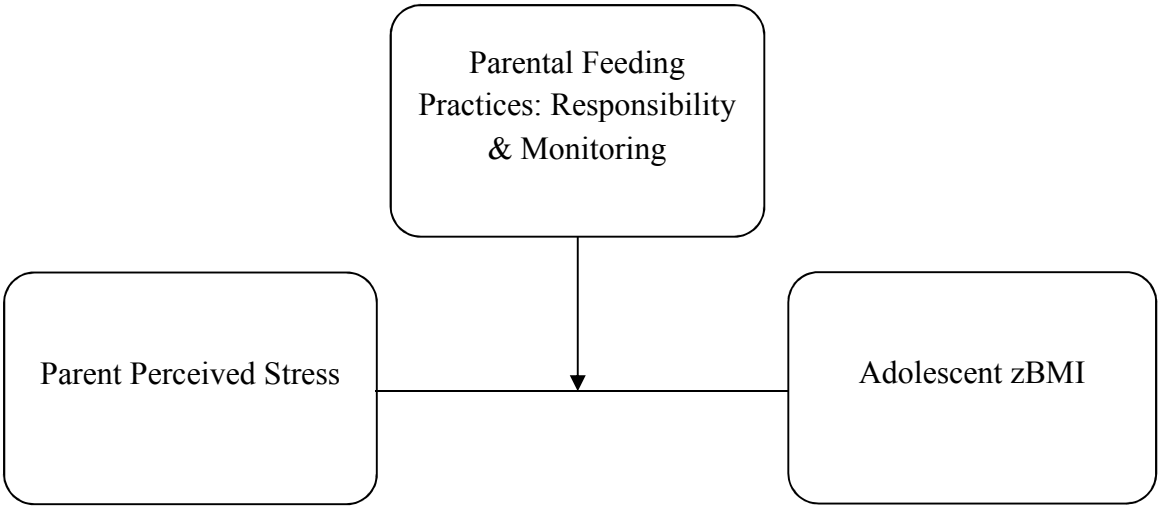

Figure 2.3. Conceptual diagram for moderating effects of nurturing parental feeding practices and parent perceived stress on adolescent zBMI.

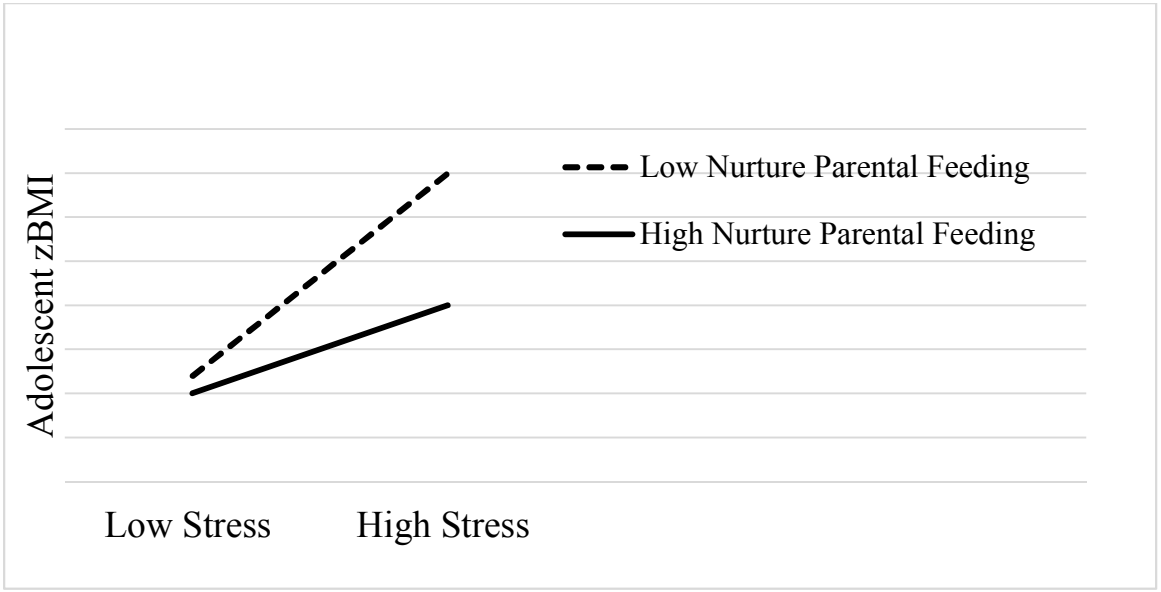

Figure 2.4. Hypothesized interaction between nurturing parental feeding practices and parent perceived stress on adolescent zBMI.

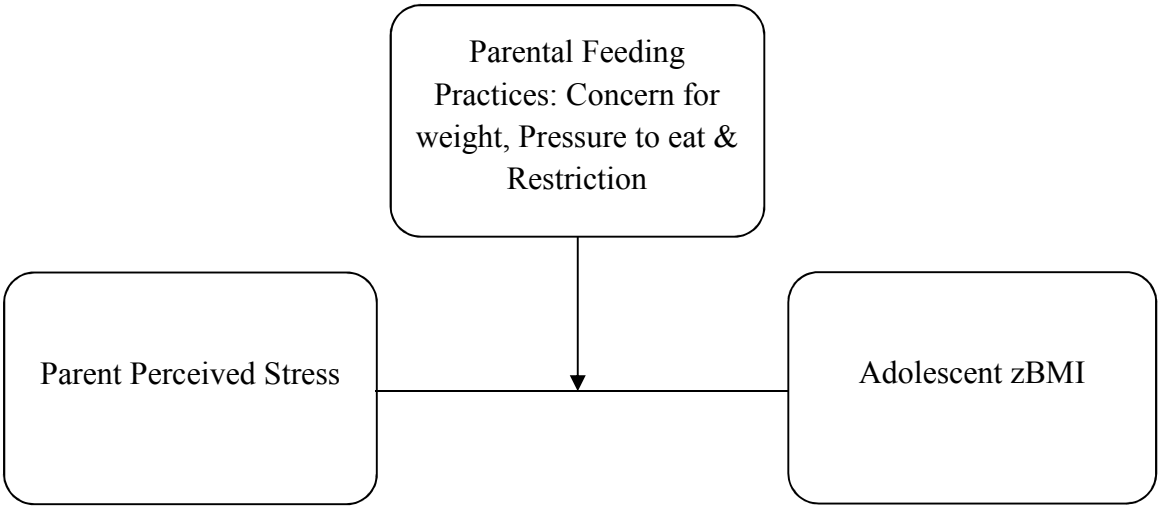

Figure 2.5. Conceptual diagram for moderating effects of controlling parental feeding practices and parent perceived stress on adolescent zBMI.

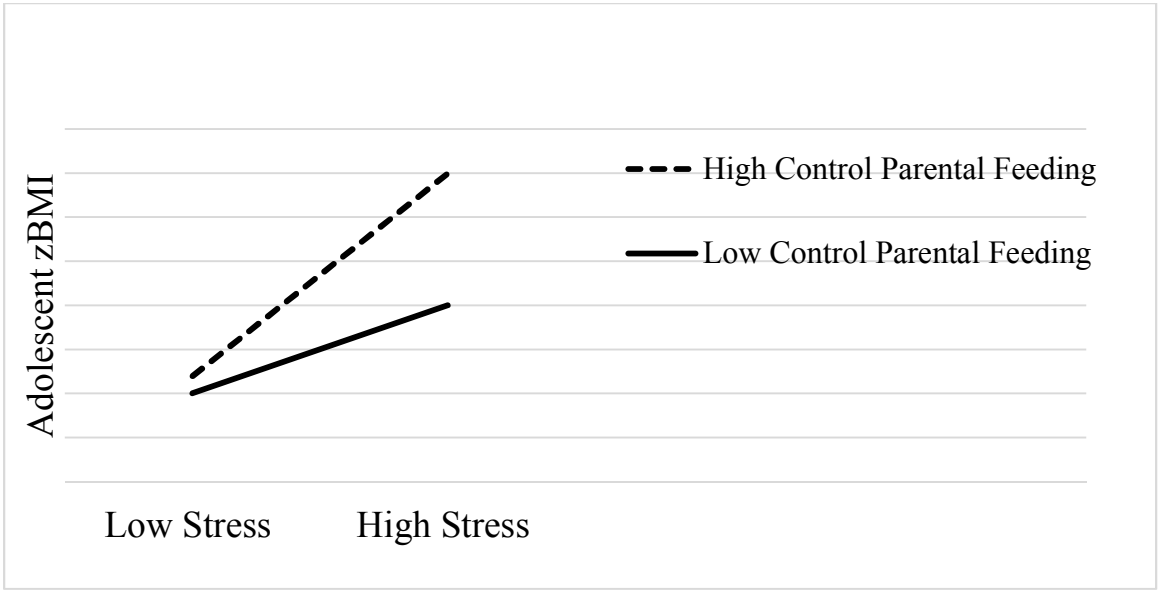

Figure 2.6. Hypothesized interaction between controlling parent feeding practices and parent perceived stress on adolescent zBMI.

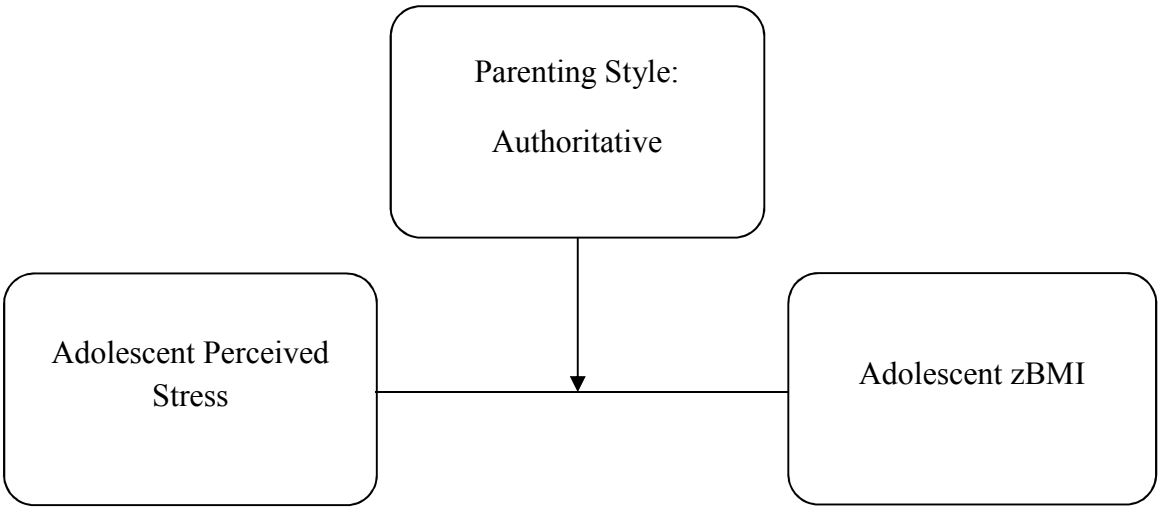

Figure 2.7. Conceptual diagram for moderating relationship between authoritative parenting and adolescent perceived stress on adolescent zBMI.

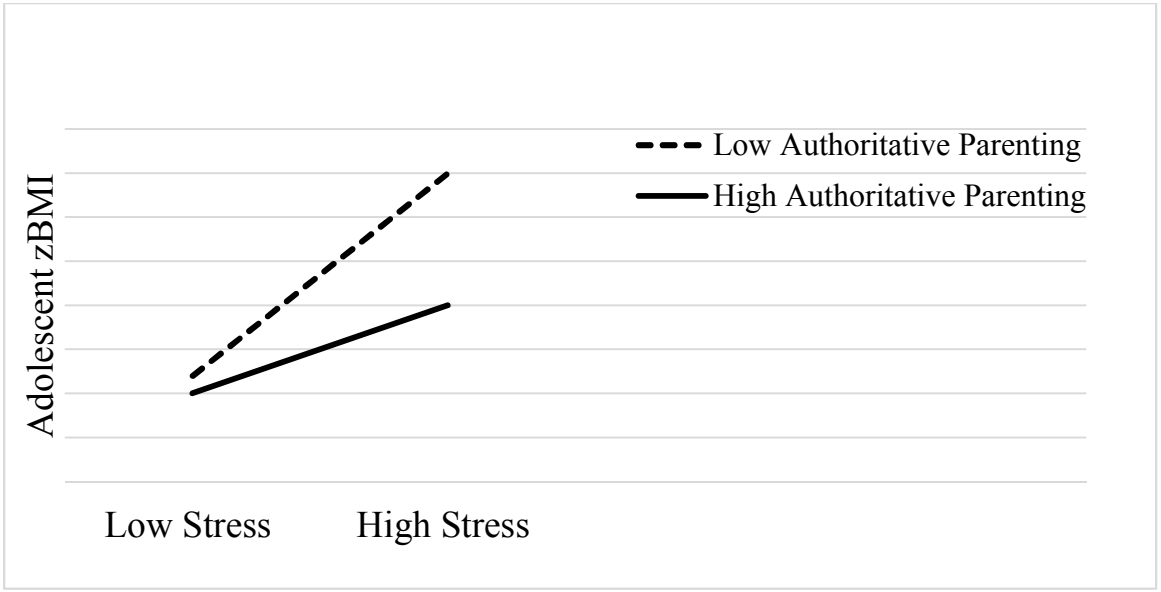

Figure 2.8. Hypothesized interaction between authoritative parenting and adolescent perceived stress on adolescent zBMI.

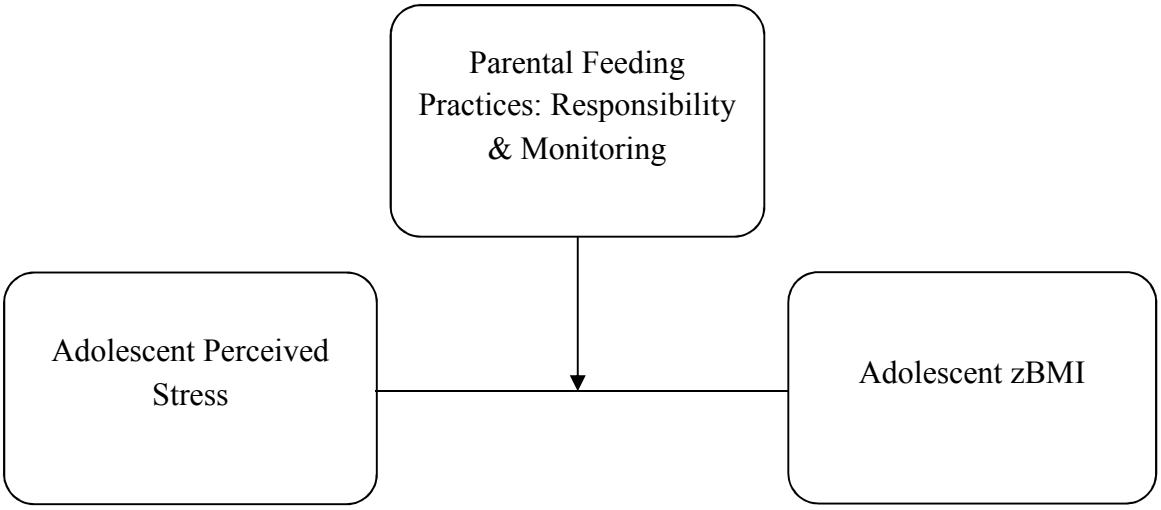

Figure 2.9. Conceptual diagram for moderating effects of nurturing parental feeding practices and adolescent perceived stress on adolescent zBMI.

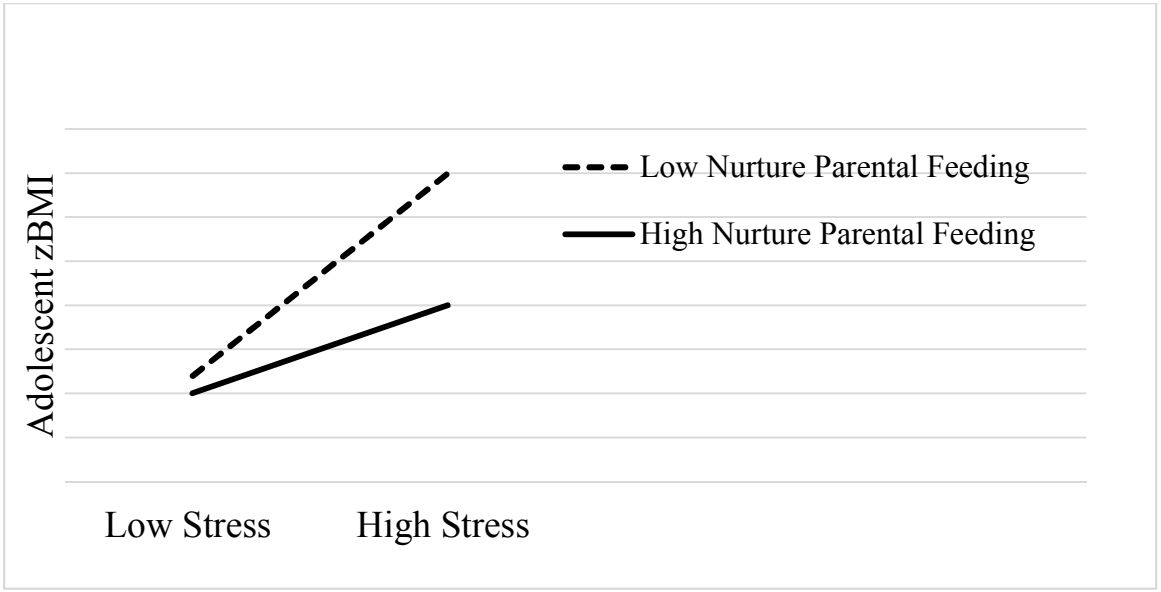

Figure 2.10. Hypothesized interaction between nurturing parental feeding practices and adolescent perceived stress on adolescent zBMI.

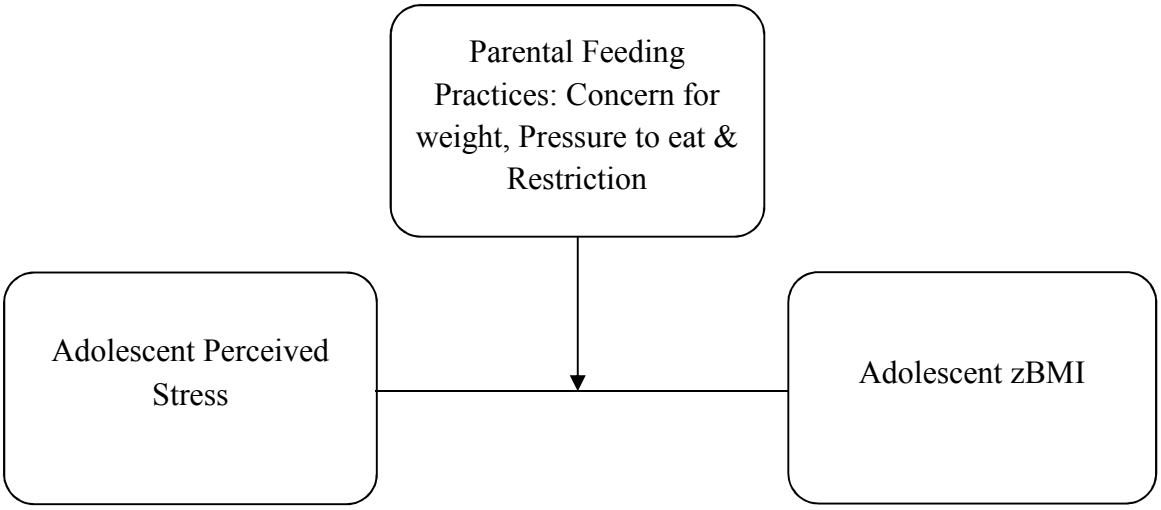

Figure 2.11. Conceptual diagram for moderating effects of controlling parental feeding practices and adolescent perceived stress on adolescent zBMI.

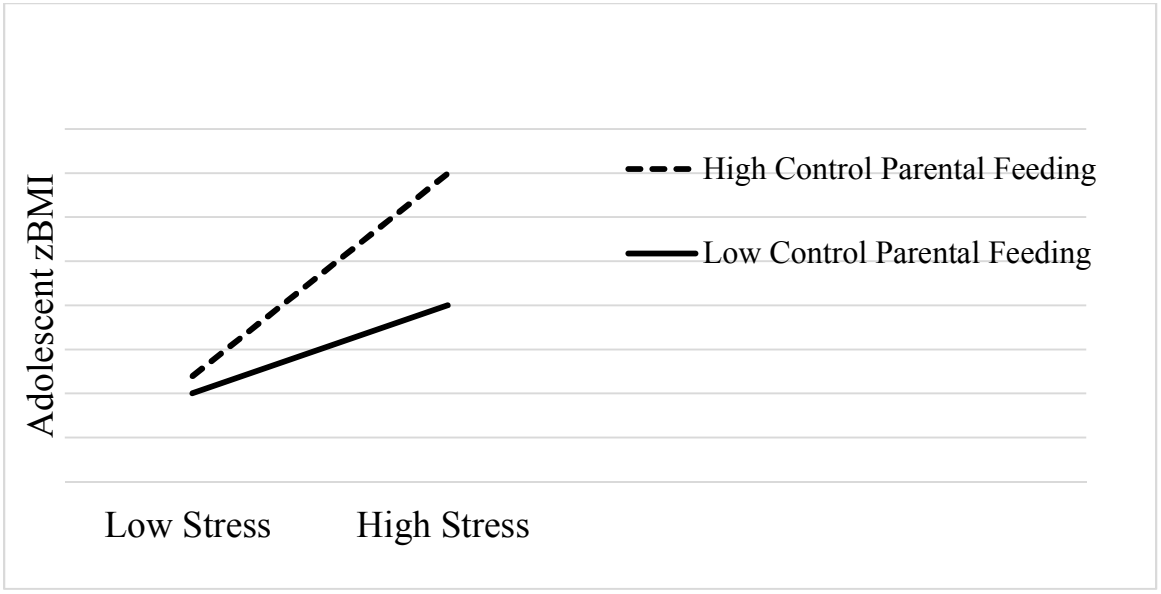

Figure 2.12. Hypothesized interaction between controlling parent feeding practices and adolescent perceived stress on adolescent zBMI.

CHAPTER 2

METHODS

2.1 Participants

Data were collected from 140 African American parent-adolescent dyads that were enrolled in the Families Improving Together (FIT) for Weight Loss randomized controlled trial (Wilson et al., 2015). Participants were recruited through culturally-relevant local events, festivals, advertisements or through collaboration with local pediatric clinics and parks and recreation partners. Eligible families met the following criteria: 1) have an African American adolescent between 11-16 years of age, 2) participating adolescent was overweight or obese, as defined by having a BMI $\geq 85^{th}$ percentile for their age and sex, 3) have an in-home caregiver willing to participate with the adolescent, and 4) have internet access. Adolescents with medical or psychiatric conditions that would affect their diet or ability to exercise were excluded from the study. Caregivers and/or adolescents that were currently enrolled in another weight loss or health program were also excluded. All participants signed a University of South Carolina IRB approved informed consent prior to participation. Families were given compensation for their participation by way of incentives paid at measurement visits.

2.2 Study Design

Project FIT evaluates the efficacy of a group-randomized trial comparing a motivational plus family-based weight loss (M+FWL) intervention to a basic health (BH) education program on reducing z-BMI and improving diet and physical activity in

overweight African American adolescents. Phase 1 of the trial tests the efficacy of an 8-week face-to-face group randomized trial on reducing z-BMI and improving diet and physical activity in overweight African American adolescents. In phase II of the trial participants were re-randomized to either an 8-week tailored on-line intervention or a control on-line program resulting in a 2 (M+FWL vs. BH group) x 2 (intervention vs. control on-line program) factorial design; which allows for testing of the added effects of the on-line intervention on maintenance of weight loss at a 6-month follow-up.

The current study is longitudinal, controlling for treatment groups using baseline psychosocial surveys and adolescent BMI measurements gathered at two separate time points during the intervention (baseline) and post online sessions (16 weeks). Full methods and procedures for Project FIT are explained in separate literature (Wilson et al., 2015).

2.3 Procedures

At the beginning of the program, FIT families attended two orientation sessions. During this time, the parent-adolescent dyads completed anthropometric measurements (height and weight) and psychosocial surveys. Weight and height measures were obtained using a Seca 880 digital scale and a Shorr height board, respectively. Adolescent BMI was calculated using these measures with Center for Disease Control (CDC) growth charts, then standardized to BMI z-scores (zBMI) using the statistical analysis system (SAS) program. Adolescent-report of perceived parenting style and parent feeding styles were assessed with psychosocial survey measures at baseline. Parent perceived stress and adolescent perceived stress were assessed with psychosocial surveys as part of a

subsequent study offered to FIT participants who participated in the intervention. Participants were paid $60 ($20 at baseline, $40 at 16-weeks) for their time.

2.4 Measures

Demographic and Covariate Information. Treatment condition was dummy coded and controlled for as a covariate in all models. Age was calculated at the time of baseline measurement using the birth date of the child and the date of the measurement appointment. Sex was measured using parent-report data at time of consent. Marital status was also measured using parent-reported data at time of consent. Parent education will be used an indicator of socioeconomic status and will be measured using a parent-self report item. Responses include 'never attended school, 'grades 1-8 (elementary),' 'grades 9-11,' 'grades 12 or GED (high school graduate,' 'college 1 year to 3 years (some college or technical school),' 'college 4 years or more (college graduate), and 'graduate training or professional degree.'

Parenting Measures.

Parenting style. Parenting style was measured using six items from an adolescent self-report measure, the Authoritative Parenting Index (API; Jackson, Henriksen, & Foshee, 1998). Based on Baumrind's parenting styles, the API consists of two subscales of responsiveness and demandingness (Baumrind, 1971). Responses are reported using a 5-point Likert scale ranging from "not at all like them" to "exactly like them." Sample items include "My parents make me feel better when I am upset," and "My parents have rules that I must follow." Participants in this study will respond to 3 items for each subscale (responsiveness, demandingness) for a total of 6 scored items. The

demandingness and responsiveness subscales were found to be reliable for adolescents (α = 0.77 and 0.85 respectively) and was shown to be comparable to the full scale (Huffman, Wilson, Van Horn, & Pate, 2017; Jackson et al., 1998). Previous studies have demonstrated construct validity of these measures, find that authoritative parenting was associated with healthier weight-status in adolescents (Shloim et al., 2015).

Child feeding questionnaire. The Child Feeding Questionnaire (CFQ; Birch et al., 2001) was used to evaluate parent feeding practices and feeding styles. The parent-report scale consists of five subscales measuring five dimensions of feeding: parental responsibility, restriction, concern, monitoring, and pressure-to-eat. This scale has been validated for use with adolescents, and each dimension is sufficiently reliable (monitoring: α = 0.88; restriction: α = 0.72; pressure to eat: α = 0.71; concern: α = 0.82; responsibility: α = 0.60; Kaur et al., 2006). Goodness of fit analyses indicated that each of the five dimensions were valid (Kaur et al., 2006). Items in this questionnaire have been modified to reflect the adolescent's perspective on their parent's feeding practices (rather than the parent's perspective on their own style). Responses for each dimension are scored on a 5-point Likert scale.

Responsibility. The responsibility dimension of the CFQ consists of 3 items and assessed parental feeding responsibility from the adolescent's perspective. Sample questions include "When home, how often is my parent responsible for preparing my meals?" and "How often is my parent responsible for deciding if I have eaten the right kind of foods?" Responses range from '1 = never' to '5 = always.'

Monitoring. The monitoring dimension of the CFQ consists of 3 items that evaluated parental monitoring of adolescent diet from the adolescent's

perspective. Sample questions include “How often does my parent keep track of the sweets (candy, ice cream, pies, pastries) that I eat?” and “How often does my parent keep track of the high-fat foods that I eat?” Responses range from ‘1 = never’ to ‘5 = always.’

Concern. The concern dimension of the CFQ consists of 3 items and assessed parental concern for their adolescent’s risk for being overweight from the adolescent’s perspective. Sample questions include “How concerned is my parent about me eating too much?” and “How concerned is my parent about me becoming overweight?” Responses range from ‘1 = unconcerned’ to ‘5 = concerned.’

Restriction. The restriction dimension of the CFQ consists of 12 items and assessed parental feeding restriction from the adolescent’s perspective. Sample items include “Does my parent intentionally keep some foods out of my reach?” and “If my parent did not guide or regulate my eating, I would eat too many junk foods.” Responses range from ‘1 = disagree’ to ‘5 = agree.’

Pressure-to-eat. The pressure-to-eat dimension of the CFQ consists of four items that assess the adolescent’s perspective of how often parents’ pressure their adolescents to eat. Sample questions include “I should always eat all the food on my plate.” And “If I say ‘I’m not hungry,’ my parent tries to get me to eat anyway.” Responses range from ‘1 = never’ to ‘5 = always.’

Stress Measure.

Parent and Adolescent Perceived Stress. The 10-item version of the Perceived Stress Scale (PSS) was used to evaluate both parent and adolescent perceived stress (Cohen, Kamarck, & Mermelstein, 1983; Cohen & Williamson, 1988). As the items are easy to understand, the PSS was developed for use with community samples with at least an eighth-grade education. The PSS has been used as a stable measure of chronic stress among African American adolescents, as the questions are general in nature, measuring the degree to which the respondent perceived their life to be unpredictable, uncontrollable, and overburdened over the past month (Tomiyama et al., 2012). Furthermore, scores on the perceived stress scale have been found to be stable over a period of 5 months in parents, suggesting its nature as a trait measure of chronic perceived stress (Dunkel Schetter et al., 2013). This measure has been used extensively to test whether stress predicts disease processes or outcomes (Cohen & Janicki-Deverts, 2012; Cohen & Williamson, 1988). Questions are rated on a 5-point Likert scale and sample items include "In the last month, how often have you felt nervous and "stressed"?, "In the last month, how often have you been angered because of things that were outside of your control?", and "In the last month, how often have you been upset because of something that happened unexpectedly?". Answers are summed to create an index, with four positively worded items reverse coded. The PSS not only captures appraisals of loss of control and inability to cope, but it is a well validated index of general stress appraisal considering stress in all domains in life (Lee, 2012). The PSS-10 had an internal consistency of 0.91 in national samples (Cohen & Janicki-Deverts, 2012). Additionally, the PSS has shown sufficient convergent and divergent validity, being highly associated

with other measures of stress (Dunkel Schetter et al., 2013; Roberti, Harrington, & Storch, 2006). The PSS has been used repeatedly among African American populations in research and clinical settings (Sims et al., 2008).

Anthropometric Measures.

Adolescent zBMI. Adolescent BMI was measured using height, weight, and age at baseline and 16 weeks. Height and weight measurements were taken at baseline and again at 16 weeks at the end of the program. An average height and an average weight are calculated using these two measurements. The CDC growth curves for adolescent BMI will be used to assess this measure. Statistical Analysis Software (SAS) was used to standardize adolescent BMI (zBMI) for comparison.

CHAPTER 3

STATISTICAL ANALYSES

3.1 Missing Data

Missing data was assumed to be missing at random. Missing baseline or Time 2 measurements of adolescent zBMI were dealt with using a single imputation. Imputation procedures were conducted in the statistical package R using the Amelia package. Diagnostics examining the results of the imputation were examined to ensure linearity assumptions were met and correlations between variables were examined for strong multicollinearity.

3.2 Preliminary Analyses and Assumptions

Assumptions for the multiple regression analyses were met. To address the assumption of normality, histograms of the standardized residuals were assessed. Scatterplots of the standardized residuals and predicted values were evaluated to assess for homoscedasticity. A Cook's distance measure was used to check for influential points in the data and a Durbin-Watson test was used to assess independence of errors.

As adolescent zBMI was measured over time, longitudinal assumptions, such as stability, stationarity and equilibrium were tested. Stability of the mean over time was examined by comparing means of zBMI at both time points. Stationarity, which assumes that obtaining zBMI measures is the same at baseline and post-intervention, has been met due to the strict and stable protocol of obtaining BMI measurements by trained staff during the intervention. Equilibrium, which assumes temporal stability in the patterns of

covariance and variance among variables, was tested by comparing variance and covariance scores across the two measurements of zBMI.

3.3 Data Analysis

A hierarchical multiple regression analysis was conducted to assess the interaction effects of authoritative parenting style, parent feeding practices, and parent perceived stress on adolescent zBMI at 16 weeks controlling for treatment condition. Adolescent age, adolescent sex, and parent BMI were included as covariates in each model due to their known associations with adolescent zBMI. Marital status and parent education were included as covariates due to their known associations with perceived stress. In addition, adolescent zBMI at baseline (Time 1) was included as a covariate. Adolescent age at the time of data collection was coded in years and mean centered. Sex was coded '1' for males and '0' for females. The research questions were answered using the following regression equations.

Aim 1. Parent Perceived Stress and Adolescent zBMI Equations

Equation 1. zBMI (16 weeks) = $\beta_0 + \beta_1 Age + \beta_2 Male + \beta_3 Marital\ Status + \beta_4 Parent\ Education + \beta_5 Parent\ BMI + \beta_6 Adolescent\ BMI\ (Time\ 1) + \beta_7 Treatment\ Condition + \varepsilon,$

Equation 2. zBMI (16 weeks) = $\beta_0 + \beta_1 Age + \beta_2 Male + \beta_3 Marital\ Status + \beta_4 Parent\ Education + \beta_5 Parent\ BMI + \beta_6 Adolescent\ zBMI\ (Time\ 1) + \beta_7 Treatment\ Condition + \beta_8 Authoritative\ Parenting\ Style + \beta_9 Feeding\ Responsibility + \beta_{10} Feeding\ Restriction + \beta_{10} Feeding\ Monitoring + \beta_{12} Feeding\ Concern + \beta_{13} Feeding\ Pressure\text{-}to\text{-}Eat + \beta_{14} Parent\ Perceived\ Stress + \varepsilon,$

Equation 3. zBMI (16 weeks) = $\beta_0 + \beta_1 Age + \beta_2 Male + \beta_3 Marital\ Status + \beta_4 Parent\ Education + \beta_5 Parent\ BMI + \beta_6 Adolescent\ zBMI\ (Time\ 1) + \beta_7 Treatment\ Condition + \beta_8 Authoritative\ Parenting\ Style + \beta_9 Feeding\ Responsibility + \beta_{10} Feeding\ Restriction + \beta_{11} Feeding\ Monitoring + \beta_{12} Feeding\ Concern + \beta_{13} Feeding\ Pressure\text{-}to\text{-}Eat + \beta_{14} Parent\ Perceived\ Stress + \beta_{15} Authoritative\ Parenting\ Style * Parent\ Perceived\ Stress + \beta_{16} Feeding\ Responsibility * Parent\ Perceived\ Stress + \beta_{17} Feeding\ Restriction * Parent\ Perceived\ Stress + \beta_{18} Feeding\ Monitoring * Parent\ Perceived\ Stress + \beta_{19} Feeding\ Concern * Parent\ Perceived\ Stress + \beta_{20} Feeding\ Pressure\text{-}to\text{-}Eat * Parent\ Perceived\ Stress + \varepsilon$

where β_0 is the intercept, $\beta_{1\text{-}7}$ are the effects of covariates (age, sex, marital status, parent education, parent BMI, adolescent zBMI at Time 1, treatment condition), $\beta_{8\text{-}13}$ assesses the effects of parenting factors (authoritative parenting and parent feeding practices), β_{14} is the effect of parent perceived stress, $\beta_{15\text{-}20}$ assesses the interaction effects of parenting practices and parent perceived stress, and ε is the residual. The β coefficients for these factors were each assessed to answer the research questions.

In addition, a hierarchical multiple regression analysis was conducted to assess the interaction effects of authoritative parenting style, parent feeding practices, and adolescent perceived stress on adolescent zBMI at 16 weeks controlling for treatment condition. Adolescent age, adolescent sex, and parent BMI were included as covariates in each model due to their known associations with adolescent zBMI. Marital status and parent education were included as covariates due to their known associations with perceived stress. In addition, adolescent zBMI at baseline (Time 1) was included as a

covariate. Adolescent age at the time of data collection was coded in years and mean centered. Sex will be coded '1' for males and '0' for females. The research questions were answered using the following regression equations.

Aim 2. Adolescent Perceived Stress and Adolescent zBMI Equations

Equation 1. zBMI (16 weeks) = $\beta_0 + \beta_1 Age + \beta_2 Male + \beta_3 Marital\ Status + \beta_4 Parent\ Education + \beta_5 Parent\ BMI + \beta_6 Adolescent\ BMI\ (Time\ 1) + \beta_7 Treatment\ Condition + \varepsilon,$

Equation 2. zBMI (16 weeks) = $\beta_0 + \beta_1 Age + \beta_2 Male + \beta_3 Marital\ Status + \beta_4 Parent\ Education + \beta_5 Parent\ BMI + \beta_6 Adolescent\ zBMI\ (Time\ 1) + \beta_7 Treatment\ Condition + \beta_8 Authoritative\ Parenting\ Style + \beta_9 Feeding\ Responsibility + \beta_{10} Feeding\ Restriction + \beta_{10} Feeding\ Monitoring + \beta_{12} Feeding\ Concern + \beta_{13} Feeding\ Pressure\text{-}to\text{-}Eat + \beta_{14} Adolescent\ Perceived\ Stress + \varepsilon,$

Equation 3. zBMI (16 weeks) = $\beta_0 + \beta_1 Age + \beta_2 Male + \beta_3 Marital\ Status + \beta_4 Parent\ Education + \beta_5 Parent\ BMI + \beta_6 Adolescent\ zBMI\ (Time\ 1) + \beta_7 Treatment\ Condition + \beta_8 Authoritative\ Parenting\ Style + \beta_9 Feeding\ Responsibility + \beta_{10} Feeding\ Restriction + \beta_{11} Feeding\ Monitoring + \beta_{12} Feeding\ Concern + \beta_{13} Feeding\ Pressure\text{-}to\text{-}Eat + \beta_{14} Adolescent\ Perceived\ Stress + \beta_{15} Authoritative\ Parenting\ Style^{*} Adolescent\ Perceived\ Stress + \beta_{16} Feeding\ Responsibility^{*} Adolescent\ Perceived\ Stress + \beta_{17} Feeding\ Restriction^{*}\ Adolescent\ Perceived\ Stress + \beta_{18} Feeding\ Monitoring^{*}\ Adolescent\ Perceived\ Stress + \beta_{19} Feeding\ Concern^{*}\ Adolescent\ Perceived\ Stress + \beta_{20} Feeding\ Pressure\text{-}to\text{-}Eat^{*}\ Adolescent\ Perceived\ Stress + \varepsilon$

where β_0 is the intercept, $\beta_{1\text{-}7}$ are the effects of covariates (age, sex, marital status, parent education, parent BMI, adolescent zBMI at Time 1, treatment condition), $\beta_{8\text{-}13}$ assesses the effects of parenting factors (authoritative parenting and parent feeding practices), β_{14} is the effect of adolescent perceived stress, $\beta_{15\text{-}20}$ assesses the interaction effects of parenting practices and adolescent perceived stress, and ε is the residual. The β coefficients for these factors were each assessed to answer the research questions.

CHAPTER 4

RESULTS

4.1 Demographic Data

Demographic data are presented in Table 4.1. The sample included 148 adolescent-parent dyads. Adolescents were on average obese ($M_{BMI\%}$ = 96.7, *SD* = 3.90). Parents had an average BMI of 37.63 (*SD* = 8.21). The majority of parents (94.6%) and adolescents (64.2%) were female. The majority of the parents had received some college education or higher (83.7%) and most of the parents reported that they were currently employed or working (68.9%). The number of children in the household ranged from 1 to 7, with a majority having 2 or less (69.6%; see Table 4.1).

4.2 Correlational Analysis

Correlation analyses are presented in Table 4.2. Adolescent zBMI at baseline was significantly correlated with adolescent zBMI at Time 2 (*r* = 0.696), parent BMI (*r* = 0.382), child age (*r* = -0.134) and parental concern (*r* = 0.163). Parent BMI was correlated with adolescent perceived stress (*r* = 0.173). Both parental concern (*r* = -0.186) and adolescent perceived stress (*r* = -0.224) were correlated with the adolescent being male. Child age was negatively correlated with parental responsibility (*r* = -0.227) and parental restriction (*r* = -0.210). Authoritative parenting was correlated with parental responsibility (*r* = 0.385), parental restriction (*r* = 0.234), parental monitoring (*r* = 0.359), and parental concern (*r* = 0.327). In addition, adolescent perceived stress was negatively correlated with authoritative parenting (*r* = -0.235) and parental monitoring (*r* = -0.175).

4.3 Parent Perceived Stress and Adolescent zBMI

A hierarchical regression model was used to examine the interaction effects of authoritative parenting style, parental feeding practices, and parent perceived stress on adolescent zBMI at 16 weeks controlling for covariates (Table 4.3). The first step of the model included the covariates (age, sex, marital status, parent education, parent BMI, adolescent zBMI at Time 1, treatment condition) and was significant (F (7, 140) = 43.68, $p < 0.001$). This step of the model accounted for 68% of the variance in adolescent zBMI at 16 weeks ($R^2 = 0.686$). The high percentage of variance explained may be due to the inclusion of baseline adolescent zBMI in the models, which was highly correlated with adolescent zBMI at Time 2 (r = 0.696). As expected, adolescent zBMI at baseline significantly predicted adolescent zBMI at 16 weeks ($B = 0.781$, $SE = 0.062$, $p < 0.001$). The second step of the model, which also examined the main effects of authoritative parenting style, parental feeding practices, and parent perceived stress was significant (F (14, 133) = 22.05, $p < 0.001$; $\Delta R^2 = 0.013$) in addition to covariates. No main effects were observed in the second step.

The third and final step of the model, which examined the interaction effects of authoritative parenting style, parental feeding practices, and parent perceived stress on adolescent zBMI at 16 weeks was significant (F (20, 127) = 16.79, $p < 0.001$, $\Delta R^2 = 0.027$). A significant interaction was found between parental pressure to eat and parent perceived stress when predicting adolescent zBMI ($B = 0.092$, $SE = 0.032$, $p = 0.004$). Simple slopes analysis further demonstrated that under higher perceived stress, higher pressure to eat predicted higher adolescent zBMI ($B = 0.094$, $SE = 0.038$, $p < 0.01$; see

Figure 4.1) and lower pressure to eat predicted lower adolescent zBMI (B = -0.087, SE = 0.043, $p < 0.05$; see Figure 4.1).

4.4 Adolescent Perceived Stress and Adolescent zBMI

A hierarchical regression model was also used to examine the interaction effects of authoritative parenting style, parental feeding practices, and adolescent perceived stress on adolescent zBMI at 16 weeks controlling for covariates (Table 4.4). The first step of the model included the covariates (age, sex, marital status, parent education, parent BMI, adolescent zBMI at Time 1, treatment condition) and was significant (F (7, 126) = 45.76, $p < 0.001$). This step of the model accounted for 72% of the variance in adolescent zBMI at 16 weeks (R^2 = 0.718). Again, the high percentage of variance explained may be due to the inclusion of baseline adolescent zBMI in the models. Adolescent zBMI at baseline significantly predicted adolescent zBMI at 16 weeks (B = 0.853, SE = 0.06, $p < 0.001$). The second step of the model, which examined the main effects of authoritative parenting style, parental feeding practices, and adolescent perceived stress was significant (F (14, 119) = 22.995, $p < 0.001$; ΔR^2 = 0.012) in addition to covariates. No main effects were observed in the second step.

The third step of the model, which examined the interaction effects of authoritative parenting style, parental feeding practices, and adolescent perceived stress on adolescent zBMI at 16 weeks was significant (F (20, 113) = 16.79, $p < 0.001$; ΔR^2 = 0.018). A significant interaction was found between parental monitoring and adolescent perceived stress when predicting adolescent zBMI (B = 0.085, SE = 0.036, p = 0.021). However, simple slopes analysis showed no significant conditional effects when comparing low and high adolescent stress levels (see Figure 4.2).

Table 4.1 Demographic Data for Total Sample

Variable	(N=148)
Age *M(SD)*	
Parent	44.45 (8.65)
Adolescent	12.93 (1.78)
BMI *M (SD)*	
Parent	37.63 (8.21)
Adolescent (%, percentile)	96.7 (3.90)
Sex (female), (%)	
Parent	94.60%
Adolescent	64.20%
Parent education	
9 to 11 years	5 (3.4%)
12 years	19 (12.8%)
Some college	64 (43.2%)
4-year college	25 (16.9%)
Professional degree	35 (23.6%)
Parent income *N* (%)	
<$10K	23 (15.5%)
$10–24K	26 (17.6%)
$25–39K	40 (27.0%)
$40–54K	20 (13.5%)
$55K+	39 (26.4%)
Parent Employment	
Working	102 (68.9%)
Unemployed/laid off	13 (8.8%)
Retired	7 (4.7%)
Unable to work/disabled	6 (4.1%)
Homemaker	11 (7.4%)
Student	5 (3.4%)
Other	4 (2.7%)

Parent Marital Status	
Married	57 (38.5%)
Divorced/separated	46 (31%)
Widowed	6 (4.1%)
Never married	30 (20.3%)
Unmarried couple	9 (6.1%)
Number of Children in the Home	
1 or less	59 (39.9%)
2	44 (29.7%)
3-4	40 (27.1 %)
5+	5(3.4%)

Table 4.2 Correlations

Variable		2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Adolescent zBMI (Time 1)	—														
2. Adolescent zBMI (Time 2)	.696**	—													
3. Parent BMI	.382**	.297**	—												
4. Child sex (male)	0.051	0.105	0.104	—											
5. Child Age	-.134*	-0.022	-0.056	0.000	—										
6. Marital Status	-0.092	-0.089	0.005	0.033	0.001	—									
7. Education Level	0.006	-0.037	-0.119	-0.121	0.049	-0.106	—								
8. Treatment Condition	0.031	0.007	-0.120	-0.077	0.053	0.095	-0.07	—							
9. Parenting Style	-0.089	-0.002	0.026	-0.092	-0.053	0.010	0.007	0.017	—						
10. Feeding Responsibility	0.000	0.013	0.079	0.015	-.227**	0.038	-0.110	-0.014	.385**	—					
11. Feeding Restriction	0.119	0.074	0.058	-0.028	-.210**	-0.029	-0.048	0.017	.234**	.426**	—				
12. Feeding Monitoring	0.103	0.084	0.008	-0.031	-0.118	0.035	-0.024	-0.075	.359**	.533**	.471**	—			
13. Feeding Concern	.163*	.144*	-0.009	-.186**	-0.073	-0.117	0.012	-0.004	.327**	.431**	.360**	.396**	—		
14. Feeding Pressure-to-Eat	0.013	0.008	0.020	-0.092	-0.117	0.052	-0.113	0.000	0.058	.232**	.409**	.297**	.149*	—	
15. Parent Perceived Stress	-0.064	0.014	0.078	0.036	0.046	0.072	-0.127	0.013	0.012	-0.010	-0.016	-0.075	-0.040	0.099	—
16. Adolescent Perceived Stress	0.156	0.103	.173*	-.224**	-0.101	-0.019	-0.076	0.113	-.235**	-0.130	-0.001	-.175*	0.074	0.035	0.130

Note ** Correlation is significant at the 0.01 level (2-tailed).
Note * Correlation is significant at the 0.05 level (2-tailed).

Table 4.3 Regression Analyses Assessing the Interaction Effects of Parenting Practices and Parent Perceived Stress on Adolescent zBMI

Model		*B*	*SE*	*t*	*p*	95% *CI*		R^2	ΔR^2
1	Intercept	0.327	0.277	1.179	0.241	-0.221	0.875	0.670	
	Child Age	0.005	0.014	0.327	0.744	-0.023	0.033		
	Child sex (male)	0.050	0.052	0.956	0.341	-0.054	0.154		
	Marital Status	0.021	0.015	1.438	0.153	-0.008	0.050		
	Education Level	-0.043	0.023	-1.850	0.066	-0.089	0.003		
	Parent BMI	0.002	0.003	0.524	0.601	-0.005	0.008		
	Adolescent BMI (Time 1)	0.857	0.055	15.640	<.001*	0.749	0.966		
	Treatment Condition	-0.008	0.050	-0.153	0.879	-0.106	0.091		
2	Intercept	0.274	0.290	0.946	0.346	-0.299	0.847	0.699	0.013
	Child Age	0.009	0.015	0.581	0.562	-0.021	0.038		
	Child sex (male)	0.063	0.054	1.161	0.248	-0.044	0.170		
	Marital Status	0.021	0.015	1.410	0.161	-0.009	0.051		
	Education Level	-0.037	0.024	-1.525	0.130	-0.084	0.011		
	Parent BMI	0.003	0.003	0.737	0.462	-0.004	0.009		
	Adolescent BMI (Time 1)	0.819	0.060	13.586	<.001*	0.700	0.938		
	Treatment Condition	0.002	0.050	0.041	0.968	-0.098	0.102		
	Parenting Style	-0.029	0.029	-0.997	0.320	-0.088	0.029		
	Feeding Responsibility	0.027	0.032	0.849	0.397	-0.036	0.091		
	Feeding Restriction	-0.010	0.030	-0.338	0.736	-0.070	0.050		
	Feeding Monitoring	0.002	0.034	0.067	0.947	-0.065	0.070		
	Feeding Concern	0.042	0.032	1.319	0.190	-0.021	0.105		

	Feeding Pressure-to-Eat	0.031	0.029	1.092	0.277	-0.026	0.088		
	Parent Perceived Stress	0.011	0.026	0.406	0.686	-0.041	0.062		
3	Intercept	0.275	0.292	0.943	0.348	-0.303	0.853	0.726	0.027
	Child Age	0.008	0.015	0.527	0.599	-0.022	0.038		
	Child sex (male)	0.047	0.054	0.870	0.386	-0.060	0.153		
	Marital Status	0.027	0.015	1.751	0.082	-0.003	0.057		
	Education Level	-0.032	0.024	-1.344	0.181	-0.079	0.015		
	Parent BMI	0.004	0.003	1.082	0.281	-0.003	0.010		
	Adolescent BMI (Time 1)	0.781	0.062	12.633	<.001*	0.659	0.904		
	Treatment Condition	0.002	0.050	0.047	0.963	-0.096	0.101		
	Parenting Style	-0.047	0.030	-1.576	0.117	-0.107	0.012		
	Feeding Responsibility	0.016	0.032	0.505	0.614	-0.047	0.080		
	Feeding Restriction	-0.001	0.030	-0.034	0.973	-0.060	0.058		
	Feeding Monitoring	0.033	0.035	0.955	0.341	-0.036	0.103		
	Feeding Concern	0.044	0.032	1.358	0.177	-0.020	0.107		
	Feeding Pressure-to-Eat	0.009	0.030	0.298	0.766	-0.050	0.068		
	Parent Perceived Stress	0.001	0.027	0.033	0.973	-0.052	0.053		
	Parenting Style*Parent Perceived Stress	0.010	0.029	0.346	0.730	-0.047	0.067		
	Responsibility*Parent Perceived Stress	0.033	0.034	0.944	0.347	-0.036	0.101		
	Restriction*Parent Perceived Stress	-0.046	0.033	-1.401	0.164	-0.111	0.019		
	Monitoring*Parent Perceived Stress	0.014	0.040	0.338	0.736	-0.066	0.093		
	Concern*Parent Perceived Stress	-0.028	0.037	-0.747	0.456	-0.102	0.046		
	Pressure-to-Eat*Parent Perceived Stress	0.092	0.032	2.919	0.004*	0.030	0.155		

N = 148

Note *significance with alpha criteria of 0.05

Table 4.4 Regression Analyses Assessing the Interaction Effects of Parenting Practices and Adolescent Perceived Stress on Adolescent zBMI

Model		*B*	*SE*	*t*	*p*	95% *CI*		R^2	ΔR^2
1	Intercept	0.288	0.284	1.016	0.311	-0.273	0.850	0.718	
	Child Age	0.002	0.015	0.106	0.916	-0.027	0.030		
	Child sex (male)	0.038	0.053	0.708	0.480	-0.068	0.144		
	Marital Status	0.021	0.015	1.412	0.160	-0.008	0.050		
	Education Level	-0.041	0.023	-1.746	0.083	-0.087	0.005		
	Parent BMI	0.003	0.003	0.810	0.419	-0.004	0.009		
	Adolescent BMI (Time 1)	0.874	0.055	16.033	<.001*	0.766	0.982		
	Treatment Condition	-0.026	0.050	-0.517	0.606	-0.126	0.074		
2	Intercept	0.189	0.303	0.622	0.535	-0.411	0.788	0.730	0.012
	Child Age	0.010	0.016	0.613	0.541	-0.021	0.041		
	Child sex (male)	0.060	0.057	1.053	0.295	-0.053	0.173		
	Marital Status	0.021	0.015	1.416	0.159	-0.008	0.051		
	Education Level	-0.035	0.024	-1.429	0.156	-0.083	0.013		
	Parent BMI	0.003	0.003	0.918	0.361	-0.004	0.010		
	Adolescent BMI (Time 1)	0.841	0.060	13.970	<.001*	0.722	0.960		
	Treatment Condition	-0.025	0.051	-0.480	0.632	-0.126	0.077		
	Parenting Style	-0.027	0.030	-0.902	0.369	-0.088	0.033		
	Feeding Responsibility	0.034	0.033	1.023	0.308	-0.032	0.099		
	Feeding Restriction	0.002	0.030	0.054	0.957	-0.058	0.062		
	Feeding Monitoring	-0.001	0.034	-0.018	0.985	-0.069	0.068		
	Feeding Concern	0.030	0.033	0.896	0.372	-0.036	0.095		

	Feeding Pressure-to-Eat	0.030	0.029	1.031	0.305	-0.028	0.089		
	Adolescent Perceived Stress	0.014	0.029	0.490	0.625	-0.044	0.073		
3	Intercept	0.209	0.302	0.693	0.490	-0.389	0.808	0.748	0.018
	Child Age	0.011	0.016	0.717	0.475	-0.020	0.042		
	Child sex (male)	0.029	0.059	0.488	0.626	-0.088	0.145		
	Marital Status	0.029	0.016	1.876	0.063	-0.002	0.060		
	Education Level	-0.047	0.025	-1.912	0.058	-0.096	0.002		
	Parent BMI	0.003	0.003	0.957	0.341	-0.004	0.010		
	Adolescent BMI (Time 1)	0.853	0.060	14.099	<.001*	0.733	0.973		
	Treatment Condition	-0.027	0.052	-0.511	0.611	-0.129	0.076		
	Parenting Style	-0.032	0.031	-1.028	0.306	-0.094	0.030		
	Feeding Responsibility	0.019	0.034	0.564	0.574	-0.048	0.085		
	Feeding Restriction	0.006	0.032	0.175	0.862	-0.057	0.068		
	Feeding Monitoring	-0.010	0.035	-0.294	0.769	-0.080	0.059		
	Feeding Concern	0.035	0.034	1.048	0.297	-0.031	0.102		
	Feeding Pressure-to-Eat	0.032	0.030	1.059	0.292	-0.028	0.091		
	Adolescent Perceived Stress	-0.018	0.034	-0.520	0.604	-0.085	0.050		
	Parenting Style*Adolescent Perceived Stress	-0.025	0.033	-0.760	0.449	-0.090	0.040		
	Responsibility*Adolescent Perceived Stress	-0.003	0.031	-0.099	0.921	-0.064	0.057		
	Restriction*Adolescent Perceived Stress	0.038	0.033	1.147	0.254	-0.027	0.103		
	Monitoring*Adolescent Perceived Stress	0.085	0.036	2.349	0.021*	0.013	0.156		
	Concern*Adolescent Perceived Stress	-0.045	0.038	-1.184	0.239	-0.120	0.030		
	Pressure-to-Eat*Adolescent Perceived Stress	-0.005	0.032	-0.162	0.872	-0.068	0.057		

N = 134
*significance with alpha criteria of 0.05

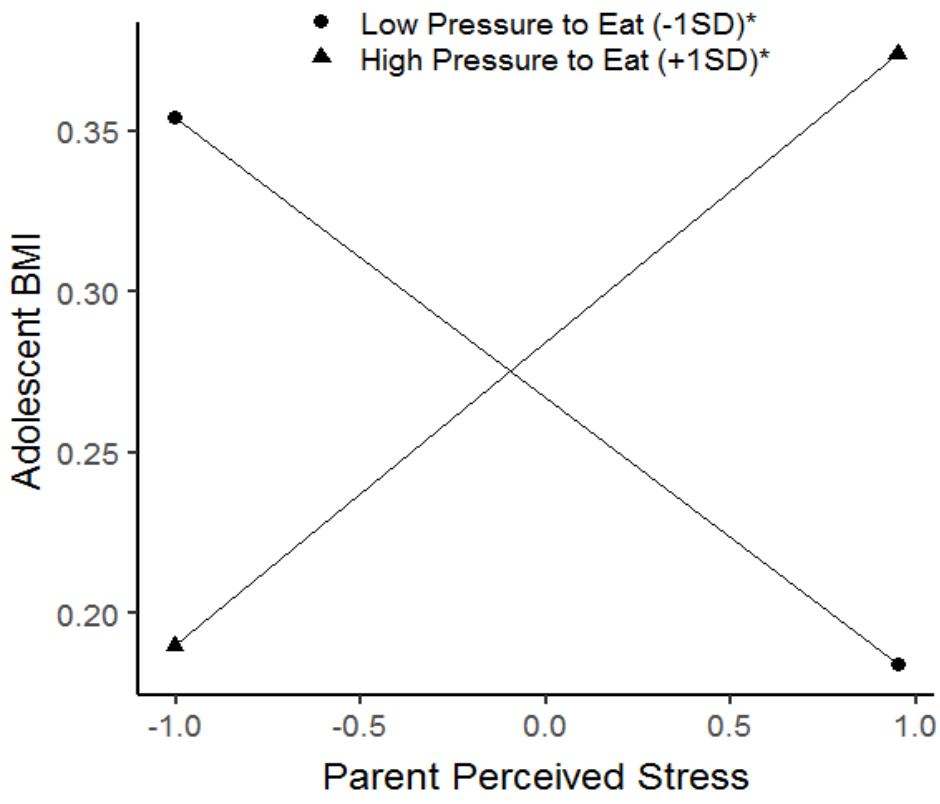

Figure 4.1. Conditional interaction between parental pressure to eat and parent perceived stress on adolescent zBMI. (*indicates significant with alpha criteria of 0.05)

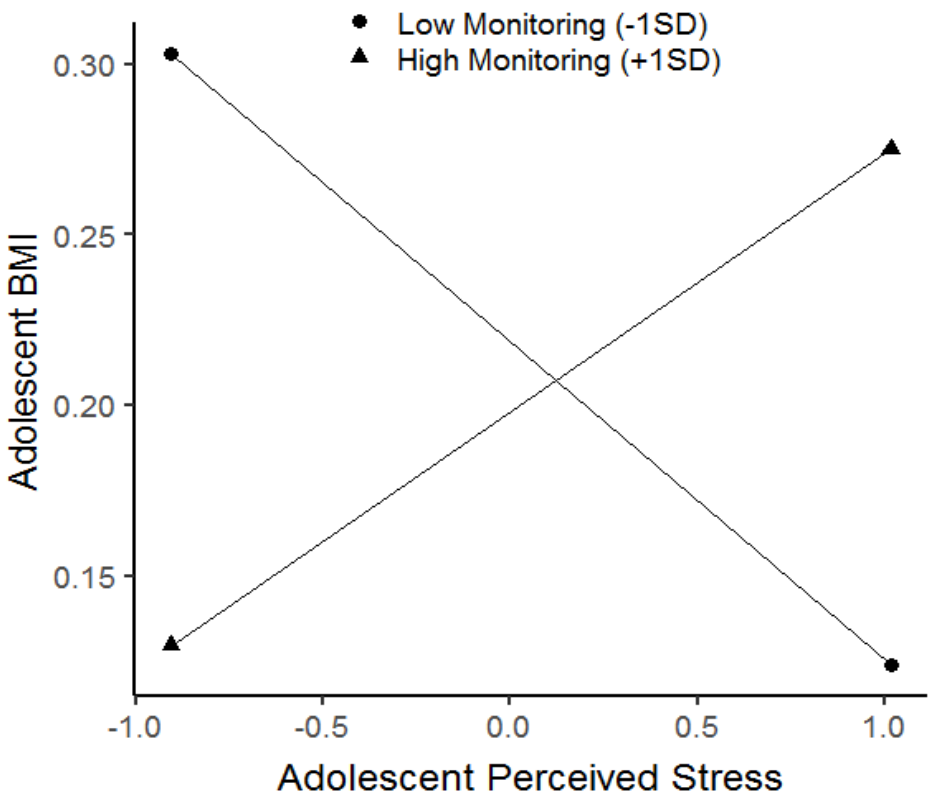

Figure 4.2. Conditional interaction between parental monitoring and adolescent perceived stress on adolescent zBMI. (*indicates significant with alpha criteria of 0.05)

CHAPTER 5

DISCUSSION

The current study evaluated the relationship between parenting style, parental feeding practices, and perceived chronic stress of both parents and youth on zBMI among African American adolescents across baseline to 16 weeks. Specifically, this study aimed to better understand the longitudinal relationships between parent and adolescent stress and adolescent BMI from baseline to 16 weeks. The results indicated that parental pressure to eat interacted with parent perceived stress on predicting adolescent BMI, such that under high perceived stress, higher parental pressure to eat predicted higher adolescent BMI while lower parental pressure to eat predicted lower adolescent BMI. Additionally, it was found that parental monitoring moderated the relationship between adolescent perceived stress and adolescent BMI. While patterns in this interaction appear to be similar to those seen with parent perceived stress (See Figure 4.2), no conditional effects were significant when comparing parental monitoring under low and high stress conditions.

A possible moderating factor that was considered in this study was parental pressure to eat, which was predicted to interact with perceived stress on adolescent BMI under high stress conditions. A few studies have found that greater pressure to eat was associated with higher reported parent stress, alluding to the possible negative impact of this parental feeding practice (Berge et al., 2017; Mitchell et al., 2009). Somewhat consistent with these findings, our study showed that parental pressure to eat moderated

parent perceived stress in predicting adolescent BMI. Families with high parent perceived stress who exhibited higher pressure to eat demonstrated higher adolescent BMI over time. Additionally, families with higher parent perceived stress who exhibited lower pressure to eat demonstrated lower adolescent BMI over time. This finding is in line with the hypothesis made about pressure to eat, such that under higher stress conditions, parents that practiced more pressure to eat tended to have adolescents with higher BMI. The stress-buffering hypothesis purports that nurturing parenting practices lead to better health outcomes in high stress conditions (Cohen & Wills, 1985). This finding demonstrates support for this hypothesis as less controlling parental feeding, specifically less pressure to eat, yielded lower adolescent BMI in high stress conditions.

To the best of our knowledge, the present study is the first to find an interaction between perceived parent stress and parent pressure to eat among African American families. Some studies have concluded that higher parental pressure to eat was related to lower adolescent BMI (Burton et al., 2017; Hennessy et al., 2010). However, this study goes beyond this finding showing the importance of considering chronic stress levels of the parent (Dunkel Schetter et al., 2013; Tomiyama, 2019). Future family-based health programs should consider addressing the controlling feeding practice of pressure to eat when trying to lower adolescent BMI among African American families. It is interesting to note that the interaction between adolescent perceived stress and pressure to eat was not significant when predicting adolescent BMI over time.

Two studies have found that greater parental monitoring was related to higher adolescent weight (Schmidt et al., 2017; Towner et al., 2015), while some including African American adolescents have found no association between parental monitoring

and adolescent BMI (Burton et al., 2017; Hennessy et al., 2010; Kaur et al., 2006). Findings about this relationship have been mixed, possibly because they did not consider the interaction between monitoring and perceived stress when predicting adolescent BMI. The present study is the first, to the best of our knowledge, to find that parental monitoring moderated the relationship between adolescent perceived stress and adolescent BMI over time. Findings were not consistent with hypotheses, which proposed that under high adolescent perceived stress (not low), higher parental monitoring would demonstrate lower adolescent BMI. No conditional effects were significant in revealing the differences between high and low adolescent perceived stress. However, this finding goes beyond previous literature that found a positive relationship between parental monitoring and adolescent weight (Schmidt et al., 2017; Towner et al., 2015), indicating the importance of perceived chronic stress among African American families. Further research should investigate this moderating effect as many family-based weight management programs use parental monitoring as a component of treatment (Wilson et al., 2015; Wilson et al., 2019). It may be important to consider how monitoring interacts with adolescent stress when designing interventions targeted at reducing adolescent BMI.

It was anticipated that authoritative parenting, which has been found to be related to weight related outcomes among African American adolescents (Berge, Wall, Loth, & Neumark-Sztainer, 2010; Kim et al., 2008; Sleddens, Gerards, Thijs, De Vries, & Kremers, 2011), would act as buffer for parent and adolescent chronic stress. Surprisingly, significant interactions were not found between authoritative parenting style and neither parent perceived stress nor adolescent perceived stress. Additionally, other parental feeding practices that were included in the study (responsibility, concern for

adolescent weight, and restriction of unhealthy foods) did not significantly interact with parent or adolescent chronic stress when predicting adolescent BMI over time. Further evaluation should be aimed at understanding the role of these parent practices in African American families that experience chronic stress. While there may be numerous explanations for these non-significant findings, one possible explanation involves the potential resilience of these families in high chronic stress conditions. African American families may exhibit higher resilience that leads to greater stress tolerance, alternating the overall impact of parenting factors, such as authoritative parenting (Taylor & Conger, 2017). Additionally, some research has found that authoritarian parenting (low warmth, high control) is associated with adaptive developmental outcomes among African Americans (Brody & Flor, 2008). Future research should consider the cultural differences in parenting styles among African American families under chronic stress.

This study was not void of limitations, which should be considered when interpreting the results. This study incorporated a longitudinal design controlling for treatment groups using baseline psychosocial surveys and adolescent BMI measurements gathered at two separate time points during the FIT intervention. However, causal interpretations are limited as this study only assessed the variables of interest longitudinally but did not manipulate the variables of interest. The present study used a self-reported measure of perceived stress to collect data about chronic stress. While this measure is stable and valid among African American populations, a more objective measure of stress, such as cortisol, should be considered in future research. This study is among the few to assess these factors in an entirely African American adolescent sample, but generalizability of the findings may be restricted. The sample has limited variability,

as it included a small sample of overweight African American youth in the Southern United States, which may not be applicable to families of non-African American decent or families with normal-weight adolescents.

Overall, the results of this study provide valuable insight for understanding adolescent obesity among African American families. The present study is, to the best of our knowledge, one of the first to investigate the interaction between parenting practices (parenting style and parental feeding practices) and perceived parent and adolescent stress on adolescent BMI over time. Assessing the influence of chronic stress and parenting practices in a primarily obese African American adolescent sample is a novel addition to existing literature, as researchers have increasingly called for longitudinal analyses to understand the role of chronic stress in racial inequities in health (Tomiyama et al., 2012). As African Americans families are more likely to experience high levels of chronic stress (Chae et al., 2011; Dunkel Schetter et al., 2013; Ong et al., 2009), moderating parental factors such as pressure to eat and monitoring should be considered when attempting to reduce adolescent BMI and improve health outcomes. Furthermore, more health promotion programs should evaluate the addition of stress management components into intervention, as chronic stress may interact with various parenting practices to influence adolescent health outcomes.

REFERENCES

Baek, R. N., Tanenbaum, M. L., & Gonzalez, J. S. (2014). Diabetes burden and diabetes distress: the buffering effect of social support. *Annals of Behavioral Medicine : A Publication of the Society of Behavioral Medicine*, 48(2), 145–155. https://doi.org/10.1007/s12160-013-9585-4

Baum, A., Garofalo, J. P., & Yali, A. M. (1999). Socioeconomic status and chronic stress: Does stress account for SES effects on health? *Annals of the New York Academy of Sciences*, 896(1), 131–144. https://doi.org/10.1111/j.1749-6632.1999.tb08111.x

Baumrind, D. (1971). Current patterns of parental authority. *Developmental Psychology*, 4(1, Pt.2), 1–103. https://doi.org/10.1037/h0030372

Berge, J. M., Tate, A., Trofholz, A., Fertig, A. R., Miner, M., Crow, S., & Neumark-Sztainer, D. (2017). Momentary parental stress and food-related parenting practices. *Pediatrics*, 140(6), e20172295–e20172295. https://doi.org/10.1542/peds.2017-2295

Berge, J. M., Wall, M., Loth, K., & Neumark-Sztainer, D. (2010). Parenting style as a predictor of adolescent weight and weight-related behaviors. *Journal of Adolescent Health*. https://doi.org/10.1016/j.jadohealth.2009.08.004

Biglan, A., Flay, B. R., Embry, D. D., & Sandler, I. N. (2012). The critical role of nurturing environments for promoting human wellbeing. *The American Psychologist*, 67(4), 257–271. https://doi.org/10.1037/a0026796

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(3), 201–210. https://doi.org/https://doi.org/10.1006/appe.2001.0398

Bowen, K. S., Uchino, B. N., Birmingham, W., Carlisle, M., Smith, T. W., & Light, K. C. (2014). The stress-buffering effects of functional social support on ambulatory blood pressure. *Health Psychology*, 33(11), 1440–1443. https://doi.org/10.1037/hea0000005

Bowen, M. (1978). Family therapy in clinical practice. New York: Jason Aronson.

Broderick, C. B. (1993). Understanding family process: Basics of family systems theory. Thousand Oaks, CA, US: Sage Publications, Inc.

Brody, G. H., & Flor, D. L. (2008). Maternal resources, parenting practices, and child competence in rural, single-parent African American families. *Child Development*, 69(3), 803–816. https://doi.org/10.1111/j.1467-8624.1998.tb06244.x

Brogan, K., Idalski Carcone, A., Jen, K. L. C., Ellis, D., Marshall, S., & Naar-King, S. (2012). Factors associated with weight resilience in obesogenic environments in female African-American adolescents. *Journal of the Academy of Nutrition and Dietetics*, 112(5), 718–724. https://doi.org/https://doi.org/10.1016/j.jand.2012.02.004

Burton, E. T., Wilder, T., Beech, B. M., & Bruce, M. A. (2017). Caregiver feeding practices and weight status among African American adolescents: The Jackson Heart KIDS Pilot Study. *Eating Behaviors*. https://doi.org/10.1016/j.eatbeh.2017.11.002

Cartwright, M., Wardle, J., Steggles, N., Simon, A. E., Croker, H., & Jarvis, M. J. (2003). Stress and dietary practices in adolescents. *Health Psychology*, 22(4), 362–369. https://doi.org/10.1037/0278-6133.22.4.362

Casagrande, S. S., Whitt-Glover, M. C., Lancaster, K. J., Odoms-Young, A. M., & Gary, T. L. (2009). Built environment and health behaviors among African Americans: A systematic review. *American Journal of Preventive Medicine*, 36(2), 174–181. https://doi.org/https://doi.org/10.1016/j.amepre.2008.09.037

Chae, D. H., Lincoln, K. D., & Jackson, J. S. (2011). Discrimination, attribution, and racial group identification: Implications for psychological distress among black americans in the national survey of american life (2001-2003). *American Journal of Orthopsychiatry*. https://doi.org/10.1111/j.1939-0025.2011.01122.x

Cohen, S., & Janicki-Deverts, D. (2012). Who's stressed? Distributions of psychological stress in the united states in probability samples from 1983, 2006, and 20091. *Journal of Applied Social Psychology*, 42(6), 1320–1334. https://doi.org/10.1111/j.1559-1816.2012.00900.x

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385–396. https://doi.org/10.2307/2136404

Cohen, S., Kessler, R. C., & Gordon, L. U. (Eds.). (1997). Measuring stress: A guide for health and social scientists. Measuring Stress: A Guide for Health and Social Scientists. New York, NY, US: Oxford University Press.

Cohen, S., & McKay, G. (1984). Social support, stress, and the buffering hypothesis: A theoretical analysis. *Handbook of Psychology and Health*. https://doi.org/10.1387/ijdb.082595mg

Cohen, S., & Williamson, G. (1988). Psychological stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.) (pp. 31–67). Newbury Park, CA: Sage. Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*. https://doi.org/10.1037/0033-2909.98.2.310

Darling, K. E., Fahrenkamp, A. J., Wilson, S. M., Karazsia, B. T., & Sato, A. F. (2016). Does social support buffer the association between stress eating and weight gain during the transition to college? Differences by gender. *Behavior Modification*, 41(3), 368–381. https://doi.org/10.1177/0145445516683924

Davis, B., & Carpenter, C. (2009). Proximity of fast-food restaurants to schools and adolescent obesity. *American Journal of Public Health*, 99(3), 505–510. https://doi.org/10.2105/AJPH.2008.137638

De Vriendt, T., Moreno, L. A., & De Henauw, S. (2009). Chronic stress and obesity in adolescents: Scientific evidence and methodological issues for epidemiological research. *Nutrition, Metabolism and Cardiovascular Diseases*, 19(7), 511–519. https://doi.org/https://doi.org/10.1016/j.numecd.2009.02.009

Dietz, W. H., & Gortmaker, S. L. (2001). Preventing obesity in children and adolescents. *Annual Review of Public Health*, 22(1), 337–353. https://doi.org/10.1146/annurev.publhealth.22.1.337

Dunkel Schetter, C., & Dolbier, C. (2011). Resilience in the context of chronic stress and health in adults. *Social and Personality Psychology Compass*, 5(9), 634–652. https://doi.org/10.1111/j.1751-9004.2011.00379.x

Dunkel Schetter, C., Schafer, P., Lanzi, R. G., Clark-Kauffman, E., Raju, T. N. K., & Hillemeier, M. M. (2013). Shedding light on the mechanisms underlying health disparities through community participatory methods: The stress pathway. *Perspectives on Psychological Science*. https://doi.org/10.1177/1745691613506016

El-Behadli, A. F., Sharp, C., Hughes, S. O., Obasi, E. M., & Nicklas, T. A. (2015). Maternal depression, stress and feeding styles: towards a framework for theory and research in child obesity. *British Journal of Nutrition*, 113(S1), S55–S71. https://doi.org/DOI: 10.1017/S000711451400333X

Elder, G. H. (1998). The life course as developmental theory. *Child Development*, 69(1), 1–12. https://doi.org/10.1111/j.1467-8624.1998.tb06128.x

Fahrenkamp, A. J., & Sato, A. F. (2017). Child-specific, maternal, and environmental stressors in the context of adolescent weight outcomes. *Children's Health Care*, 1–19. https://doi.org/10.1080/02739615.2017.1383910

Fryar, C. D., Carroll, M. D., & Ogden, C. L. (2014). Prevalence of overweight and obesity among children and adolescents: United States, 1963–1965 Through 2011–2012. *Division of Health and Nutrition Examination Surveys*. https://doi.org/10.1238/Physica.Regular.068a00163

Fuemmeler, B. F., Yang, C., Costanzo, P., Hoyle, R. H., Ph.D, Siegler, I. C., … Østbye, T. (2012). Parenting styles and body mass index trajectories from adolescence to adulthood. *Health Psychology*, 31(4), 441–449. https://doi.org/10.1037/a0027927

Geronimus, A. T. (1992). The weathering hypothesis and the health of African-American women and infants: evidence and speculations. *Ethnicity & Disease*.

Geronimus, A. T. (2001). Understanding and eliminating racial inequalities in women's health in the United States: the role of the weathering conceptual framework. *Journal of the American Medical Women's Association* (1972).

Geronimus, A. T., Hicken, M., Keene, D., & Bound, J. (2006). "Weathering" and age patterns of allostatic load scores among blacks and whites in the United States. *American Journal of Public Health*. https://doi.org/10.2105/AJPH.2004.060749

Geronimus, A. T., & Thompson, J. P. (2004). To denigrate, ignore, or disrupt: Racial Inequality in Health and the Impact of a Policy-induced Breakdown of African American Communities. *Du Bois Review: Social Science Research on Race*, 1(2), 247–279. https://doi.org/DOI: 10.1017/S1742058X04042031

Glanz, K., & Schwartz, M. D. (2008). Stress, coping and health. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), Health Behavior and Health Education: Theory, Research, and Practice (pp. 211–236). San Francisco: Wiley.

Gordon-Larsen, P., Adair, L. S., Nelson, M. C., & Popkin, B. M. (2004). Five-year obesity incidence in the transition period between adolescence and adulthood: the National Longitudinal Study of Adolescent Health. *The American Journal of Clinical Nutrition*, 80(3), 569–575. https://doi.org/10.1093/ajcn/80.3.569

Gordon-Larsen, P., The, N. S., & Adair, L. S. (2010). Longitudinal trends in obesity in the United States from adolescence to the third decade of life. *Obesity*. https://doi.org/10.1038/oby.2009.451

Gottlieb, B. H. (Ed.). (1997). Coping with chronic stress. Coping with Chronic Stress. New York, NY, US: Plenum Press. https://doi.org/10.1007/978-1-4757-9862-3

Gray, M. R., & Steinberg, L. (1999). Unpacking authoritative parenting: reassessing a multidimensional construct. *Journal of Marriage and Family*, 61(3), 574–587. https://doi.org/10.2307/353561

Guajardo, N. R., Snyder, G., & Petersen, R. (2009). Relationships among parenting practices, parental stress, child behaviour, and children's social-cognitive development. *Infant and Child Development*. https://doi.org/10.1002/icd.578

Guilfoyle, S. M., Zeller, M. H., & Modi, A. C. (2010). Parenting stress impacts obesity-specific health-related quality of life in a pediatric obesity treatment-seeking sample. *Journal of Developmental and Behavioral Pediatrics*, 31(1), 17–25. https://doi.org/10.1097/DBP.0b013e3181c73641

Haines, J., Rifas-Shiman, S. L., Horton, N. J., Kleinman, K., Bauer, K. W., Davison, K. K., … Gillman, M. W. (2016). Family functioning and quality of parent-adolescent relationship: cross-sectional associations with adolescent weight-related behaviors and weight status. *The International Journal of Behavioral Nutrition and Physical Activity*, 13, 68. https://doi.org/10.1186/s12966-016-0393-

Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2017). Prevalence of obesity among adults and youth: United States, 2015–2016. NCHS Data Brief, No 288. Hyattsville, MD: National Center for Health Statistics. https://doi.org/10.1017/S1368980017000088

Halfon, N., Larson, K., & Slusser, W. (2013). Associations between obesity and comorbid mental health, developmental, and physical health conditions in a nationally representative sample of us children aged 10 to 17. *Academic Pediatrics*. https://doi.org/10.1016/j.acap.2012.10.007

Harris, K. M., Gordon-Larsen, P., Chantala, K., & Udry, J. R. (2006). Longitudinal trends in race/ethnic disparities in leading health indicators from adolescence to young adulthood. *Archives of Pediatrics & Adolescent Medicine*, 160(1), 74–81. https://doi.org/10.1001/archpedi.160.1.74

Heerman, W. J., Lounds-Taylor, J., Mitchell, S., & Barkin, S. L. (2018). Validity of the toddler feeding questionnaire for measuring parent authoritative and indulgent feeding practices which are associated with stress and health literacy among Latino parents of preschool children. *Nutrition Research*, 49, 107–112. https://doi.org/https://doi.org/10.1016/j.nutres.2017.10.018

Hennessy, E., Hughes, S. O., Goldberg, J. P., Hyatt, R. R., & Economos, C. D. (2010). Parent behavior and child weight status among a diverse group of underserved rural families. *Appetite*. https://doi.org/10.1016/j.appet.2010.01.004

Holland, J. C., Kolko, R. P., Stein, R. I., Welch, R. R., Perri, M. G., Schechtman, K. B., … Wilfley, D. E. (2014). Modifications in parent feeding practices and child diet during family-based behavioral treatment improve child zBMI. *Obesity*. https://doi.org/10.1002/oby.20708

Hruby, A., Manson, J. E., Qi, L., Malik, V. S., Rimm, E. B., Sun, Q., … Hu, F. B. (2016). Determinants and consequences of obesity. *American Journal of Public Health*, 106(9), 1656–1662. https://doi.org/10.2105/AJPH.2016.303326

Hubbs-Tait, L., Kennedy, T. S., Page, M. C., Topham, G. L., & Harrist, A. W. (2008). Parental feeding practices predict authoritative, authoritarian, and permissive parenting styles. *Journal of the American Dietetic Association*, 108(7), 1154–1161. https://doi.org/https://doi.org/10.1016/j.jada.2008.04.008

Huffman, L. E., Wilson, D. K., Van Horn, M. L., & Pate, R. R. (2017). Associations between parenting factors, motivation, and physical activity in overweight African American adolescents. *Annals of Behavioral Medicine*. https://doi.org/10.1007/s12160-017-9919-8

Hughes, S. O., Power, T. G., Liu, Y., Sharp, C., & Nicklas, T. A. (2015). Parent emotional distress and feeding styles in low-income families. The role of parent depression and parenting stress. *Appetite*. https://doi.org/10.1016/j.appet.2015.06.002

Hurley, K. M., Black, M. M., Papas, M. A., & Caufield, L. E. (2008). Maternal symptoms of stress, depression, and anxiety are related to nonresponsive feeding styles in a statewide sample of WIC participants. *The Journal of Nutrition*, 138(4), 799–805. https://doi.org/10.1093/jn/138.4.799

Isasi, C. R., Hua, S., Jung, M., Carnethon, M. R., Perreira, K., Vidot, D. C., … Gallo, L. C. (2017). The association of parental/caregiver chronic stress with youth obesity: Findings from the study of latino youth and the hispanic community health study/study of latinos sociocultural ancillary study. *Childhood Obesity*. https://doi.org/10.1089/chi.2016.0205

Jackson, C., Henriksen, L., & Foshee, V. A. (1998). The authoritative parenting index: Predicting health risk behaviors among children and adolescents. *Health Education & Behavior*, 25(3), 319–337. https://doi.org/10.1177/109019819802500307

Jackson, J. S., Knight, K. M., & Rafferty, J. A. (2010). Race and unhealthy behaviors: chronic stress, the HPA axis, and physical and mental health disparities over the life course. *American Journal of Public Health*, 100(5), 933–939. https://doi.org/10.2105/AJPH.2008.143446

Jones, V. F., Rowland, M. L., Young, L., Atwood, K., Thompson, K., Sterrett, E., … Davis, D. W. (2014). Stakeholder perspectives on barriers for healthy living for low-income african american families. *Frontiers in Pediatrics*, 2, 137. https://doi.org/10.3389/fped.2014.00137

Juonala, M., Magnussen, C. G., Berenson, G. S., Venn, A., Burns, T. L., Sabin, M. A., … Raitakari, O. T. (2011). Childhood adiposity, adult adiposity, and cardiovascular risk factors. *New England Journal of Medicine*, 365(20), 1876–1885. https://doi.org/10.1056/NEJMoa1010112

Kaplan, S. G., Arnold, E. M., Irby, M. B., Boles, K. A., & Skelton, J. A. (2014). Family systems theory and obesity treatment: Applications for clinicians. *Infant, Child & Adolescent Nutrition*, 6(1), 24–29. https://doi.org/10.1177/1941406413516001

Kaur, H., Li, C., Nazir, N., Choi, W. S., Resnicow, K., Birch, L. L., & Ahluwalia, J. S. (2006). Confirmatory factor analysis of the child-feeding questionnaire among parents of adolescents. *Appetite*. https://doi.org/10.1016/j.appet.2006.01.020

Kim, K. H., Bursac, Z., DiLillo, V., White, D. B., & West, D. S. (2009). Stress, race, and body weight. *Health Psychology*, 28(1), 131–135. https://doi.org/10.1037/a0012648

Kim, M. J., McIntosh, W. A., Anding, J., Kubena, K. S., Reed, D. B., & Moon, G. S. (2008). Perceived parenting behaviours predict young adolescents' nutritional intake and body fatness. *Maternal and Child Nutrition*. https://doi.org/10.1111/j.1740-8709.2008.00142.x

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(3), 231–253. https://doi.org/10.1007/s10567-010-0073-0

Law, L. H., Wilson, D. K., St. George, S. M., Kitzman-Ulrich, H., & Kipp, C. J. (2019). Families Improving Together (FIT) for Weight Loss: A resource for translation of a climate-based intervention into community settings. *Translational Behavioral Medicine*. doi: 10.1093/tbm/ibz020.

Lazarus, R. S., & Folkman, S. (1984). Stress, appraisal, and coping. New York: Springer.

Lee, E.-H. (2012). Review of the psychometric evidence of the perceived stress scale. Asian Nursing Research, 6(4), 121–127. https://doi.org/https://doi.org/10.1016/j.anr.2012.08.004

Lee, H., Harris, K. M., & Lee, J. (2013). Multiple levels of social disadvantage and links to obesity in adolescence and young adulthood. *The Journal of School Health*, 83(3), 139–149. https://doi.org/10.1111/josh.12009

Leppert, B., Junge, K. M., Röder, S., Borte, M., Stangl, G. I., Wright, R. J., … Trump, S. (2018). Early maternal perceived stress and children's BMI: longitudinal impact and influencing factors. *BMC Public Health*, 18(1), 1211. https://doi.org/10.1186/s12889-018-6110-5

Lohman, B. J., Stewart, S., Gundersen, C., Garasky, S., & Eisenmann, J. C. (2009). Adolescent overweight and obesity: Links to food insecurity and individual, maternal, and family stressors. *Journal of Adolescent Health*, 45(3), 230–237. https://doi.org/https://doi.org/10.1016/j.jadohealth.2009.01.003

Loncar, H., Wilson, D. K., & Zarrett, N. (2019). Associations among parenting style, parental feeding practices and adolescent self-efficacy for diet and obesity in african american adolescents. Manuscript Submitted for Publication.

Loth, K. a, Maclehose, R. F., Fulkeson, J. A., Crow, S., & Sztainer, D. N. (2013). Food-related parenting practices and adolescent weight status: a population-based study. *Pediatrics*. https://doi.org/10.1542/peds.2012-3073

Lovasi, G. S., Hutson, M. A., Guerra, M., & Neckerman, K. M. (2009). Built environments and obesity in disadvantaged populations. *Epidemiologic Reviews*, 31(1), 7–20. https://doi.org/10.1093/epirev/mxp005

McCurdy, K., Gorman, K. S., & Metallinos-Katsaras, E. (2010). From poverty to food insecurity and child overweight: A family stress approach. *Child Development Perspectives*, 4(2), 144–151. https://doi.org/10.1111/j.1750-8606.2010.00133.x

McMahon, S. D., Felix, E. D., & Nagarajan, T. (2011). Social support and neighborhood stressors among african american youth: Networks and relations to self-worth. *Journal of Child and Family Studies*, 20(3), 255–262. https://doi.org/10.1007/s10826-010-9386-3

Mitchell, S., Brennan, L., Hayes, L., & Miles, C. L. (2009). Maternal psychosocial predictors of controlling parental feeding styles and practices. *Appetite*, 53(3), 384–389. https://doi.org/https://doi.org/10.1016/j.appet.2009.08.001

Nguyen-Rodriguez, S. T., Chou, C.-P., Unger, J. B., & Spruijt-Metz, D. (2008). BMI as a moderator of perceived stress and emotional eating in adolescents. *Eating Behaviors*, 9(2), 238–246. https://doi.org/https://doi.org/10.1016/j.eatbeh.2007.09.001

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the united states, 2011-2012. *Journal of the American Medical Association*, 311(8), 806–814. https://doi.org/10.1001/jama.2014.732

Ogden, C. L., Carroll, M. D., Lawman, H. G., Fryar, C. D., Kruszon-Moran, D., Kit, B. K., & Flegal, K. M. (2016). Trends in obesity prevalence among children and adolescents in the United States, 1988-1994 through 2013-2014. *Journal of the American Medical Association*, 315(21), 2292–2299. https://doi.org/10.1001/jama.2016.6361

Ong, A. D., Fuller-Rowell, T., & Burrow, A. L. (2009). Racial discrimination and the stress process. *Journal of Personality and Social Psychology*. https://doi.org/10.1037/a0015335

Parks, E. P., Kazak, A., Kumanyika, S., Lewis, L., & Barg, F. K. (2016). Perspectives on stress, parenting, and children's obesity-related behaviors in Black families. *Health Education & Behavior*, 43(6), 632–640. https://doi.org/10.1177/1090198115620418

Parks, E. P., Kumanyika, S., Moore, R. H., Stettler, N., Wrotniak, B. H., & Kazak, A. (2012). Influence of stress in parents on child obesity and related behaviors. *Pediatrics*, 130(5), e1096–e1104. https://doi.org/10.1542/peds.2012-0895

Parletta, N., Peters, J., Owen, A., Tsiros, M. D., & Brennan, L. (2012). Parenting styles, communication and child/adolescent diets and weight status: let's talk about it. *Early Child Development and Care*, 182(8), 1089–1103. https://doi.org/10.1080/03004430.2012.678597

Richardson, A. S., Arsenault, J. E., Cates, S. C., & Muth, M. K. (2015). Perceived stress, unhealthy eating behaviors, and severe obesity in low-income women. *Nutrition Journal*, 14, 122. https://doi.org/10.1186/s12937-015-0110-4

Roberti, J. W., Harrington, L. N., & Storch, E. A. (2006). Further psychometric support for the 10-item version of the perceived stress scale. *Journal of College Counseling*, 9(2), 135–147. https://doi.org/10.1002/j.2161-1882.2006.tb00100.x

Schmidt, R., Richter, R., Brauhardt, A., Hiemisch, A., Kiess, W., & Hilbert, A. (2017). Parental feeding practices in families with children aged 2–13 years: Psychometric properties and child age-specific norms of the German version of the Child Feeding Questionnaire (CFQ). *Appetite*. https://doi.org/10.1016/j.appet.2016.11.038

Schofield, T. J., Conger, R. D., Gonzales, J. E., & Merrick, M. T. (2016). Harsh parenting, physical health, and the protective role of positive parent-adolescent relationships. *Social Science & Medicine* (1982), 157, 18–26. https://doi.org/10.1016/j.socscimed.2016.03.027

Shankardass, K., McConnell, R., Jerrett, M., Lam, C., Wolch, J., Milam, J., … Berhane, K. (2013). Parental stress increases body mass index trajectory in pre-adolescents. *Pediatric Obesity*, 9(6), 435–442. https://doi.org/10.1111/j.2047-6310.2013.00208.x

Shloim, N., Edelson, L. R., Martin, N., & Hetherington, M. M. (2015). Parenting styles, feeding styles, feeding practices, and weight status in 4-12 year-old children: A systematic review of the literature. *Frontiers in Psychology*, 6, 1849. https://doi.org/10.3389/fpsyg.2015.01849

Sims, R., Gordon, S., Garcia, W., Clark, E., Monye, D., Callender, C., & Campbell, A. (2008). Perceived stress and eating behaviors in a community-based sample of African Americans. *Eating Behaviors*, 9(2), 137–142. https://doi.org/https://doi.org/10.1016/j.eatbeh.2007.06.006

Sleddens, E. F. C., Gerards, S. M. P. L., Thijs, C., De Vries, N. K., & Kremers, S. P. J. (2011). General parenting, childhood overweight and obesity-inducing behaviors: A review. *International Journal of Pediatric Obesity*. https://doi.org/10.3109/17477166.2011.566339

Sokol, R. L., Qin, B., & Poti, J. M. (2017). Parenting styles and body mass index: a systematic review of prospective studies among children. *Obesity Reviews*. https://doi.org/10.1111/obr.12497

Tajik, E., Zulkefli, N. A. M., Baharom, A., Minhat, H. S., & Latiff, L. A. (2014). Contributing factors of obesity among stressed adolescents. *Electronic Physician*, 6(1), 771–778. https://doi.org/10.14661/2014.771-778

Tate, E. B., Wood, W., Liao, Y., & Dunton, G. F. (2015). Do stressed mothers have heavier children? A meta-analysis on the relationship between maternal stress and child body mass index. *Obesity Reviews*. https://doi.org/10.1111/obr.12262

Taylor, Z. E., & Conger, R. D. (2017). Promoting strengths and resilience in single-mother families. *Child Development*, 88(2), 350–358. https://doi.org/10.1111/cdev.12741

Tomiyama, A. J. (2019). Stress and obesity. *Annual Review of Psychology*, 70(1), 703–718. https://doi.org/10.1146/annurev-psych-010418-102936

Tomiyama, A. J., Puterman, E., Epel, E. S., Rehkopf, D. H., & Laraia, B. A. (2012). Chronic psychological stress and racial disparities in body mass index change between black and white girls aged 10–19. *Annals of Behavioral Medicine*, 45(1), 3–12. https://doi.org/10.1007/s12160-012-9398-x

Tovar, A., Hennessy, E., Pirie, A., Must, A., Gute, D. M., Hyatt, R. R., … Economos, C. D. (2012). Feeding styles and child weight status among recent immigrant mother-child dyads. *The International Journal of Behavioral Nutrition and Physical Activity*, 9, 62. https://doi.org/10.1186/1479-5868-9-62

Towner, E. K., Reiter-Purtil, J., Boles, R. E., & Zeller, M. H. (2015). Predictors of caregiver feeding practices differentiating persistently obese from persistently non-overweight adolescents. *Appetite*. https://doi.org/10.1016/j.appet.2014.08.015

van Jaarsveld, C. H. M., Fidler, J. A., Steptoe, A., Boniface, D., & Wardle, J. (2009). Perceived stress and weight gain in adolescence: A longitudinal analysis. *Obesity*, 17(12), 2155–2161. https://doi.org/10.1038/oby.2009.183

Vollmer, R. L., & Mobley, A. R. (2013). Parenting styles, feeding styles, and their influence on child obesogenic behaviors and body weight. A review. *Appetite*, 71, 232–241. https://doi.org/https://doi.org/10.1016/j.appet.2013.08.015

Walton, K., Simpson, J. R., Darlington, G., & Haines, J. (2014). Parenting stress: a cross-sectional analysis of associations with childhood obesity, physical activity, and TV viewing. *BMC Pediatrics*, 14(1), 244. https://doi.org/10.1186/1471-2431-14-244

Watt, T. T., Appel, L., Roberts, K., Flores, B., & Morris, S. (2013). Sugar, stress, and the supplemental nutrition assistance program: Early childhood obesity risks among a clinic-based sample of low-income hispanics. *Journal of Community Health*. https://doi.org/10.1007/s10900-012-9641-1

Wilson, D. K., Kitzman-Ulrich, H., Resnicow, K., Lee Van Horn, M., St. George, S. M., Rebekah Siceloff, E., … Prinz, R. (2015). An overview of the Families Improving Together (FIT) for Weight Loss randomized controlled trial in African American families. *Contemporary Clinical Trials*, 42, 145–157. https://doi.org/10.1016/j.cct.2015.03.009

Wilson, D. K., Sweeney, A. M., Kitzman-Ulrich, H., Gause, H., & St. George, S. M. (2017). Promoting social nurturance and positive social environments to reduce obesity in high risk youth. *Clinical Child and Family Psychology Review*, 20(1), 64–77. https://doi.org/10.1007/s10567-017-0230-9

Wilson, S. M., & Sato, A. F. (2014). Stress and paediatric obesity: What we know and where to go. *Stress and Health*. https://doi.org/10.1002/smi.2501

Wilson, T. A., Liu, Y., Adolph, A. L., Sacher, P. M., Barlow, S. E., Pont, S., … Butte, N. F. (2019). Behavior modification of diet and parent feeding practices in a community- vs primary care-centered intervention for childhood obesity. *Journal of Nutrition Education and Behavior*, 51(2), 150–161.e1. https://doi.org/10.1016/j.jneb.2018.05.010

Zeller, M. H., Reiter-Purtill, J., Modi, A. C., Gutzwiller, J., Vannatta, K., & Davies, W. H. (2012). Controlled study of critical parent and family factors in the obesigenic environment. *Obesity*, 15(1), 126. https://doi.org/10.1038/oby.2007.517