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Effects of Parenting and Self-Efficacy on Diet, Family Mealtime and Weight-Related Outcomes in African American Adolescents

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ABSTRACT

Despite substantial research and concern, adolescent overweight and obesity continues to be a significant public health problem. Theory based on developmental literature emphasizes the role of adolescent self-regulatory factors, like self-efficacy, in health behavior engagement and weight-related outcomes. There is also extensive literature that highlights parents' role in promoting self-regulatory development through warm and responsive behaviors and practices. However, few studies have considered longitudinal associations and changes in weight-related outcomes over time, as well as moderated effects by parenting. This study assessed longitudinal associations between adolescent self-efficacy parenting factors and adolescent BMI, diet, and family mealtime to fill gaps in current literature. It was hypothesized that greater improvements in adolescent self-efficacy would be associated with greater improvements over time on adolescent weight-related outcomes (improved zBMI, increases in fruit and vegetable intake, decreases in fat intake and kilocaloric intake, and improvements in family mealtime). Moreover, it was hypothesized that increases in warm, responsive parenting (more responsive, greater responsibility) would be associated with greater improvements over time in adolescent BMI, diet, and family mealtime outcomes. Conversely, increases in parental demandingness and monitoring were hypothesized to be associated with less desirable BMI, diet, and family mealtime outcomes over time. A second aim of this study was to investigate the moderating effects of parenting factors on adolescent self-efficacy in predicting adolescent zBMI, diet, and mealtime related outcomes. It was hypothesized

that increases in responsive parenting (responsiveness, parental responsibility) would be related to a more positive association between self-efficacy and adolescent healthier outcomes, while more demanding parenting (demandingness, parental monitoring) would be related to a negative association between self-efficacy and adolescent BMI, diet, and family mealtime outcomes over time. This study used longitudinal data from families enrolled in the Families Improving Together (FIT) for Weight Loss trial (n = 241; $M_{adolescent\ age}$ = 12.83 years; 64% female; $M_{BMI\%}$ = 96.6%) to test these associations and interactions from baseline to 16-weeks. The hypotheses for the study were only partially supported. There were no significant associations between adolescent self-efficacy and weight-related outcomes. Significant main effects demonstrated temporal stability of some variables. Parental responsiveness was positively related to kCal (*Estimate*=127.37, *SE = 63.65*, $p<0.05$) and fat intake (*Estimate*=6.15, *SE = 2.46*, $p<0.01$), which was contrary to the hypothesized direction. However, as expected, parental responsiveness was positively associated with frequency of family meals (*Coefficient*=0.43, *SE* = 0.10, $p<0.01$) and parental responsibility was positively associated with quality of family meals (*Coefficient*=0.35, *SE = .18*, $p<0.05$). Significant two-way interactions with time were also found. Parental responsibility over time was related to zBMI in an unexpected direction (*Estimate*=0.09, *SE* = 0.02, $p<0.01$), and parental monitoring over time was related to zBMI in an unexpected direction (*Estimate*=-0.10, *SE* = 0.02, $p<0.01$). However, parental responsiveness (*Coefficient*=0.16, *SE* = 0.08, $p=0.04$) and parental demandingness (*Coefficient*=-0.25, *SE* = 0.08, $p<0.01$) both predicted quality of family mealtime over time in the expected direction. Results also indicated three significant three-way interactions that were in unexpected directions. Specifically, three-way

interactions between adolescent self-efficacy, time, and parental demandingness on kCal intake (*Estimate*=62.83, $SE = 28.13$, $p<0.05$) and fat intake (*Estimate*=3.09, $SE = 1.09$, $p<0.01$) revealed unexpected findings, such that self-efficacy was associated with greater kCal/fat intake among adolescents with parents who practiced low demandingness and lower kCal/fat intake among those with parents who practiced high demandingness. Additionally, there was a significant three-way interaction between adolescent self-efficacy, time, and parental responsibility for their adolescent's diet in predicting frequency of family meals (*Estimate*=0.12, $SE = 0.04$, $p<0.01$), such that lower self-efficacy was associated with more frequent family meals for adolescents with highly responsible parents during baseline (0-weeks) and post-group (8-weeks). Results from this study may provide directions for future research and have implications for adolescent overweight/obesity prevention and interventions through family-based programs.

Keywords: Parenting, Adolescent self-efficacy, Family mealtime, African American

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CHAPTER ONE

INTRODUCTION

Childhood overweight and obesity remain a significant health concern in the United States (Ogden, Carroll, Lawman, et al., 2016). This problem is particularly salient in African American families, where nearly 40% of adolescents are overweight or obese (Ogden, Carroll, Kit, et al., 2016). Persistence of childhood obesity prevalence is alarming as it is predictive of numerous serious health conditions, including hypertension and diabetes (Kohut et al., 2019). Continued evaluation of factors that may contribute to adolescent obesity and related health disparities is needed to determine efficacious prevention and treatment approaches. One relationship that has been studied involves that connections between cognitive factors and health outcomes in adolescents. Specifically, self-regulatory skills, including self-efficacy, have gained scholars' attention for their association with adolescents' weight related outcomes.

Recent studies have highlighted the associations between adolescents' perceived self-efficacy for health outcomes such as BMI and diet, as well as family mealtime (Bandura, 2004; Dallacker et al., 2018, Hill et al., 11998, Milleret al., 2020; Robson, Allen, & Howard, 2020). Self-efficacy is one's belief in his or her ability to engage in a specific action to reach an anticipated outcome and is considered a key predictor of intentions and behaviors (Bandura 1986, 1997). Research shows associations among adolescent's self-efficacy beliefs and engagement in specific actions, such as health behaviors (Greve et

al., 2001). Similarly, self-regulation relates to an individual's ability to regulate his or her own behaviors, cognitions, and emotions (Baker et al., 2019). Literature suggests that these two concepts are closely related as emergent self-efficacy triggers self-regulatory processes, such as goal-setting and self-monitoring (Bandura, 2004; Zimmerman, 2000). A recent review highlights these associations between self-regulatory processes and weight-related outcomes and found that greater self-efficacy and self-regulation are largely related to more desirable health outcomes, such as healthier diet or healthier body mass index (BMI) in youth (Robson et al.,2020). Some research also established a link between adolescent self-efficacy and self-regulation and family mealtime (Dallacker et al, 2018; De wit et al, 2013). Examining these relationships in adolescents is particularly important, as adolescence is a critical developmental period where youth become more independent and cultivate self-efficacy (Keshavarz & Mounts, 2017).

Sufficient evidence exists in broader literature to suggest marked relationships between self-efficacy and BMI and diet in adolescents (Dowda et al., 2020; Pajares, 2006; Schunk & DiBenedetto, 2019). Namely, cross-sectional findings suggest that greater self-efficacy is associated with healthier adolescent outcomes, such as healthier BMI and dietary intake (Prioste et al., 2017; Steele et al., 2011a). However, few studies have investigated how associations between these variables may change over time. One recent study evaluated longitudinal effects of a self-efficacy intervention aimed to increase fruit and vegetable intake in adolescents (Luszczynska et al., 2016). Luszczynska and colleagues (2016) found that adolescents who received interventions based on behavioral change principles – aimed to increase planning and self-efficacy for fruit and vegetable consumption – demonstrated increases in fruit and vegetable intake after 14 months

(Luszczynska et al., 2016). However, the authors found no relationship between the intervention and adolescents' body weight. In addition to suggesting that dietary self-efficacy is a promising target for improving health outcomes, this past study suggests that changes in dietary self-efficacy are related to changes in health outcomes over time. Specifically, increases in dietary self-efficacy may be associated with increases in healthful dietary intake and greater weight-loss. Therefore, this study will assess the relationship between adolescent self-efficacy and BMI and diet over time in an entirely overweight, African American adolescent sample.

Despite significant literature on the relationships between self-efficacy and BMI and diet outcomes, there is little research on the relationships between self-efficacy and family mealtime. Existing literature has suggested that greater self-efficacy is established through increasing practical skills in an area (Bandura, 1977). For instance, engagement in food-related behaviors such as grocery shopping and meal preparation may increase practical skills, thereby increasing self-efficacy. In turn, engagement in these meal-related behaviors may lead to increased engagement and enjoyment of family meals (Dallacker et al., 2018; Hill et al 1998). One study found a direct relationship between self-efficacy and family mealtime. Woodruff and colleagues (2013) found that children and adolescents with higher self-efficacy had greater family dinner frequency when compared to children with lower self-efficacy (Woodruff & Kirby, 2013). The study assessed these relationships in primarily white participants and is one of the only known studies to assess these direct relationships. The present study will fill a gap in literature to assess the relationship between self-efficacy and family mealtime outcomes in overweight, African American families.

In addition to self-efficacy, parenting factors, such as parenting style and feeding practices, have also been associated with adolescent health and related outcomes. Specifically, past research highlights the relationship between parenting style and feeding practices on adolescent BMI and weight-related outcomes (Loncar et al., 2021; Pearson et al., 2012; Shloim et al., 2015a; Thomson et al., 2020; Vaughn et al., 2016). More so, parenting styles and parenting practices have been linked to family mealtime behaviors (Ardakani et al., 2023; Kitzman et al., 2010; Wilson et al., 2021). Parenting styles are categorized by the responsiveness and demandingness that parents practice with their children (Baumrind, 1971; Maccoby & Martin, 1983). Authoritative (high responsiveness, high demandingness) and authoritarian (low responsiveness, high demandingness) are commonly considered in literature. Authoritative parenting has been associated with a broad range of desirable health outcomes, including healthier zBMI and more nutritious dietary intake, in adolescents as it balances age-appropriate expectations with warm and supportive interactions (Berge et al., 2010a; Blissett & Bennett, 2013a; Burton et al., 2017; Franchini et al., 2011; Kiefner-Burmeister & Hinman, 2020; Loncar et al., 2021c; Shloim et al., 2015b; Sleddens et al., 2008). However, most of this research is cross-sectional in design and examines these associations in younger population. Additionally, authoritative parenting style has been associated with increased family meal frequency (Ardakani et al., 2023; Wilson et al, 2021). Though there is limited literature outlining associations with parenting style and quality of family mealtime, concepts of authoritative parenting (e.g. responsiveness) map onto factors for higher quality meals. Though experts suggest that parenting style is generally a time-stable construct, insufficient longitudinal data exists to conclude parenting style does not change over time

(Darling & Steinberg, 1993). The current study aims to add to existing literature by providing a longitudinal perspective on the changes over time and moderating effects of parenting and self-efficacy on adolescent BMI and diet.

Parental feeding practices, which involve parents' behaviors that affect their child's eating, are also a popular metric for understanding the relationship between parenting behaviors and adolescent BMI and diet, as well as family mealtime (Ardakani et al., 2023; Birch et al., 2001a; Gevers et al., 2014; Wilson et al., 2021). These practices vary in their perceived responsiveness and demandingness, where parental responsibility for their adolescent's diet highlights areas of support around diet, while parental monitoring for adolescent dietary intake involves aspects of control surrounding the adolescent's diet. Unlike parenting style, experts suggest that parenting practices, such as parental responsibility and monitoring of adolescent diet, may fluctuate over time (Baumrind, 1971; Darling & Steinberg, 1993). However, the bulk of existing literature is cross-sectional in design, limiting the interpretation of longitudinal relationships and changes over time among parenting factors and adolescent BMI and diet (Blissett, 2011; Loncar et al., 2021; Rollins et al., 2016; Shloim et al., 2015a; Wilson et al., 2002). More so, limited research exists that examines the association between parental feeding practices and family mealtime frequency or quality. Holland and colleagues (2014) investigated changes in parental feeding practices over time in their family-based behavioral intervention to improve child BMI (n=170, 7 -11 years). The researchers found that increases in perceived parental responsibility for adolescents' diet was associated with decreases in child zBMI (Holland et al., 2014). These results highlight the relationship between parenting factors and adolescent health and suggest that changes

in parenting are followed by changes in adolescent health. Recent cross-sectional literature provides additional support that feeding practices, responsibility and monitoring, are associated with adolescent weight-related outcomes (Schmidt et al., 2017; Shloim et al., 2015a). Namely, greater parental responsibility has been related to healthier adolescent BMI, while greater parental monitoring has been associated with higher adolescent BMI (Burton et al., 2017; Holland et al., 2014; Schmidt et al., 2017; Towner et al., 2015). Given the limitations of cross-sectional evidence, the present study will assess these parenting measures using a longitudinal design and focus on evaluating how changes overtime impact adolescent BMI, diet, and family mealtime.

While literature adequately outlines the direct associations between adolescent self-efficacy and health outcomes and parenting factors and health outcomes, less research has focused on how parenting style and feeding practices can modify the relationship between adolescent self-regulatory factors on adolescent BMI, diet, and family mealtime. Theoretical and developmental literature has emphasized that warm and responsive parenting style and practices promote key developmental tasks such as building self-efficacy, self-regulation, and autonomy in adolescents (Biglan et al., 2012; Greve et al., 2001; Keshavarz & Mounts, 2017; Smetana et al., 2006). Parents may foster this development through both general parenting styles, such as warm and responsive authoritative parenting, as well as specific parental feeding practices that map onto those dimensions. Specifically, parents may support dietary self-regulation and self-efficacy through appropriate engagement with their adolescent. Promotion of these cognitive factors is essential as research suggests that self-regulation and self-efficacy are critical predictors of health behavior engagement and weight-related outcomes (Burns, 2019;

O'Dea & Wilson, 2006; Robson, D.A. et al., 2020). Conversely, parenting characterized by low responsiveness (i.e. authoritarian parenting) or is not autonomy-supportive may impede the development of these skills, relating to poorer BMI and diet in adolescents (Kipp et al., 2021; Loncar et al., 2021; Shloim et al., 2015; Sleddens et al., 2011; Wilson et al., 2017). Additionally, literature shows that more supportive parental feeding practices, such as providing adolescents autonomy for healthy meals, encourage adolescent self-efficacy and self-regulation development and may therefore modify the relationship between self-efficacy and BMI and diet in adolescents (Holland et al., 2014; LeCuyer et al., 2011). Warm and responsive parenting may also be related to the frequency of family meals and the perceived quality of those meals (Ardakani et al., 2023; Wilson et al., 2021). Therefore, the current study will investigate the potential interaction of parenting factors and adolescent self-efficacy in predicting adolescent weight-status, dietary outcomes, and family mealtime in overweight, African American adolescents.

In sum, parenting factors play an important role in adolescent development domains, including self-regulation and self-efficacy development (Biglan et al., 2012; Tabak & Zawadzka, 2017; Wilson et al., 2017). Specifically, familial influences such as parenting style (responsiveness and demandingness) and feeding practices relate to adolescent's self-efficacy and may be linked to weight-related outcomes such as BMI, diet, and family mealtime outcomes (Gestsdottir & Lerner, 2008; Keshavarz & Mounts, 2017; Masten, 2004; Schunk & Pajares, 2002). Thus, this proposed study will examine the moderating effect of parenting factors on self-efficacy in predicting adolescent BMI, diet, and family mealtime outcomes in overweight, African American adolescents.

1.1 Theoretical Framework

Family systems theory. The Family Systems Theory (FST) highlights the importance of the family system in understanding and explaining individual behavior (Broderick, 1993). According to FST, families' functionality hinges on the types of interactions members have with each other. Positive interactions, such as warm and supportive parent-adolescent exchanges, have been associated with a number of desirable health outcomes, including improvements in adolescent overweight and obesity and increasing frequency and quality of family meals (Biglan et al., 2012; Kitzman-Ulrich et al., 2010; Parletta, Peters, Owen, Tsiros, & Brennan, 2012; Shloim et al., 2015; Wilson et al., 2021). Authoritative parenting is one parenting factor that promotes a positive environment through parents' developmentally appropriate expectations and warmth. This type of environment may foster the development of key psychological factors, such as self-regulation and self-efficacy, and thereby influence adolescent health. In fact, adolescents with authoritative parents typically experience more desirable health outcomes, such as having a healthier weight-status or consuming a more nutritious diet. Additionally, authoritative parenting may have impacts on family mealtime frequency and quality, whereby responsive parenting relates to more frequent family meals that adolescents enjoy. These effects, in turn, can affect child and adolescent weight-related outcomes (Berge et al., 2014; Berge et al., 2015; Dallacker et al., 2019).

As parents shape their adolescent's home environment, they may influence several relationships and outcomes. Namely, authoritative parenting style and practices may act as a buffer for at-risk adolescents and undesirable health outcomes. For instance, Connell and Francis (2014) examined the moderating effects of parenting on the

longitudinal relationship between child self-regulation and weight-status. The authors found that warm and responsive parenting led to a stronger relationship between self-regulation and healthier weight-status in boys when compared to peers with less authoritative parents. While literature specifically examining this type of interaction is limited, the FST highlights the potential influence that parents have on the home environment and may consequently influence BMI and diet in adolescents. Specifically, FST suggests that parents' overall ability to shape environmental factors results in their influence in numerous contexts, including the relationship between adolescent self-efficacy and health outcomes (e.g., diet and weight related outcomes). Importantly, parenting practices may change over time. These changes, according to FST, may precipitate changes in adolescent BMI and diet (Boele et al., 2020). Changes in parenting practices, such as parental feeding practices, may also affect both quantity and quality of family meals (Ardakani et al., 2023). This present study aims to specifically assess how changes in parenting factors relate to changes in adolescent BMI, diet, and family mealtime over time. The FST framework highlights how engaging the family system in weight-related interventions can promote positive health outcomes through addressing the parenting factors. This framework suggests that changes in parenting factors, such as increased parental warmth, responsiveness, and responsibility, may result in improvements in health behavior changes in adolescents. Additionally, more responsive parents may initiate more family meals, creating a positive climate for familial interactions and fostering opportunities for health behavior changes. Higher responsiveness and responsibility that is characteristic of authoritative parenting may also influence the quality of mealtime, as adolescents may perceive the supportive mealtime

environment to be more enjoyable. The FST framework is essential in considering interactions between parenting factors and adolescent self-efficacy in predicting adolescent BMI, diet, and family mealtime over time. Namely, this framework emphasizes that parenting factors may interact with various aspects of adolescent development, including self-regulatory factors, to ultimately improve adolescent weight-related, dietary, and family mealtime outcomes (Kitzman-Ulrich et al., 2010).

Social Cognitive Theory. Social cognitive theory (SCT) is considered a theory of reciprocal determinism and asserts that personal, environmental, and behavioral factors reciprocally interact to determine behavior engagement (Bandura, 1986). SCT considers self-efficacy to be an essential and flexible determinant for health behaviors (Bandura, 1977; Bandura, 1998). The SCT notes that self-efficacy is a critical prerequisite for behavior participation, where an individual that believes they are capable of performing a behavior is more likely to engage in that behavior over time. Self-efficacy is closely related to self-regulation, a known predictor of adolescent BMI and diet (Francis & Susman, 2009; Seeyave et al., 2009; Tsukayama et al., 2008). Specifically, perceived self-efficacy is one determinant of self-regulatory behaviors. For instance, adolescents' who have greater self-efficacy for eating nutritiously are more likely to engage in behaviors such as goal-setting, planning, problem-solving, and self-monitoring for their diet (Bandura, 2004). Overall, both self-efficacy and self-regulation are mechanisms related to an adolescent's ability to control their environment and behavior.

The SCT details the importance of self-efficacy development in children, as it relates to numerous specific health outcomes. In addition to successful mastery the behavior, self-efficacy can be increased through environmental factors. Literature shows

that parenting styles and practices are known contributors to self-efficacy development in children. Given the nature of developmental experiences, self-efficacy is largely considered a construct that can change over time given the presentation of various situational factors (Bandura, 1997). For instance, authoritative parenting style and practices have been associated with long-term benefits for adolescent's self-efficacy (Schunk & Pajares, 2002). Authoritative parents provide an autonomy-supportive environment that allows adolescents to build their self-efficacy through mastery experiences and opportunities (Keshavarz & Mounts, 2017). More so, these parents typically provide emotional support and encouragement that also serve to improve adolescents' self-efficacy. In presenting this environment, authoritative parenting style and responsive practices may increase adolescent's self-efficacy. For instance, parental responsiveness during family meals may create an ideal environment for fostering dietary self-efficacy. In doing so, authoritative parents help their adolescents develop critical self-regulation and consequently increase desired behaviors including positive health behaviors related weight management and diet (Jackson, L.M., Pratt, Hunsberger, & Pancer, 2005).

Parents may also affect relationships between adolescents' self-efficacy and BMI and diet. The SCT highlights the environmental influence on self-efficacy, suggesting home environment itself may be an important determinant of behavior engagement. This study aims to assess how changes in adolescent self-efficacy relate to changes in BMI, diet, and family mealtime over time. The social cognitive theory provides a foundation for predicting this relationship, where positive changes in self-efficacy will be associated with positive changes in health outcomes such as BMI and dietary factors, as well as

increases in the quantity and quality of family mealtime. More so, the home environment that parents create through their parenting styles and behaviors may interact with adolescent self-efficacy to create stronger, more positive associations with adolescent BMI, diet, and family mealtime. The proposed study aims to investigate the modifying role of parenting factors on adolescent self-efficacy in predicting BMI, diet, and family mealtime. Given the foundations of the social cognitive theory and parents' ability to shape adolescent self-efficacy through self-regulatory support and offering mastery experiences, warm and responsive parenting may interact with adolescent self-efficacy to predict more positive health outcomes related to BMI, diet, and family mealtime. Alternatively, demanding and unsupportive parenting may interact with adolescent self-efficacy to worsen a negative relationship with adolescent BMI, diet, and family mealtime.

1.2 Prior Literature on Self-Efficacy, Adolescent BMI, Diet, and Family Mealtime

A considerable amount of research has investigated the direct relationships between adolescent dietary self-efficacy and BMI and dietary outcomes. However, much of this literature is cross-sectional and does not investigate these relationships over time. The following sections review current literature that examines associations between adolescent self-efficacy and BMI, fruit and vegetable intake, fat intake, kcal intake, and family mealtime.

BMI. Recent research has shown that greater adolescent self-efficacy is related to adolescent BMI. Some of these studies have investigated the association in the context of weight-related interventions. For instance, Lee and colleagues (2020) recently examined the effects of a nutrition-based intervention on obese adolescents' dietary self-efficacy

and BMI (Lee et al., 2020). The researchers found that over the course of the program, changes in adolescent dietary self-efficacy were significantly associated with changes in BMI for adolescents in the intervention (dietary education) group, such that increases in self-efficacy related to decreases in BMI (n = 168, average 10.95 years, Korean sample). This finding not only highlights the relationship between adolescent self-efficacy and BMI, but also emphasizes direct influence of self-regulation on weight-status over time. Similarly, Miri and colleagues (2019) studied the effects of a randomized controlled trial aimed to improve nutrition in adolescents with overweight and obesity (n = 55;13 – 18 years). The results of the study indicated that greater adolescent self-efficacy was related to decreases in BMI (Miri et al., 2019). Results of this study signify the benefits of interventions aimed to increase aspects of self-regulation among overweight adolescents. Specifically, this recent study demonstrates that self-regulatory factors are a meaningful point of intervention for adolescents with overweight and obesity. Another recent study assessed the effects of an obesity prevention study for families (Herget et al., 2015). Herget and colleagues (2015) found that over the course of study, adolescents' self-efficacy was not significantly related to changes in BMI (n = 157, 10-17 years). However, general self-efficacy may not directly map onto dietary self-efficacy and this distinction may have contributed to the null finding.

Though longitudinal research is limited, numerous cross-sectional studies have highlighted the significant associations between adolescent self-efficacy and BMI. Results of these studies have primarily supported an inverse relationship between these two variables, where greater self-efficacy is related to healthier BMI and lower self-efficacy is related to higher BMI (Fu et al., 2020; Gamble et al., 2009; Miri et al., 2017;

O’Dea & Wilson, 2006; Steele et al., 2011b; Woltering et al., 2021). Some of these studies have drawn direct comparisons between normal weight and overweight/obese adolescents. Specifically, when grouped separately, overweight and obese adolescents reported significantly lower weight-related self-efficacy when compared to normal weight adolescents (Miri et al., 2017; Steele et al., 2011b; Woltering et al., 2021). However, other studies have found associations in unexpected directions (Brogan et al., 2012; Williams et al., 2020). Namely, Brogan and colleagues (2012) found that when normal weight and obese adolescents were compared, there was a positive association between higher self-efficacy and obesity (Brogan et al., 2012; n = 67, 12 – 17 years, 100% African American). Despite these findings, several recent cross-sectional studies found no association between adolescent self-efficacy and BMI (Chae et al., 2018; Lloyd-Richardson et al., 2012; Prioste et al., 2017; Rinderknecht & Smith, 2004; Ward et al., 2006). These mixed findings support the need for further longitudinal research that evaluates changes over time in adolescent self-efficacy on predicting BMI and dietary outcomes.

Diet. Of the health outcomes of interest, the majority of recent research has focused on investigating the role of adolescent self-efficacy in fruit and vegetable intake (Bere & Klepp, 2004; Bruening et al., 2010; Cho & Kim, 2018; Franko et al., 2013; Granner & Evans, 2012; Lotrean & Tutui, 2015; Monge-Rojas et al., 2002; Parks et al., 2018; Pearson et al., 2011b, 2017; Sato et al., 2020; Trude et al., 2016; Vereecken et al., 2005; Zabinski et al., 2006). While current literature primarily focuses on cross-sectional effects, two longitudinal studies have assessed the relationship between adolescent self-efficacy and fruit and vegetable consumption over time. Bere and Klepp (2005) assessed

a large sample of adolescents (average age at baseline 11.8 years) to determine whether SCT constructs were related to fruit and vegetable intake. The results of their study not only indicated correlations between self-efficacy and fruit and vegetable consumption, but also found that changes in adolescent self-efficacy were significantly related to changes in fruit and vegetable intake over time (Bere & Klepp, 2005; n = 1950, 10-12 years). In a more recent longitudinal study, Pearson and colleagues (2011) surveyed Australian adolescents during their 7th year in school and again two years later to determine predictors for dietary intake (n = 1850, 12 – 15 years). The authors found that adolescent self-efficacy for increasing fruit predicted increases in fruit consumption and vegetable consumption approximately one year later (Pearson et al., 2011b). The bulk of existing cross-sectional literature has also found that adolescent self-efficacy is associated with fruit and vegetable intake (Bere & Klepp, 2004; Bruening et al., 2010; Cho & Kim, 2018; Granner & Evans, 2012; Lotrean & Tutui, 2015; Parks et al., 2018; Sato et al., 2020; Trude et al., 2016). Specifically, these studies have found that greater adolescent dietary self-efficacy is significantly associated with greater fruit and vegetable consumption. Not all of the relevant studies found consistent results, with some studies finding no evidence for a relationship between self-efficacy and dietary outcomes and others demonstrating mixed findings (Cho & Kim, 2018; Franko et al., 2013; Frenn et al., 2003; Pearson et al., 2017; Vereecken et al., 2005; Zabinski et al., 2006). Overall, these findings provide support for the positive relationship between adolescent self-efficacy and desirable health outcomes related to BMI and dietary outcomes. Given this evidence, the proposed study will contribute to existing literature by assessing how the

changes in adolescent self-efficacy relate to the changes in adolescent dietary intake over time.

Taken together, these findings highlight the role of adolescent self-efficacy on BMI and dietary outcomes. Limited longitudinal research demonstrates that adolescent self-efficacy was predictive of adolescent BMI and dietary intake. This study will add to existing literature by investigating the associations among longitudinal changes in these variables with a focus on high risk, overweight African American adolescents.

Family Mealtime. Limited literature exists that demonstrates direct relationships between adolescent self-efficacy and frequency or quality of family mealtime. In fact, only one recent study was identified that considered the relationship between self-efficacy and family mealtime variables. Woodruff and Kirby (2013) assessed cross-sectional associations between cooking self-efficacy and frequency of family dinners in youth (Woodruff and Kirby, 2013; n = 145, 9-14 years, 23% minorities). The results indicated that participants with greater self-efficacy were more likely to have a higher frequency of family dinners. Interestingly, results also indicated that family attitudes and behaviors (i.e. familial interactions) were significantly associated with frequency of family dinners.

Some literature also questions the direction of such associations, noting that the relationship between adolescent self-efficacy and family mealtime may be reciprocal in nature (Dallacker et al., 2019). In other words, adolescents with greater self-efficacy may feel more engaged with family meals due to their positive self-perceptions, and nurturing family mealtime environments may contribute to improved adolescent self-efficacy.

This study will address a gap in literature by investigating the associations between adolescent self-efficacy and family mealtime frequency and quality among African American adolescents.

1.3 Prior Literature on Parenting and Adolescent BMI, Diet, and Family Mealtime

BMI. Research suggests that parenting style is associated with adolescent BMI. Namely, authoritative parenting as characterized by high responsiveness and appropriate demandingness has been largely related to healthier adolescent BMIs (Shloim et al., 2015; Sleddens et al., 2011). This review will focus on research with adolescent samples, a less represented group in this literature. Few longitudinal studies exist that evaluate the relationship between parenting style and adolescent BMI over time and results of existing literature vary (Berge, Wall, Loth, & Neumark-Sztainer, 2010b; Fuemmeler et al., 2012; Lane, Bluestone, & Burke, 2013). Berge and colleagues (2010) assessed the influence of maternal parenting style on adolescent BMI over a 5-year follow-up (11-18 years, 18.7% African American). The results of this study indicated that maternal authoritative parenting style predicted a lower, healthier BMI in adolescents 5 years later, which may suggest that it is a protective factor for obesity in adolescents (Berge et al., 2010a). Similarly, Fuemmeler and colleagues (2012) found that authoritarian parenting style (characterized by low parental responsiveness) was associated with greater increases in BMI for adolescents (11-21 years, 17.1% African American). Another longitudinal study found that maternal authoritarian parenting was predictive of higher adolescent BMI (11-18 years) in sons (Berge et al., 2010b). Although only few studies exist that examine these relationships over time, significant evidence exists that links authoritative parenting

style to healthier weight outcomes in adolescents, including African American adolescents (Loncar et al., 2021b; Shloim et al., 2015b; Sleddens et al., 2011).

Despite the limited longitudinal analyses, other studies have outlined the positive effects of parenting involvement on adolescents' weight outcomes (Janicke et al., 2008; Jelalian et al., 2010, 2015; Mellin et al., 1987; R. G. Steele et al., 2012; West et al., 2010). For instance, West and colleagues (2010) evaluated the effects of a parent-focused intervention for weight management in overweight and obese children (West et al., 2010). The intervention, Group Lifestyle Triple P, aimed to help parents adjust their parenting approaches around weight-related behaviors (diet, physical activity) to be warmer and more engaged with their children. The authors found that children whose parents received the intervention experienced significant decreases in BMI compared to children in the control group (n=101, 4 – 11 years). The results of this intervention demonstrate that increases in responsive and responsible parenting may lead to healthier adolescent diets and healthier BMIs. More so, a recent review assessed existing literature to determine the effects of family-based interventions on adolescent obesity (Bean et al., 2020). The authors found that studies that targeted parenting style and practices were largely associated with adolescent weight loss. Specifically, interventions that aimed to improve parent-adolescent interactions and increase parental responsiveness through support behaviors showed significant differences in adolescent weight loss when compared to the control groups. The proposed study will add to this existing literature by investigating how the temporal stability of parenting style and determining whether changes parenting styles relate to changes in adolescent BMI over time.

Parental practices or behaviors have also been associated with adolescent BMI (Kipp et al., 2021; Loncar et al., 2021). Specifically, a substantial amount of literature exists that demonstrates the association between parental feeding practices and adolescent weight-status (Faith et al., 2004; Shloim et al., 2015a) Parental feeding practices are especially critical, as they may influence dietary self-regulation development in adolescents (Hennessy, et al., 2010). Further, recent literature has suggested that dietary self-regulation influences adolescent weight over time (Connell & Francis, 2014). This study will focus on responsibility and monitoring, two common feeding behaviors consistent with those measured in the Child Feeding Questionnaire (CFQ; Birch et al., 2001b). Only one recent study evaluated the role of parental responsibility and monitoring in adolescent weight status over time (Holland et al., 2014). In their large family-based intervention aimed to improve child BMI, Holland and colleagues (2014) determined that increases in parental responsibility were associated with decreases in child BMI (7-11 years, 17.1% African American). While no effects were found for parental monitoring, the study results suggest that parents' perceived role in providing responsible eating choices was associated with healthier child BMI. Some cross-sectional studies emphasized the link between parental monitoring and adolescent BMI, primarily demonstrating that greater parental monitoring was associated with higher adolescent BMI (Schmidt et al., 2017; Towner et al., 2015). Apart from these findings, remaining existing literature did not demonstrate relations between parental responsibility and monitoring and adolescent weight-status (Blissett & Bennett, 2013b; Gray et al., 2010; Hennessy et al., 2010; Huang et al., 2012; Kaur et al., 2006a). This study will advance existing literature by providing longitudinal perspectives on these relationships. Namely,

the proposed study will investigate whether changes in parental responsibility and parental monitoring relate to changes in adolescent health outcomes specific to BMI. Furthermore, the secondary aim of this study will determine whether these parenting factors interact with adolescent self-efficacy to predict BMI related health outcomes. These are both relevant and novel contributions to literature.

Diet. In addition to BMI outcomes, research also highlights the relationship between parenting factors and adolescent diet. Literature was reviewed that assessed the relationship between parenting factors (parenting style, parental feeding practices) and adolescent fruit and vegetable intake, fat intake, and kcal intake. Literature largely demonstrates the benefits of an authoritative approach to parenting on youth's diet. Most of this research is cross-sectional in design, making it difficult to determine causality. The existing longitudinal research revealed mixed findings, where more supportive, authoritative parenting was linked to healthier adolescent dietary intake for some studies while parenting practices were not associated with adolescent intake in others (Dickens & Ogden, 2014; Moens & Braet, 2007; Pearson et al., 2010a). However, a substantial body of cross-sectional literature shows that authoritative parenting style and practices are related to greater fruit and vegetable in adolescents (Franchini et al., 2011; Kremers et al., 2003; Monge-Rojas et al., 2010; Pearson et al., 2010b; Watts et al., 2017). Though less common, studies have also demonstrated links between authoritative parenting and parenting practices and adolescent kcal and fat intake, where warmer, autonomy-supportive parenting was associated with less kcal and fat consumption (Haugland et al., 2019; Kim et al., 2008; Pearson et al., 2010b).

Family Mealtime. Research shows that parents also play a large role in family mealtimes. Namely, family mealtime is an opportunity for parents to engage in several behaviors that may influence adolescent health. Dallacker and colleagues (2019) recently conducted a meta-analysis related to family meals. They determined that parental modeling of healthy eating, providing higher quality food, and creating a positive atmosphere were all significant components of children's nutritional health (Dallacker et al., 2019). Notably, modeling and creating a positive environment are both characteristics of authoritative parenting. Alternatively, more restrictive parental feeding practices have been associated with lower frequency of family meals (Wilson et al., 2021). Ardakani and colleagues (2023) found that authoritative parenting directly related to family meal frequency in African American families, demonstrating that more authoritative parenting was associated with more frequent family meals (n = 211, 10-17 years, 100% African American; Ardakani et al., 2023). In addition, the results of their study also indicated that parental monitoring and modeling were also related to more frequent family meals. Further, a recent finding detailed the positive moderating effects of authoritative parenting (n = 241, 11-16 years, 100% African American; Wilson et al., 2021). Specifically, authoritative parenting style was found to positive moderate intervention effects of the Project FIT motivational + family weight loss (M+FWL) to improve frequency of family mealtimes.

1.4 Prior Literature on Parenting, Adolescent Self-Efficacy, Adolescent BMI, Diet and Family Mealtime

The present study aims to investigate the potential moderating effect of parenting factors on the relationship between adolescent self-efficacy and adolescent BMI, dietary,

and family mealtime outcomes. Understanding how parenting factors interact with adolescent self-efficacy is necessary for drawing informed hypotheses regarding potential moderating effects in the present study. While significant theoretical and developmental literature exists that emphasize parents' role in their adolescent's self-efficacy development, very few studies have examined the relationship between parenting factors and adolescent self-efficacy (Bandura, 1997). Previous studies have demonstrated positive associations between responsive parenting and adolescent self-efficacy (Keshavarz & Mounts, 2017; Kim et al., 2016; Tabak & Zawadzka, 2017; Tam et al., 2012). For instance, a recent study evaluated the role of parent involvement in adolescents' weight management and dietary self-efficacy (Kim et al., 2016). Kim and colleagues (2016) found that adolescents whose parents helped them with weight-related behaviors such as goal-setting experienced significant increases in dietary self-efficacy. The results of this intervention show the positive effects that parent responsiveness may have on adolescent dietary self-efficacy and may have subsequent influence on adolescent weight-status. Though few studies assess the relationship between adolescent dietary self-efficacy, parenting, and adolescent BMI, several recent studies have assessed these relationships with general self-efficacy. For example, Tabak and Zawadzka (2017) found positive associations between authoritative parenting and adolescent general self-efficacy in their longitudinal study aimed to assess parenting effects on youth mental health (n = 355, 13 -18 years). The results of their study indicated that positive parenting, identified by characteristics such as responsive parenting and consistent expectations, was associated with greater general self-efficacy in 13-year-old Polish adolescents (Tabak & Zawadzka, 2017). The authors also found that mothers' positive parenting

during adolescence was predictive of their adolescent's self-efficacy in early adulthood. In their recent cross-sectional study, Keshavarz and Mounts (2017) assessed the cross-sectional relationship between perceived paternal parenting style and adolescents' general self-efficacy in Iranian families (n=382). Results indicated that paternal authoritative parenting was positively related to adolescent self-efficacy (Keshavarz & Mounts, 2017). Another cross-sectional study examined similar associations in a sample of older Asian adolescents and young adults (Tam et al., 2012). Tam and colleagues (2012) found that adolescents who perceived their parents to be authoritative also had higher general self-efficacy (n = 120, 16 – 21 years). These studies highlight parent's influence on key aspects of self-regulation development through the caregiving actions they engage in and the environmental conditions they provide (Bradley & Caldwell, 1995; Wilson et al., 2017). This current study expands on this literature by examining the interaction of parenting factors and dietary self-efficacy on adolescent dietary and family mealtime outcomes over time.

Literature shows that parent's influence is not limited to main effects. The previously reviewed literature details the association between adolescent self-efficacy and adolescent BMI, diet, and family mealtime outcomes, signifying that adolescents' beliefs about their health-related abilities influence their motivation to engage in health behaviors, thereby influencing adolescent BMI, diet, and mealtime (Bandura, 2004). Parenting factors influence adolescent BMI, diet, and family mealtime in a similar way, where parents can increase adolescent self-efficacy to engage in healthful behaviors through practices parental practices that provide encouragement and support while helping their adolescent develop independence, autonomy, and mastery experiences

(Darling & Steinberg, 1993; Kitzman-Ulrich et al., 2010; Lawman et al., 2011; Ryan & Deci, 2000). Schunk and Pajares (2002) highlight parental influence through the home environment that parents create, specifically noting the positive association between warm, stimulating environments and adolescent self-efficacy (Schunk & Pajares, 2002). These assertions are founded in the social cognitive theory, where Bandura states that parents are critical providers of self-efficacy information and experiences to children (Bandura, 1997). Taken together, literature suggests that parenting factors may also indirectly influence adolescent development and health outcomes by moderating adolescent self-efficacy on BMI, diet, and family mealtime. In other words, parenting factors such as parenting style and feeding practices may increase the positive association between self-regulatory factors and BMI and diet in adolescents.

These effects are demonstrated in recent research where Connell and Francis (2014) analyzed longitudinal data to determine connections between parenting factors, child self-control, and child BMI (n=778, 4 - 15 years). The authors assessed self-control when children were age 4 years through a series of delay of gratification tasks, a metric for self-regulation. Researchers then tested the interaction of parenting style and self-regulation on children's BMI trajectories from 4 -15 years (Connell & Francis, 2014b). The results of this study indicated that authoritative parenting and permissive parenting, both characterized by high parental responsiveness, were associated with greater self-regulation and healthier BMI outcomes in boys. These findings suggest that the relationship between adolescent self-regulatory processes and health outcomes may be a function of parenting, where responsive parenting interacts with self-regulation to predict adolescent weight-status. Similarly, Rhee and colleagues (2016) investigated the

relationship between parenting factors and child BMI on families enrolled in a 16-week family-based behavioral weight control program (n=40, 8 – 12 years). The authors concluded that warmer, more responsive parenting created a nurturing environment that supported the child's weight-related efforts, such as goal setting and self-monitoring, that subsequently resulted in healthier weight outcomes (Rhee et al., 2016). These findings emphasize the function of parenting style and behaviors in adolescent self-regulatory processes and subsequent health outcomes. Namely, the results suggest that greater parental nurturance can influence aspects of adolescents' self-regulation, such as perceived dietary self-efficacy, to ultimately affect adolescent weight-status and dietary behaviors.

Anderson and colleagues (2016) reviewed recent literature and reported further apparent connections between parenting factors and subsequent child health. In their summary, the authors highlighted the effects of parental sensitivity and responsiveness on child weight (Anderson & Keim, 2016). For instance, the authors reviewed findings from an earlier study where maternal sensitivity in early childhood was linked to weight-status in adolescence (Anderson et al., 2012). More so, Anderson and colleagues (2012) assessed maternal sensitivity at 15, 24, and 36 months through observation and concluded that mothers who practiced greater sensitivity in these early years increased their child's healthy responses to stress and challenges and ultimately predicted healthier weight during adolescence (n=977, 1 – 15 years). Similar findings were echoed in studies with younger samples, where higher maternal sensitivity was related to healthier weight later in adolescence (Rhee et al., 2006; Wendland et al., 2014; Wu et al., 2011). Research has also summarized the parental influence on adolescent health behaviors. For instance,

Berge (2014) found that greater parental warmth during mealtimes was associated with healthier weight throughout childhood (n=120, average 9 years, 74% African American). The results of this study highlight parents' role in child development and health, where increased warmth and positive communication potentially affect adolescents' self-perceptions and regulatory beliefs and therefore influence dietary behaviors and weight-related outcomes (J. M. Berge et al., 2014). Despite the younger samples, these results illustrate the influence of parenting style and practices on the adolescent self-regulatory processes that influence BMI and diet.

Limited research was identified that assess explicit interactions between parenting factors (parenting style and parental feeding practices), adolescent self-regulatory factors, and adolescent health outcomes (BMI and dietary intake). Furthermore, literature examining the moderating role of parenting on the association between broader adolescent self-regulation and BMI and diet is nearly nonexistent. However, some research has demonstrated moderating effects of parenting on the relationship between other adolescent self-regulatory behaviors and health outcomes. Quattlebaum and colleagues (2021) investigated the influence of parental feeding practices in the association between adolescents' emotional eating (a metric of low self-regulation) and dietary outcomes (n = 127, 11-16 years, 100% African American). The authors found that emotional eating was positively associated with fruit and vegetable intake when parents demonstrated high levels of monitoring, low restriction, and low concerns (Quattlebaum, Wilson, Sweeney, and Zarrett, 2021 in press). These findings suggest that adolescents with lower self-regulatory skills have better dietary outcomes when parents practice fewer overbearing feeding practices. Additionally, Connell and Francis (2014) conducted

one of the only recent investigations that assessed parents' role in the relationship between adolescent self-regulation and BMI, finding that authoritative parenting practices mitigated the harmful effects of poor self-regulation on adolescent BMI over time (n = 778, 4-15 years, 12% African American; Connell & Francis, 2014). Results of this study draw attention to indirect effects of parenting on adolescent development and emphasize the need for further research. This study will add to existing literature by examining whether parenting factors interact with adolescent self-efficacy to predict adolescent health outcomes including BMI and dietary outcomes.

1.5 Study Purpose and Hypotheses

In all, prior research has clearly demonstrated relationships between parenting style, parental feeding practices, adolescent self-efficacy for diet, and adolescent health. Existing literature highlights the role of parenting in adolescent health (BMI and dietary intake) and the positive relationship between adolescent self-efficacy for diet and dietary behaviors. However, while cross-sectional research is abundant there is limited longitudinal research examining these associations. Fewer studies have examined how parenting factors relate to adolescent dietary self-efficacy, and literature assessing interactions between adolescent dietary self-efficacy, adolescent BMI and diet, and parenting factors is rare. The proposed study aims to build on existing literature in several ways. First, this study aims to explore the temporal stability of parenting factors and adolescent dietary self-efficacy while assessing longitudinal relationships with adolescent BMI and diet. Few studies have assessed the stability of parenting factors or adolescent dietary self-efficacy over time. More so, little research has evaluated associations between adolescent self-efficacy and fruit and vegetable intake over time, and no known

studies have evaluated these longitudinal associations with adolescent zBMI, fat intake, or kcal intake as well as family mealtime. More importantly, no known studies have investigated the potential moderating effect of parenting factors in the relationship between adolescent self-efficacy for diet and adolescent BMI and diet. Prior literature demonstrates that parents play a role in adolescent health behaviors and weight-status, suggesting parenting factors have the potential to strengthen the positive effects of adolescent self-efficacy on BMI, diet, and family mealtime. Given the limitations in current literature, this study will explore the relationships between adolescent self-efficacy, adolescent BMI, diet, family mealtime and parenting using a longitudinal study design. In considering the known associations between each of the variables, this study will focus on evaluating potential interaction effects of parenting practices (responsibility, monitoring, responsiveness, and demandingness) on the relationship between adolescent self-efficacy for diet and adolescent health outcomes (BMI, fruit and vegetable intake, fat intake, and kcal intake and family mealtime). Therefore, the specific aims and hypotheses for this study are:

Aim 1. To examine the temporal stability of parenting factors and adolescent dietary self-efficacy to determine associations between adolescent self-efficacy and parenting factors and how they are related to changes in adolescent health outcomes of diet, zBMI, and family mealtime from baseline to 16 weeks (post-online intervention; Figure 1.1).

Hypothesis 1a. Increases in adolescent self-efficacy will be related to improvements in adolescent BMI and diet from baseline to 16 weeks, such that adolescents who increase self-efficacy from baseline to 16 weeks will also have

decreased zBMIs, increased fruit and vegetable consumption, lower fat intake, lower kilocaloric intake, and greater frequency and quality of family mealtime at 16 weeks.

Hypothesis 1b. Changes in parenting factors (parent responsiveness, monitoring, and responsibility, demandingness) will be related to changes in adolescent BMI and diet from baseline to 16 weeks, such that adolescents whose parents became more responsive and practiced more dietary responsibility will also have decreased zBMIs, dietary intake (increased fruit and vegetable consumption, decreased fat intake, and decreased kilocaloric intake), and increased frequency and quality of family mealtime at 16 weeks. Adolescents whose parents became more demanding and practiced greater monitoring will also have increased zBMIs, poorer dietary intake (decreased fruit and vegetable consumption, increased fat intake, and increased kilocaloric intake), and reduced frequency and quality of family mealtime at 16 weeks.

Aim 2. To examine whether parenting factors (responsiveness, demandingness, responsibility, monitoring) moderate the relationship between adolescent self-efficacy and adolescent zBMI, dietary intake, and family mealtime outcomes (Figure 1.1).

Hypothesis 2. Parenting factors will modify the relationship between adolescent self-efficacy and adolescent zBMI and diet over time, such that increases in warm and responsive parenting (responsiveness, parental responsibility for adolescent diet) will be related to a more positive association between self-efficacy and positive health outcomes over time (healthier zBMI, increased fruit and vegetable consumption, decreased fat and kcal intake, increased frequency and quality of family mealtime). In contrast, harsh and demanding parenting (demandingness, parental monitoring of adolescent diet) will be

related to a negative association between self-efficacy and BMI, diet, and frequency and quality of family mealtime over time.

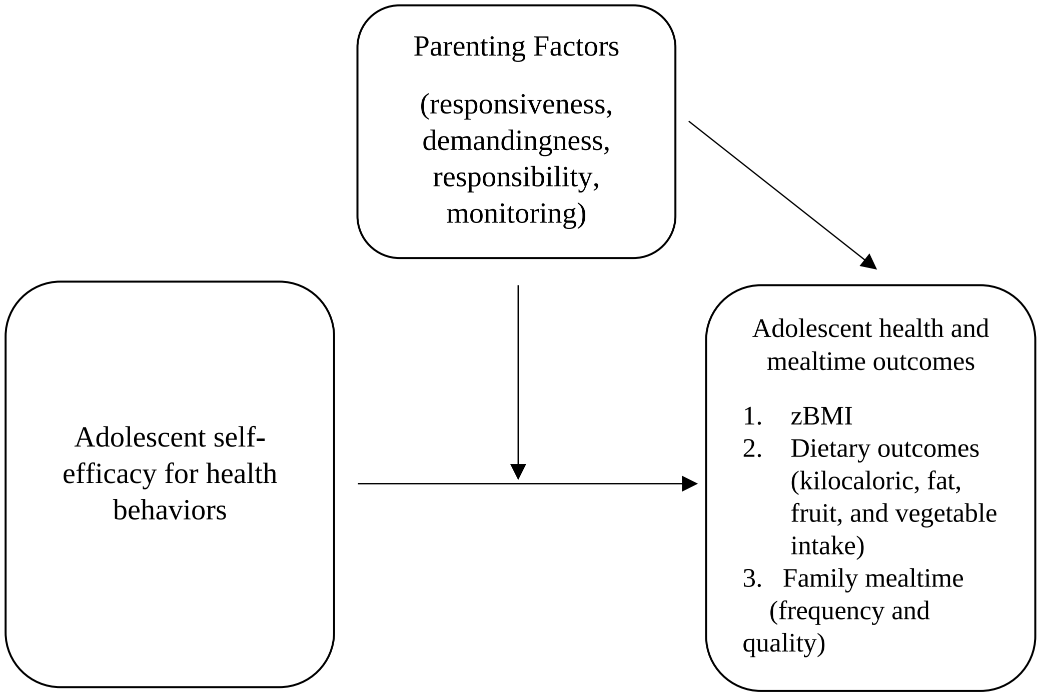

Figure 1.1 Model of expected relationships between adolescent self-efficacy, adolescent health outcomes, mealtime outcomes, and parenting factors.

CHAPTER TWO

METHODS

2.1 Participants

Data were collected from 241 African American parent-adolescent dyads that were enrolled in the Families Improving Together (FIT) for Weight Loss randomized controlled trial (Alia et al., 2015; Wilson et al., 2015; Wilson et al., 2022). 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) having 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) having an in-home caregiver willing to participate with the adolescent, and 4) having 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 informed consent forms prior to participation and were given compensation for their participation in FIT.

Participant (n=241) baseline demographics are described in Table 2.1 The majority of adolescent participants were female (64%) and the average age was 12.83 years old. The average BMI percentile for adolescents was 96.61 (*SD*=4.25), placing

them on average in the obese BMI range. The average age for parents was 43.19 (*SD*=8.65). Most caregivers were unmarried and had an annual income between $25,000 - $39,999.

2.2 Study Design

Project FIT evaluated the efficacy of a family-based motivational weight-loss intervention as compared to a basic health education program for African American families (Wilson et al, 2015, Wilson et al., 2022). The current study is longitudinal in design and evaluates baseline, post-group (8 weeks), and post-online data (16 weeks) of the larger longitudinal FIT trial. While the FIT trial was an intervention, this study controls for treatment condition and intervention effects will not be assessed. Full methods and procedures for Project FIT are explained in separate literature (Wilson et al., 2015; Wilson et al., 2022).

2.3 Procedures

Prior to enrollment, a trained staff member conducted informed consent with interested participants. After enrolling, participants completed a “welcome visit,” where they learned how to report dietary intake during dietary recall measurements. At the beginning of the program, FIT families attended two orientation sessions (run-in). During this time, the parent-adolescent dyads completed anthropometric measurements (height and weight), psychosocial surveys, and dietary recall measurements. 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 (CDC, 2000), then standardized to BMI z-scores

Table 2.1 Descriptive Baseline Data

Variable	Value
Adolescent Age *M(SD)*	12.83 (1.75)
Adolescent Sex (Female), *N%*	64%
Parent Education, *N%*	
Less Than 4 Year College Degree	127 (56.8%)
4 Year College or Professional Degree	100 (42.2%)
Parent BMI *M(SD)*	37.49 (8.34)
Parent Age *M(SD)*	43.18 (8.65)
Parent Income	$25,000-$39,999
Parents Married, *N(%)*	83 (34.4%)
Children in Home, *M(SD)*	2.05 (1.20)
Adolescent zBMI, *M(SD)*	2.05 (0.05)
Adolescent BMI Percentile *M(SD)*	96.61 (4.25)

Note. *N*=241

(zBMI) using the statistical analysis system (SAS) program. Adolescent-report of perceived parenting style, parental feeding styles, self-efficacy for diet, and family mealtime were assessed with psychosocial survey measures. Adolescent dietary intake was measured through dietary recalls performed by a registered dietician. Participants repeated anthropometric and psychosocial measures at the post-group timepoint (8 weeks) and repeated anthropometric, psychosocial, and dietary recall and family mealtime measures at the post-online timepoint (16 weeks). Participants were incentivized for their time at the conclusion of the each timepoint.

2.4 Measures

Demographic Information. Demographic information was self-reported through either parent or adolescent psychosocial surveys. These measures included parent age, adolescent sex, parent annual income, and parent education. Parent education was used as a measure of socioeconomic status and responses ranged from '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.' Adolescent age and parent age were measured at the time of consent through parent-report data. Parent BMI was calculated using parent baseline measurements.

Predictors Variables

Parenting style. Parenting style was measured using six items from an adolescent self-report measure, the Authoritative Parenting Index (Jackson, Kimiecik, Ford, & Marsh, 1998). Informed by Baumrind's parenting styles (authoritative, authoritarian,

permissive, and neglectful; 1977), the API consists of two subscales of responsiveness and demandingness. 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." This scale has been validated for diverse samples. The demandingness and responsiveness subscales were found to be reliable for adolescents ($\alpha = 0.77$ and 0.85 respectively). Participants in this study will respond to 3 items for each subscale (responsiveness, demandingness) for a total of 6 scored items. Previous studies have demonstrated construct validity of these measure, for example a significant relationship between parenting style and adolescent weight was reported, where authoritative parenting was associated with healthier weight-status in adolescents (Shloim et al., 2015).

Adolescent self-efficacy for health behaviors Adolescent self-efficacy for health behaviors was measured using the Self-Efficacy for Exercise Behaviors Scale (Sallis, 1988). Data was collected for dietary self-efficacy, but this data was not imputed and unavailable at the time data analysis. However, the self-efficacy for diet and self-efficacy for physical activity scales demonstrated correlations between 0.57- 0.73 acoss timepoints. The adapted self-efficacy scale has previously demonstrated predictive validity to specifically evaluate self-efficacy for healthy eating in African American adolescents (Wilson et al., 2002). This adolescent self-report measure consists of 10 items that are related to relapse prevention and behavioral skills. Adolescents are asked to rate how confident they are that they could continue to engage in health behaviors (i.e. exercise) for at least six months when experiencing specific challenges. Sample items include "How sure are you that you can stick to your exercise program when your family

is demanding more time from you?" and "How sure are you that you can stick to exercising even when you have limited amounts of time??" Responses are scored on a 5-point Likert scale that ranges from '1 = I know I cannot' to '5 = I know I can.'

Child feeding questionnaire. The Child Feeding Questionnaire (CFQ; Birch et al., 2001b) was used to evaluate parental feeding practices and feeding styles. The parent-report scale consisted of five subscales measuring five dimensions of feeding: parental responsibility, restriction, concern, monitoring, and pressure-to-eat. Only parental responsibility and parental monitoring will be assessed in this study. This scale has been validated for use with adolescents, and each dimension is sufficiently reliable (Kaur et al., 2006). Goodness of fit analyses indicated that each of the seven dimensions were valid in the measure (Kaur et al., 2006a). 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.’

Outcomes Variables

Adolescent zBMI. Adolescent BMI was measured using height, weight, and age at the time of data collection measurements. Height and weight measurements were taken at the first group session. Two measurements were taken for both height and weight for each participant. A third measure was taken if the two height measurements differed by more than 1 centimeter or the weight measurements differed by more than 0.5 kilogram. An average height and an average weight were calculated using these measurements. The CDC growth curves for adolescent BMI was used to assess this measure. Statistical Analysis Software (SAS) will be used to standardize adolescent BMI (zBMI) for comparison.

kCal, fat, fruit, and vegetable intake. Adolescent kCal, fat, fruit, and vegetable intake were collected using three random 24-hour dietary recalls conducted with a registered dietician, which has been shown to be a valid measure (Thompson & Subar, 2017). It is the standard to conduct three 24-hour dietary recalls to determine dietary intake in adolescents (Ebbeling et al., 2012; Patrick et al., 2006). The recalls were by telephone on two weekdays and one weekend day. Adolescents were given instructions on how to estimate portion sizes during their baseline visit. During the recall, participants were asked to report the type and quantity of food they had eaten the previous day. Daily fruit and vegetable intake (with fried fruit and vegetable items removed), energy intake (kilocalories), and total fat intake (grams) were estimated, and each outcome was averaged from the completed recalls for the current study. This data was collected at

baseline and post-online (16 weeks) timepoints only. No dietary data was collected at the post-group (8 weeks) timepoint.

Frequency and quality of family mealtime. This study aimed to assess the temporal stability of parenting factors and adolescent self-efficacy as they relate to adolescent health outcomes. Additionally, the study aimed to determine whether parenting factors moderate the relationship between adolescent self-efficacy and adolescent health. Originally, the proposal did not include outcomes related to family mealtime. However, quality of family mealtime and frequency of family mealtime were added as outcomes after considering established associations between adolescent health and family mealtime (Hammons and Fiese, 2011). For the frequency of family mealtime measure, adolescents were asked to report the number of meals they had with their family during a typical week using a validated scale (Neumark-Sztainer et al., 2010). Response choices ranged from 1-6: where 1 (never), 2 (1-2 times), 3 (3-4 times), 4 (5-6 times), 5 (7 times), and 6 (more than 7 times). The scale has been used in diverse racial populations and shown to have construct validity (Neumark-Sztainer et al., 2010). For the quality of family mealtime measure, adolescents were asked to rate their family meal environment by indicating how strongly they agreed with statements regarding family meals. The scale was validated with a diverse population of youth and was found to be reliable ($\alpha = 0.73$; Neumark-Sztainer et al., 2010). There were four items on the measure, which included statements such as “I enjoy eating meals with my family” and “In my family, dinner time is about more than just getting food, we all talk to each other.” Item responses ranged from 1-4: 1 (strongly disagree), 2 (somewhat disagree), 3 (somewhat agree), and 4 (strongly agree).

Table 2.2 Predictor Means and Standard Deviations Across Timepoints, *M(SD)*

Variable	Baseline (0 weeks)	Post-Online (8 weeks)	Post-Group (16 weeks)
SE	3.76 (0.96)	3.71 (1.00)	3.71 (1.02)
Responsiveness	4.38 (1.02)	4.32 (1.26)	4.19 (1.38)
Demandingness	5.20 (0.80)	5.02 (0.86)	4.91 (1.12)
Responsibility	2.85 (0.51)	2.86 (0.53)	2.99 (0.52)
Monitoring	2.82 (0.98)	3.06 (0.97)	3.18 (0.97)
zBMI	2.06 (0.50)	2.06 (0.51)	2.04 (0.55)
kCal intake (grams/day)	1668.29 (479.34)	---	1750.47 (587.23)
Fat intake (grams/day)	64.67 (21.26)	---	65.79 (20.34)
Fruit intake (servings/day)	1.04 (1.02)	---	1.11 (1.10)
Vegetable intake (servings/day)	1.38 (0.87)	---	1.63 (1.18)
Freq. Family Meals (meals/week)	3.46 (1.61)	3.44 (1.55)	3.24 (1.52)
Qual. Family Meals	3.26 (0.65)	3.35 (0.61)	3.17 (0.76)

Note: “SE” represents self-efficacy, “Freq. Family Meals” represents frequency of family meals, and “Qual. Family Meals" represents quality of family meals

2.5 Data Analytic Plan

Multi-Level Model Building. A growth curve analysis approach was used to allow for the estimation of effects occurring at multiple time points within an individual. Models were developed with the R statistical software package, version 4.2.2 (The R Foundation for Statistical Computing, Vienna, Austria), using a stepped approach. Given the longitudinal study design, random intercepts and random slopes for time were included in each model, based upon recommendations by Raudenbush & Bryk (2002).

A growth curve analysis was used, and an extensive model building process occurred initially to determine a baseline model that would be utilized in further model building. This first model fit procedure involved testing a series of models with increasing complexity to predict adolescent zBMI (primary outcome). To determine which model best fit the data, a series of chi-square difference tests were conducted. If the more complex model did not yield significantly better fit, then the simpler model was retained as the final model for this phase of model building. First, the unconditional model (1) which only included a random intercept was run. The next model (2) was expanded to include time as a fixed effect. The third model (3) was expanded to consider the random effect of individuals nested within timepoints. The following model (4) expanded to consider the random effect of individuals nested within groups within timepoints and did not yield significantly better fit than the previous model, χ^2 (9) = <0.01, p=1.00. Therefore, this model was not retained. A final model (5) was assessed to consider a fixed effect for time and a random effect for groups. This model yielded significantly better fit than the previous model, χ^2 (4) = 741.18, p<0.01, and was retained (Table 2.2). Thus, the model retained as the best fitting model was a linear growth model

that considered a fixed effect for time and random effect for group. This modeling approach was used for all subsequent analyses and is consistent with the approach used in prior Project FIT analyses (Wilson et al., 2022).

Analyses. For Aim 1 and 2, the best fitting model (i.e. the model with the fixed effect for time and random effect for group) was incorporated for a series of model comparisons that included theory-based predictors. Using a hierarchical approach, a series of chi-square difference tests compared a covariate only model, the addition of main effects, and the addition of interaction terms. Covariates included adolescent age, adolescent sex, parent education, parent BMI, and a main effect for time (0=baseline, 1=8 weeks, 2=16 weeks). Predictor variables included adolescent self-efficacy (hypothesis 1a) and parenting variables (parental responsiveness, demandingness, responsibility for adolescent diet, and monitoring of adolescent diet; Hypothesis 1b). All predictor variables were z-scored. Two-way interactions between the predictors and time were used to test Aim 1, and three-way interactions between self-efficacy, time, and the parenting factors were used to test Aim 2. The model testing Aim 1 on adolescent zBMI is:

$$\text{Adolescent zBMI} = \beta_0 + \beta_1\text{AdolescentAge}_{ij} + \beta_2\text{AdolescentSex}_{ij} + \beta_3\text{ParentEducation}_{ij}$$

$$+ \beta_4\text{ParentBMI}_{ij} + \beta_5\text{GroupRandomization}_{ij} + \beta_6\text{OnlineRandomization}_{ij}$$

$$+ \beta_7\text{Timeij} + \beta_8\text{Self-efficacy}_{ij}$$

$$+ \beta_9\text{ParentResponsiveness}_{ij} + \beta_{10}\text{ParentDemandingness}_{ij}$$

$$+ \beta_{11}\text{ParentalResponsibility}_{ij} + \beta_{12}\text{ParentalMonitoring}_{ij}$$

$$+ \beta_{13}\text{Self-Efficacy*Time}_{ij}$$

$$+ \beta_{14}\text{ParentResponsiveness*Time}_{ij}$$

$$+ \beta_{15}\text{ParentDemandingness*Time}_{ij} \quad +$$

$$\beta_{16}\text{ParentalResponsibility*Time}_{ij}$$

$$+ \beta_{17}\text{ParentalMonitoring*Time}_{ij}$$

$$+ b_i + \varepsilon_{ij}$$

where adolescent zBMI is predicted for the individual *i* in the *j*th treatment group, β_0 is the intercept across all treatment groups, $\beta_1 - \beta_6$ are the effects of covariates, β_7 is the effect of time, $\beta_{8\text{-}12}$ are main effects of self-efficacy and parenting factors, $\beta_{13\text{-}17}$ are the two-way interactions between self-efficacy and parenting factors. The random effect b_i allows for intercepts to differ across treatment groups, thus accounting for any non-independence of the outcome within groups. Aim 1 of the proposed study concerns evaluating the effects of parenting and adolescent self-efficacy over time, which are represented by $\beta_{13\text{-}17}$ in the above equation. For Aim 2, three-way interactions between time, self-efficacy, and parenting factors were added to the model. The same modeling approach was used to predict dietary and mealtime outcomes.

2.6 Preliminary Analyses and Assumptions

All model assumptions and case diagnostics were tested using R statistical software package, version 4.2.2 (The R Foundation for Statistical Computing, Vienna, Austria). Tests to assess assumptions for the multilevel regression analyses were tested before running outcome analyses. To address the assumption of normality, histograms of

Table 2.3 Model Building

Model	Df	logLikelihood	Test	Likelihood Ratio	P-value
1	3	-211.89			
2	4	-211.42	1 vs 2	0.93	0.33
3	6	-175.33	2 vs 3	72.18	<0.01
4	9	-175.33	3 vs 4	0.00	1.00
5	4	-545.92	3 vs 5	741.18	<0.01

Note. Model 1 is the unconditional model, Model 2 includes time as a fixed effect, Model 3 adds the random effect of individuals nested within timepoints, Model 4 adds the random effect of individuals nested within groups within timepoints, Model 5 includes a fixed effect for time and a random effect for groups and was the best fitting model.

the standardized residuals were assessed, and data was found to be normally distributed. Scatterplots of the standardized residuals and predicted values were evaluated, and independent variables exhibited homoscedasticity. Additionally, scatterplots were used to examine variability between groups and confirmed that error is randomly distributed across levels of each model predictor. A Durbin-Watson test was used to assess independence of errors. A Cook's distance measure was used to check for influential points in the data and no cases were deemed to be significantly influential so final models include all 241 participants. Bivariate correlations between independent variables were used to assess potential multicollinearity. Effect sizes were in appropriate ranges, indicating this assumption was not violated.

Adolescent zBMI was measured over time (baseline and post-intervention) and longitudinal assumptions including stability, stationarity, and equilibrium was tested. Stability of the mean over time was examined by comparing means of zBMI at both time points. Stationarity, which assumes that zBMI measurements were obtained in the same manner at baseline and post-intervention, has been met due to the strict protocol for 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. These preliminary analyses demonstrated that multilevel modeling assumptions were met.

2.7 Missing Data

Missing data in the larger FIT trial was assumed to be missing at random. BMI data were missing for 0.8% of adolescents at baseline and 14.5% of adolescents at 16

weeks. Dietary data were included if the participant had at least one dietary recall at each timepoint. No dietary data was collected at the post-group (8 weeks) timepoint. Dietary data was averaged for participants with 2-3 dietary recall sessions for each timepoint. Multiple imputations were used to address missing data using the MICE package in R. All primary and secondary outcomes, demographic data, and variables of theoretical importance, including the key variables assessed in the present analyses, were included in the imputation to minimize the likelihood of biased estimates and meet missing at random assumptions. A total of 20 datasets were imputed and one random imputation will be selected for the analyses of the proposed study (Wilson et al., 2021).

CHAPTER THREE

RESULTS

3.1 Correlation Analyses

To assess for multicollinearity, bivariate correlations among model variables were calculated with alpha set at 0.05 for a two-tailed significance test (Table 3.1). Results indicated that several covariate, predictor, and outcome variables were correlated across the three timepoints. Among baseline variables, the strongest positive correlations included adolescent kCal intake with adolescent fat intake (r = .88), parental demandingness with parental responsiveness (r = .48), and parental monitoring with parental responsibility (r = .53). Among post-group variables, the strongest positive correlations were parental demandingness with parental responsiveness (r = .46) and parental responsiveness with frequency of family meals (r = .44). The strongest positive correlations among post-online variables included parental responsiveness and parental demandingness (r = .42), parental responsiveness and frequency of family meals (r = .40), and adolescent kCal intake and fat intake (r = .81). Across timepoints, the strongest correlations included baseline and post-group adolescent self-efficacy (r = .46), baseline and post-group responsiveness (r = .52), baseline zBMI with post-group zBMI (r = .84) and post-online zBMI (r = .79), post-group and post-online zBMI (r = .93), and post-group with post-online demandingness (r = .44).Though kCal intake and fat were highly correlated, they were not included in the same model and therefore did not violate the

multicollinearity assumption. The effect sizes for other correlations fell within the small-to-medium range, indicating that the assumption for multicollinearity was not violated.

3.2 Primary Outcome zBMI. For the zBMI outcome, the addition of the two-way interaction terms significantly improved the model above the model with main effects only (Table 3.2). The addition of three-interaction terms did not improve the model, χ^2 (28) = 7.15, p=0.52), but the three-way interaction terms were retained to interpret Aim 2. Addressing Aim 1, results from the final model indicated a significant two-way interaction between parental responsibility and time, *Estimate*=0.09, *SE* = 0.02, p<0.01. Unexpectedly, zBMI decreased across timepoints for adolescents whose parents had low responsibility for their diet, and zBMI increased across time for adolescents whose parents had high responsibility for their diet (Figure 3.1) The unexpected outcomes are considered in the discussion section.

Results also indicated a significant two-way interaction between parental monitoring and time, *Estimate*=-0.10, *SE* = 0.02, p<0.01. The plot of the interaction demonstrated that zBMI decreased over time for adolescents whose parents had high levels of monitoring for their diet, and zBMI increased over time for adolescents whose parents had low levels of monitoring (Figure 3.2). These findings were inconsistent with the hypothesized relationship between parental monitoring and adolescent zBMI and are considered further in the discussion.

There was no significant two-way interaction between self-efficacy and time (Hypothesis 1a), or time and any other parenting factors (Hypothesis 1b), and no significant three-way interactions (Hypothesis 2).

Table 3.1 Correlations between predictors and outcome variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1. [0] kCal	1																															
2. [0] Fat	.88**	1																														
3. [0] Fruit	.20**	.10	1																													
4. [0] Veg.	.17**	.07	.21**	1																												
5. [0] SE	-.02	-.04	.07	-.00	1																											
6. [0] Respons.	.12	.13*	.07	.09	.16*	1																										
7. [0] Demand.	-.03	.03	-.04	-.01	.08	.48**	1																									
8. [0] Resp.	-.09	-.08	.01	.05	.15*	.31**	.36**	1																								
9. [0] Monitor	-.12	-.11	.10	.10	.18**	.29**	.33**	.53**	1																							
10. [0] zBMI	-.12	-.13*	.04	.02	-.05	-.08	-.03	.00	.11	1																						
11. [0] Freq. Meals	-.02	-.02	.08	.07	.17**	.44**	.27**	.31**	.24**	.03	1																					
12. [0] Qual. Meals	-.07	-.06	.02	-.03	.00	.15*	.24**	.29**	.25**	.08	.38**	1																				
13. [1] SE	.03	.03	-.05	-.04	.46**	.14*	.03	.20**	.20**	.01	.15*	.12	1																			
14. [1] Respons.	.01	.04	-.09	.01	.11	.52**	.22**	.12	.15*	-.02	.22**	.09	.23**	1																		
15. [1] Demand.	-.10	-.08	-.08	-.04	.20**	.23**	.31**	.13*	.15*	-.11	.15*	.07	.20**	.46**	1																	
16. [1] Resp.	-.04	-.03	-.02	-.01	-.02	.17**	.17**	.38**	.21**	.10	.03	.15*	.20**	.27**	.16*	1																
17. [1] Monitor	-.02	.02	-.02	.04	.13*	.20**	.18**	.21**	.32**	.11	.13	.21**	.22**	.28**	.20**	.30**	1															
18. [1] Freq. Meals	-.02	.02	.00	.07	.13*	.30**	.16*	.21**	.18**	.08	.39**	.23**	.20**	.44**	.29**	.22**	.32**	1														
19. [1] Qual. Meals	.03	.03	.06	.03	.00	.08	.08	.17**	.11	.09	.17**	.39**	.09	.08	.03	.14*	.10	.32**	1													
20. [1] zBMI	-.10	-.12	.06	.09	-.11	-.02	.04	.05	.15*	.84**	.00	.07	-.04	-.05	-.11	.07	.08	.05	.13*	1												
21. [2] SE	-.06	-.10	.04	.03	.32**	.11	.01	.19**	.09	.01	.15*	-.00	.31**	.06	.09	.08	-.07	.04	.09	.04	1											
22. [2] Respons.	.08	.05	.08	.08	.10	.39**	.22**	.13*	.05	-.13*	.09	-.03	.09	.39**	.20**	.09	.08	.14*	-.07	-.14*	.15*	1										
23. [2] Demand.	-.03	-.05	-.04	.01	.10	.14*	.30**	.14*	.10	-.04	.16*	.04	.02	.16*	.44**	-.02	.10	.15*	-.08	-.02	.15*	.42**	1									
24. [2] Resp.	-.06	-.00	-.05	.10	.12	.13*	.10	.26**	.14*	.08	.09	.09	.25**	.10	.05	.24**	.14*	.23**	.09	.16*	.34**	.31**	.19**	1								
25. [2] Monitor	.03	.07	.09	.09	.05	.13*	.12	.18**	.32**	-.11	.09	.11	.01	.14*	.11	.21**	.37**	.13	.08	-.10	.07	.27**	.19**	.31**	1							
26. [2] Freq. Meals	.10	.04	.03	.01	.14*	.18**	.11	.15*	.16*	-.01	.22**	.07	.11	.19**	.18**	.05	.17*	.25**	.16*	-.03	.22**	.40**	.31**	.23**	.33**	1						
27. [2] Qual. Meals	.12	.07	.07	.01	.02	.06	.05	.11	.08	.03	.09	.22**	-.01	.12	.00	.05	.04	.14*	.39**	.01	.05	.17**	-.06	.12	.11	.38**	1					
28. [2] kCal	.33**	.22**	.06	.08	-.09	.02	-.17**	-.06	-.07	-.01	.04	.02	.03	.07	-.18**	-.04	-.02	.00	.15*	.02	-.03	.00	-.10	-.04	-.04	.07	.07	1				
29. [2] Fat	.26**	.17**	.01	.04	-.11	.00	-.17**	-.05	-.10	-.01	.03	.01	-.02	.11	-.11	-.04	-.02	.04	.11	.02	-.05	-.07	-.15*	-.09	-.08	.03	.01	.81**	1			
30. [2] Fruit	.01	.03	.13*	-.05	-.08	.08	.03	-.01	.13*	.08	-.04	.03	.03	.07	-.08	-.01	.05	-.02	.01	.07	-.10	-.06	-.16*	-.07	-.00	.02	-.03	.19**	.02	1		
31. [2] Veg.	.06	.03	-.02	.13*	.06	.08	.10	.03	.07	-.01	.10	.03	-.03	-.05	-.08	-.07	.06	.06	.08	-.02	.04	.00	-.04	-.10	-.10	.04	-.07	.20**	.10	.19**	1	
32. [2] zBMI	-.07	-.11	.03	.11	-.09	.02	.10	.08	.14*	.79**	.01	.06	-.02	-.02	-.10	.07	.06	.08	.16*	.93**	.02	-.04	.00	.19**	-.12	.06	.10	.01	-.00	.05	-.01	1

Note. Covariates (adolescent age, adolescent sex, parent education, parent BMI) not included. [0], baseline; [1], post-group; [2], post-only.

Table 3.2 Hierarchical Approach for zBMI

Model	Df	logLikelihood	Test	Likelihood Ratio	P-value
1	10	-487.67			
2	15	-482.07	1 vs 2	11.20	<0.05
3	20	-470.32	2 vs 3	23.512	<0.01
4	28	-466.74	3 vs 4	7.15	0.52

Note. Model 1 included covariates and time; Model 2 included covariates, time, predictor variables (parenting variables and self-efficacy); Model 3 included covariates, time, predictor variables, and interactions with time; Model 4 included covariates, time, predictor variables, interactions with time, and three-way interactions with adolescent self-efficacy, parenting variables, and time.

Table 3.3: Outcome Analyses - zBMI

	Estimate	*SE*	*T*-value	*P*-value	Lower 95% CI	Upper 95% CI
Intercept	2.00	0.06	31.92	0.00	1.88	2.12
Group Randomization	0.07	0.05	1.50	0.14	-0.02	0.16
Online Randomization	0.04	0.04	1.19	0.24	-0.03	0.11
Child Age	**-0.04**	**0.01**	**-3.62**	**<0.01**	-0.06	-0.02
Child Sex	0.00	0.04	0.14	0.89	-0.07	0.08
Parent Education	0.06	0.04	1.54	0.12	-0.01	0.13
Parent BMI	**0.02**	**0.00**	**10.24**	**<0.01***	0.02	0.03
SE	-0.05	0.05	-1.03	0.31	-0.14	0.04
Time	-0.02	0.02	-0.86	0.38	-0.06	0.02
Responsiveness	-0.04	0.05	-0.79	0.43	-0.15	0.06
Demandingness	-0.04	0.05	-0.71	0.48	-0.14	0.07
Responsibility	**-0.15**	**0.05**	**-2.75**	**<0.01***	-0.26	-0.05
Monitoring	**0.22**	**0.05**	**4.01**	**<0.01***	0.11	0.32
SE*Time	0.01	0.02	0.63	0.53	-0.03	0.06
SE*Responsiveness	0.00	0.05	0.18	0.86	-0.09	0.11
Time*Responsiveness	-0.00	0.02	-0.04	0.96	-0.05	0.05
SE*Demandingness	0.00	0.06	0.01	0.99	-0.11	0.11
Time*Demandingness	0.01	0.02	0.49	0.63	-0.03	0.06
SE*Responsible	-0.01	0.06	-0.15	0.88	-0.12	0.10
Time*Responsible	**0.09**	**0.02**	**3.65**	**<0.01***	0.04	0.14
SE*Monitor	-0.06	0.05	-1.09	0.28	-0.16	0.05
Time*Monitor	**-0.10**	**0.02**	**-4.30**	**<0.01***	-0.15	-0.06
SE*Time*Responsiveness	-0.00	0.02	-0.17	0.86	-0.05	0.04
SE*Time*Demandingness	0.00	0.02	0.14	0.89	-0.04	0.05
SE*Time*Responsible	-0.00	0.02	-0.15	0.89	-0.05	0.04
SE*Time*Monitor	0.04	0.02	1.76	0.08	0.00	0.08

Note: “SE” represents self-efficacy.

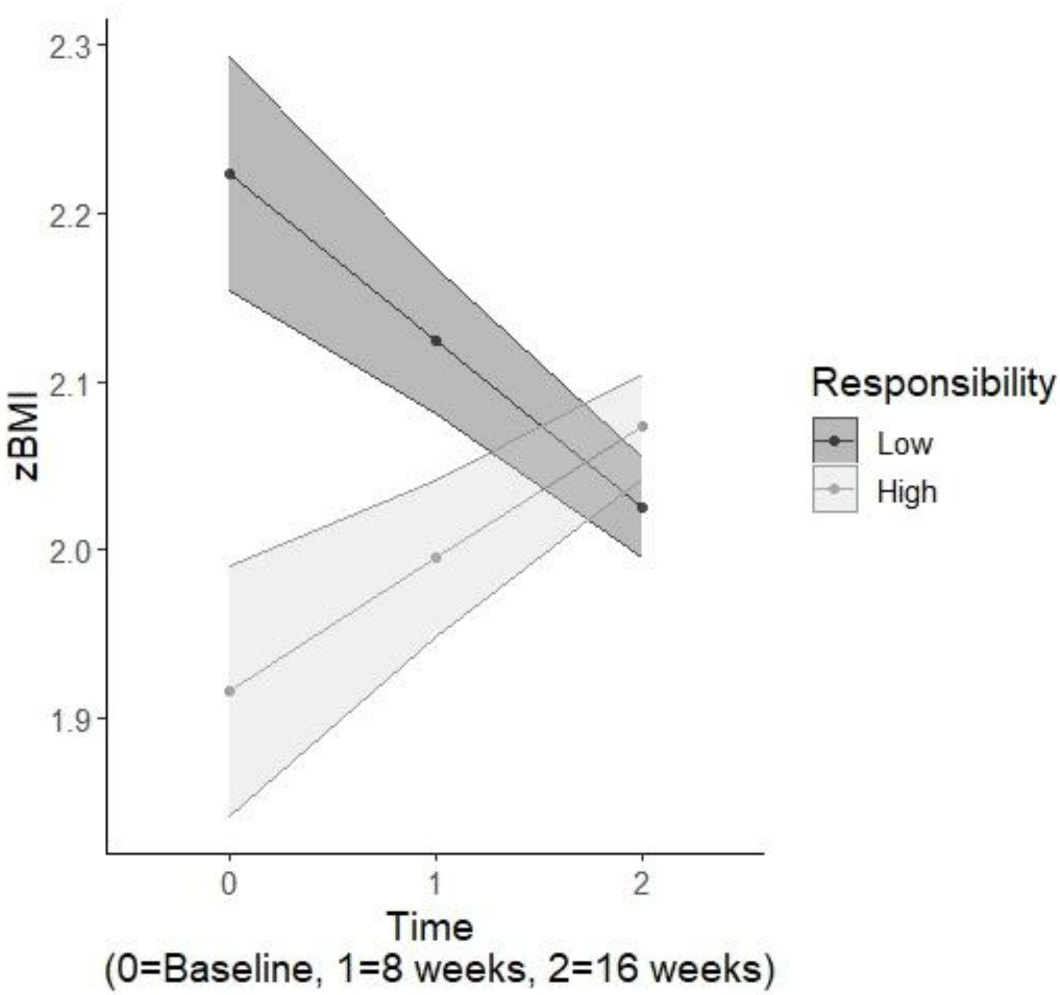

Figure 3.1 Interaction between parental responsibility and time in predicting adolescent zBMI.

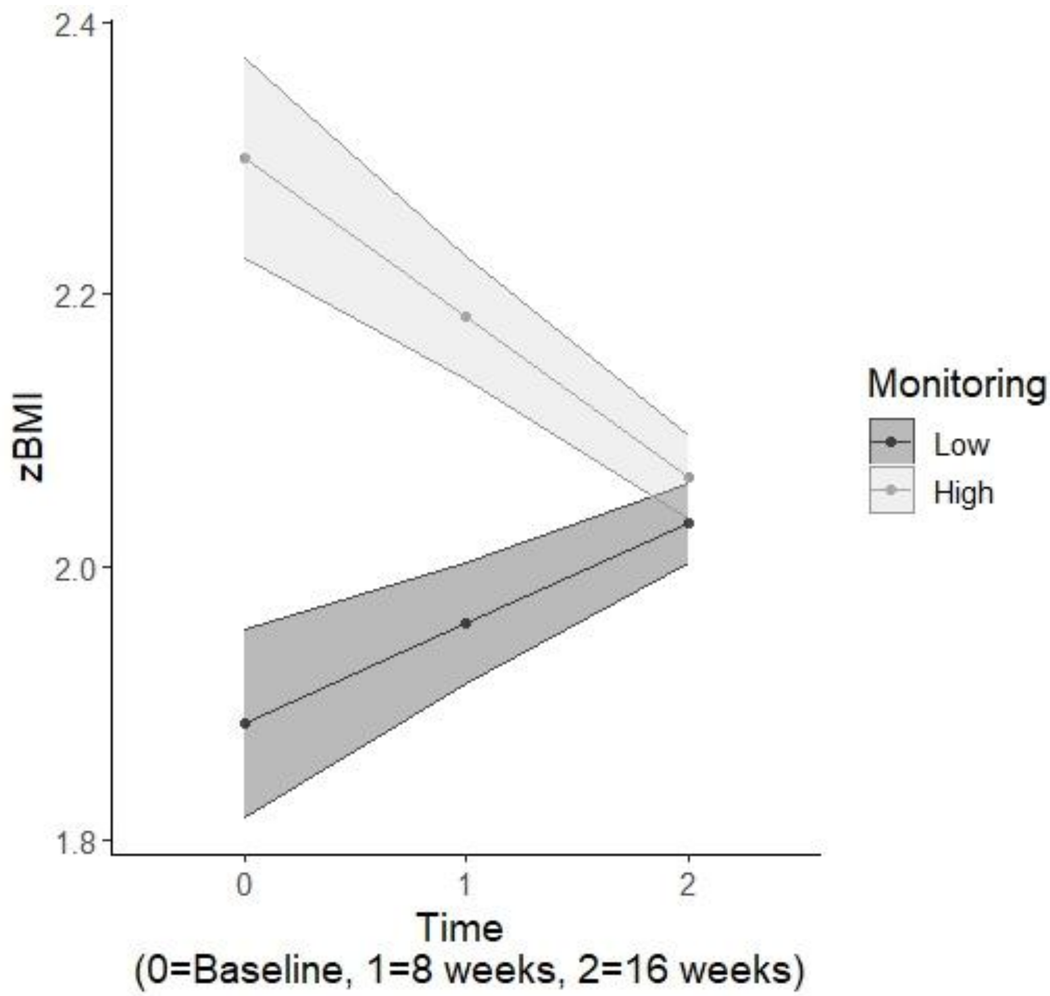

Figure 3.2 Interaction between parental monitoring and time in predicting adolescent zBMI.

3.3 Secondary Outcome kCal Intake. Model comparisons were completed using the same methods as the zBMI model and a total of three chi-square comparisons were completed (Table 3.4). For the kCal outcome, the best-fitting model was Model 4, which included three-way interactions (χ^2 (28) = 15.72, p<0.05). Results indicated a significant three-way interaction between adolescent self-efficacy, time, and parental demandingness, *Estimate*=62.83, *SE* = 28.13, *p*<0.05 (Table 3.5). As shown in Figure 3.4, self-efficacy was associated with greater kCals among those with low demandingness and lower kCals among those with high demandingness at baseline. However, this interaction attenuated across time. This finding is inconsistent with the hypothesis that greater parental demandingness would be associated with higher adolescent kCal intake across timepoints. There were no other significant three-way interactions (Hypothesis 2), nor significant two-way interactions (Hypothesis 1a and 1b). However, a significant main effect existed for parental responsiveness, *Estimate*=127.37, *SE = 63.65*, *p*<0.05, indicating that parental responsiveness was associated with greater adolescent kCal intake, and remained stable over time.

3.4 Secondary Outcome Fat Intake. Model comparisons for adolescent fat intake were completed using the same methods as the other models and a total of three chi-square comparisons were completed (Table 3.6). For the fat outcome, the best-fitting model was Model 4, which included three-way interactions (χ^2 (28) = 16.58, *p*<0.05).

Similar to the kCal model, results indicated a significant three-way interaction between adolescent self-efficacy, time, and parental demandingness, *Estimate*=3.09, *SE* = 1.09, *p*<0.01 (Table 3.7) As shown in Figure 3.4, self-efficacy was associated with greater fat intake among

Table 3.4 Hierarchical Approach for kCal intake

Model	Df	logLikelihood	Test	Likelihood Ratio	P-value
1	10	-3697.91			
2	15	-3693.93	1 vs 2	7.97	0.15
3	20	-3692.02	2 vs 3	3.82	0.58
4	28	-3684.16	3 vs 4	15.72	<0.05

Note. Model 1 included covariates and time; Model 2 included covariates, time, predictor variables (parenting variables and self-efficacy); Model 3 included covariates, time, predictor variables, and interactions with time; Model 4 included covariates, time, predictor variables, interactions with time, and three-way interactions with adolescent self-efficacy, parenting variables, and time.

Table 3.5 Model Outcome Analysis - kCal intake

	Estimate	SE	T-value	P-value	Lower 95% CI	Upper 95% CI
Intercept	1511.06	75.37	20.05	0.00	1366.95	1655.16
Group Randomization	52.10	58.23	0.89	0.38	-62.13	166.32
Online Randomization	63.16	47.81	1.32	0.19	-28.26	154.57
Child Age	18.99	14.25	1.33	0.18	-8.25	46.23
Child Sex	**207.65**	**51.60**	**4.02**	**<0.01***	108.99	306.30
Parent Education	-34.67	50.68	-0.68	0.49	-131.56	62.22
Parent BMI	-3.12	2.85	-1.09	0.27	-8.58	2.33
SE	45.37	55.45	0.82	0.41	-60.65	151.40
Time	38.57	24.63	1.57	0.12	-8.52	85.66
Responsiveness	**127.37**	**63.65**	**2.00**	**<0.05***	5.69	249.06
Demandingness	-0.03	63.98	0.00	1.00	-122.35	122.29
Responsibility	-35.34	65.01	-0.54	0.59	-159.64	88.97
Monitoring	-67.46	64.17	-1.05	0.29	-190.15	55.24
SE*Time	-27.43	24.38	-1.12	0.26	-74.04	19.19
SE*Responsiveness	-4.24	64.18	-0.07	0.95	-126.96	118.47
Time*Responsiveness	-30.00	27.40	-1.09	0.27	-82.39	22.39
SE*Demandingness	-113.45	71.18	-1.59	0.11	-249.53	22.64
Time*Demandingness	-13.89	26.93	-0.52	0.61	-65.38	37.60
SE*Responsible	12.31	68.12	0.18	0.86	-117.93	142.54
Time*Responsible	3.05	27.24	0.11	0.91	-49.03	55.12
SE*Monitor	54.49	64.85	0.84	0.40	-69.49	178.47
Time*Monitor	23.82	26.56	0.90	0.37	-26.95	74.60
SE*Time*Responsiveness	-9.96	26.07	-0.38	0.70	-59.81	39.89
SE*Time*Demandingness	**62.83**	**28.13**	**2.23**	**0.03***	9.05	116.62
SE*Time*Responsible	-4.59	26.72	-0.17	0.86	-55.68	46.49
SE*Time*Monitor	-45.91	26.10	-1.76	0.08	-95.82	4.00

Note: “SE” represents self-efficacy.

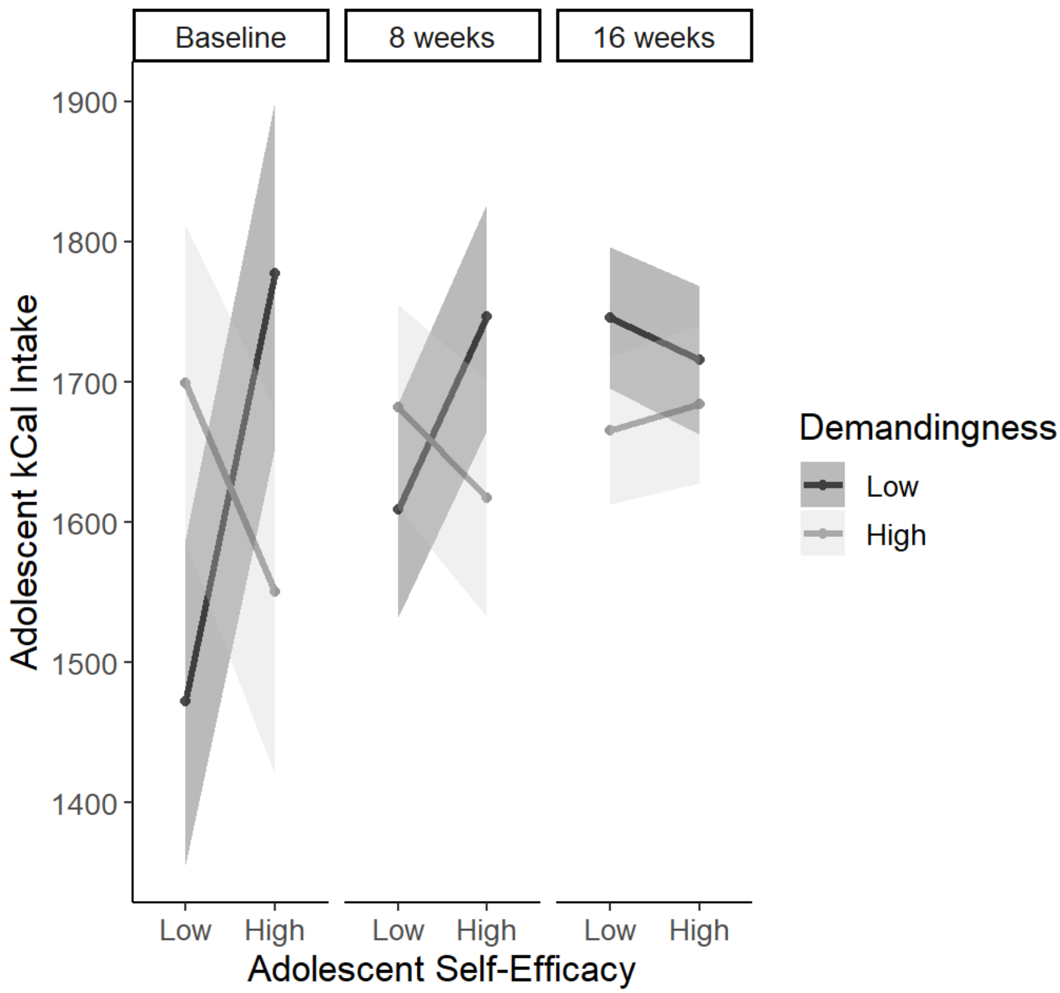

Figure 3.3 Interaction between adolescent self-efficacy and parental demandingness on adolescent kCal intake at baseline, 8 weeks, and 16 weeks.

Table 3.6 Hierarchical Approach for fat intake

Model	Df	logLikelihood	Test	Likelihood Ratio	P-value
1	10	-2133.52			
2	15	-2129.16	1 vs 2	8.72	0.12
3	20	-2125.01	2 vs 3	8.30	0.14
4	28	-2116.72	3 vs 4	16.58	0.03

Note. Model 1 included covariates and time; Model 2 included covariates, time, predictor variables (parenting variables and self-efficacy); Model 3 included covariates, time, predictor variables, and interactions with time; Model 4 included covariates, time, predictor variables, interactions with time, and three-way interactions with adolescent self-efficacy, parenting variables, and time.

Table 3.7 Model Outcome Analysis - Fat

	Estimate	SE	T-value	P-value	Lower 95% CI	Upper 95% CI
Intercept	59.33	2.95	20.13	0.00	53.69	64.96
Group Randomization	3.51	2.34	1.50	0.14	1.09	8.11
Online Randomization	3.41	1.84	1.85	0.07	-0.12	6.94
Child Age	0.32	0.55	0.57	0.57	-0.74	1.37
Child Sex	**5.68**	**2.00**	**2.85**	**<0.01***	1.87	9.50
Parent Education	-0.67	1.96	-0.34	0.73	-4.42	3.08
Parent BMI	-0.11	0.11	-1.06	0.29	-0.33	0.09
SE	1.23	2.14	0.58	0.56	-2.86	5.34
Time	1.19	0.95	0.20	0.84	-1.63	2.00
Responsiveness	**6.15**	**2.46**	**2.50**	**0.01***	1.44	10.85
Demandingness	1.06	2.47	0.43	0.67	-3.67	5.78
Responsibility	-1.59	2.51	-0.63	0.53	-6.39	3.21
Monitoring	-2.07	2.48	-0.84	0.40	-6.82	2.67
SE*Time	-0.79	0.94	-0.84	0.40	-2.59	1.01
SE*Responsiveness	0.90	2.48	0.36	0.72	-3.84	5.64
Time*Responsiveness	-1.85	1.06	-1.75	0.08	-3.88	0.17
SE*Demandingness	**-6.95**	**2.75**	**-2.53**	**0.01***	-12.20	-1.69
Time*Demandingness	-0.99	1.04	-0.96	0.34	-2.98	0.99
SE*Responsible	0.09	2.63	0.04	0.97	-4.94	5.13
Time*Responsible	-0.03	1.05	-0.03	0.98	-2.04	1.98
SE*Monitor	1.93	2.51	0.77	0.44	-2.86	6.72
Time*Monitor	0.56	1.03	0.54	0.59	-1.40	2.52
SE*Time*Responsiveness	-1.03	1.01	-1.02	0.31	-2.96	0.89
SE*Time*Demandingness	**3.09**	**1.09**	**2.85**	**<0.01***	1.02	5.17
SE*Time*Responsible	0.13	1.03	0.12	0.90	-1.85	2.10
SE*Time*Monitor	-1.45	1.01	-1.43	0.15	-3.37	0.48

Note: “SE” represents self-efficacy.

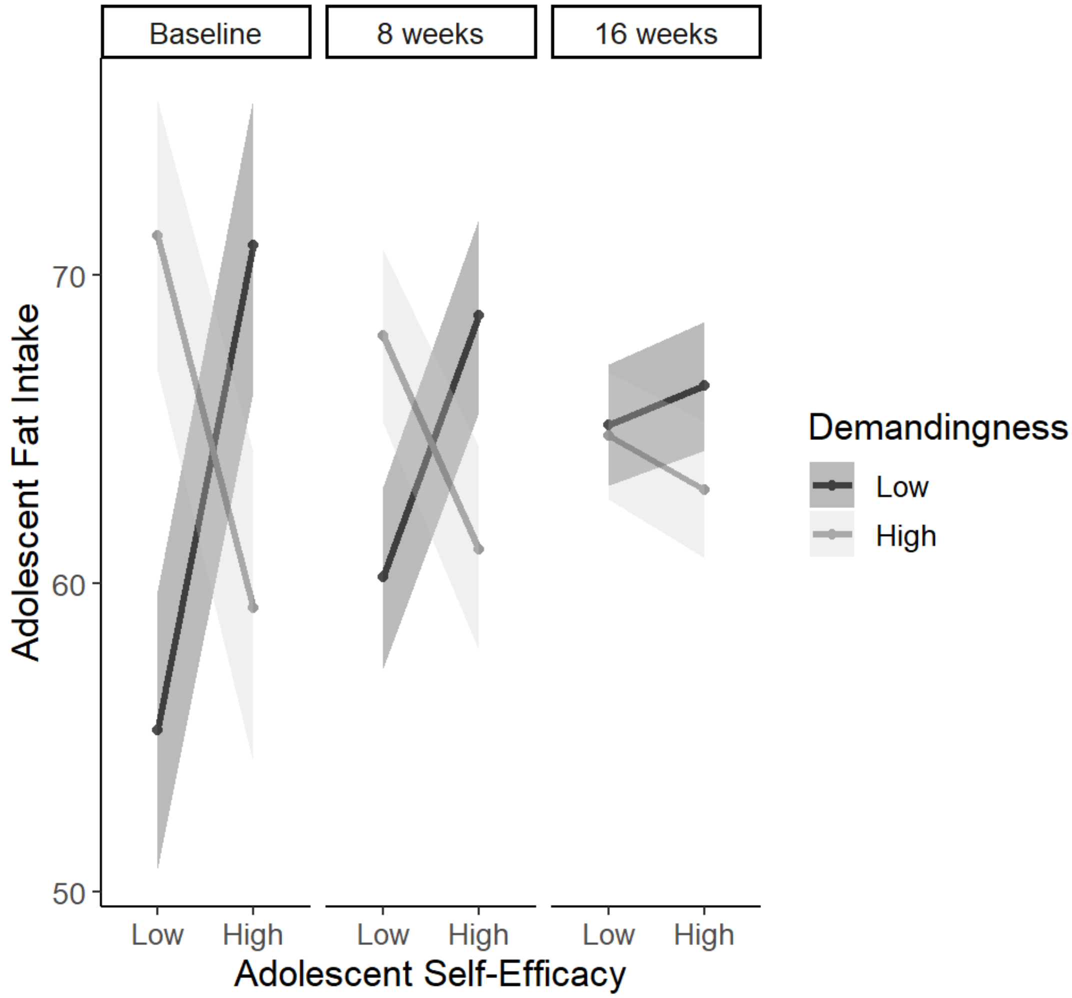

Figure 3.4 Interaction between adolescent self-efficacy and parental demandingness on adolescent fat intake at baseline, 8 weeks, and 16 weeks.

those with low demandingness and lower fat intake among those with high demandingness at baseline. However, this interaction also attenuated across time. This finding is inconsistent with the hypothesized direction of the relationship between adolescent fat intake, self-efficacy, and parental demandingness. There were no other significant three-ways interactions (Hypothesis 2), nor any two-way interactions (Hypothesis 1a, 1b). However, a significant main effect existed for parental responsiveness, *Coefficient*=6.15, *SE = 2.46*, *p*<0.01, indicating that greater parental responsiveness was associated with greater adolescent fat intake, and was stable across time. This finding is considered further in the discussion section.

3.5 Secondary Outcome Fruit Intake. Model comparisons for adolescent fruit intake were completed using the same methods as the other models and a total of three chi-square comparisons were completed (Table 3.8). No models were a significantly better fit than Model 1 (covariates only model). However, for the fruit outcome, the best-fitting model was considered to be Model 2, which included only main effects (χ^2 (15) = 10.03, p=0.07). However, all interaction terms remained in the final model for interpretation. There was no significant two-way interaction between self-efficacy and time (Hypothesis 1a), or time and any parenting factors (Hypothesis 1b), and no three-way interactions (Hypothesis 2; see Table 3.9).

3.6 Secondary Outcome Vegetable Intake. Model comparisons for adolescent vegetable intake were completed using the same methods as the other models and a total of three chi-square comparisons were completed (Table 3.10). For the vegetable outcome, the best-fitting model was Model 3, which included the two-way interaction terms, as the last model (which included three-way interactions; χ^2 (28) = 4.63, p=0.80) did not fit the

Table 3.8 Hierarchical Approach for fruit intake

Model	Df	logLikelihood	Test	Likelihood Ratio	P-value
1	10	-706.61			
2	15	-701.59	1 vs 2	10.03	0.07
3	20	-698.92	2 vs 3	5.34	0.38
4	28	-696.56	3 vs 4	4.72	0.79

Note. Model 1 included covariates and time; Model 2 included covariates, time, predictor variables (parenting variables and self-efficacy); Model 3 included covariates, time, predictor variables, and interactions with time; Model 4 included covariates, time, predictor variables, interactions with time, and three-way interactions with adolescent self-efficacy, parenting variables, and time.

Table 3.9 Model outcome analysis – fruit intake

	Estimate	SE	T-value	P-value	Lower 95% CI	Upper 95% CI
Intercept	1.04	0.15	7.04	0.00	0.76	1.32
Group Randomization	-0.09	0.10	-0.92	0.36	-0.29	0.10
Online Randomization	0.10	0.10	0.97	0.33	-0.09	0.28
Child Age	0.00	0.03	0.12	0.89	-0.05	0.06
Child Sex	-0.06	0.11	-0.54	0.59	-0.26	0.14
Parent Education	-0.03	0.10	-0.25	0.80	-0.22	0.17
Parent BMI	0.01	0.00	1.76	0.08	0.00	0.02
SE	0.09	0.11	0.82	0.41	-0.12	0.31
Time	0.02	0.05	0.45	0.65	-0.07	0.12
Responsiveness	0.17	0.13	1.32	0.19	-0.08	0.42
Demandingness	-0.12	0.13	-0.95	0.34	-0.37	0.13
Responsibility	-0.07	0.13	-0.50	0.61	-0.32	0.19
Monitoring	0.18	0.13	1.39	0.17	-0.07	0.43
SE*Time	-0.06	0.05	-1.16	0.25	-0.15	0.04
SE*Responsiveness	0.14	0.13	1.07	0.29	-0.11	0.39
Time*Responsiveness	-0.05	0.05	-0.87	0.38	-0.16	0.06
SE*Demandingness	-0.12	0.14	-0.85	0.39	-0.40	0.15
Time*Demandingness	-0.01	0.06	-0.23	0.82	-0.12	0.09
SE*Responsible	0.02	0.14	0.13	0.90	-0.25	0.28
Time*Responsible	0.00	0.06	0.10	0.92	-0.10	0.11
SE*Monitor	0.04	0.13	0.27	0.79	-0.22	0.29
Time*Monitor	-0.05	0.05	-0.84	0.40	-0.15	0.06
SE*Time*Responsiveness	-0.06	0.05	-1.21	0.23	-0.17	0.04
SE*Time*Demandingness	0.07	0.06	1.15	0.25	-0.04	0.18
SE*Time*Responsible	0.00	0.05	0.00	1.00	-0.10	0.10
SE*Time*Monitor	0.04	0.05	-0.72	0.47	-0.14	0.06

Note: “SE” represents self-efficacy.

Table 3.10 Hierarchical Approach for vegetable intake

Model	Df	logLikelihood	Test	Likelihood Ratio	P-value
1	10	-698.40			
2	15	-696.40	1 vs 2	3.99	0.55
3	20	-691.95	2 vs 3	8.91	0.11
4	28	-689.64	3 vs 4	4.63	0.80

Note. Model 1 included covariates and time; Model 2 included covariates, time, predictor variables (parenting variables and self-efficacy); Model 3 included covariates, time, predictor variables, and interactions with time; Model 4 included covariates, time, predictor variables, interactions with time, and three-way interactions with adolescent self-efficacy, parenting variables, and time.

Table 3.11 Model outcome analysis – vegetable intake

	Estimate	SE	T-value	P-value	Lower 95% CI	Upper 95% CI
Intercept	1.18	0.15	8.10	0.00	0.90	1.46
Group Randomization	0.12	0.10	1.21	0.23	-0.07	0.31
Online Randomization	0.16	0.10	1.68	0.09	-0.02	0.35
Child Age	-0.01	0.03	-0.23	0.81	-0.06	0.05
Child Sex	-0.17	0.10	-1.60	0.11	-0.36	0.03
Parent Education	0.02	0.10	0.18	0.86	-0.17	0.21
Parent BMI	0.00	0.01	-0.70	0.49	-0.01	0.01
SE	-0.10	0.11	-0.90	0.37	-0.31	0.11
Time	0.11	0.05	2.15	0.03	0.01	0.20
Responsiveness	0.11	0.13	0.83	0.41	-0.14	0.35
Demandingness	-0.14	0.13	-1.05	0.29	-0.38	0.11
Responsibility	0.08	0.13	0.64	0.52	-0.17	0.33
Monitoring	0.18	0.13	1.40	0.16	-0.07	0.43
SE*Time	0.07	0.05	1.33	0.18	-0.03	0.16
SE*Responsiveness	0.08	0.13	0.58	0.56	-0.17	0.32
Time*Responsiveness	0.00	0.06	-0.04	0.97	-0.11	0.10
SE*Demandingness	0.10	0.14	0.70	0.48	-0.17	0.37
Time*Demandingness	0.03	0.05	0.50	0.62	-0.08	0.13
SE*Responsible	-0.16	0.14	-1.15	0.25	-0.42	0.10
Time*Responsible	-0.07	0.06	-1.31	0.19	-0.18	0.03
SE*Monitor	0.06	0.13	0.49	0.62	-0.19	0.31
Time*Monitor	-0.09	0.05	-1.71	0.09	-0.19	0.01
SE*Time*Responsiveness	-0.02	0.05	-0.41	0.68	-0.12	0.08
SE*Time*Demandingness	-0.06	0.06	-1.10	0.27	-0.17	0.05
SE*Time*Responsible	0.08	0.05	1.43	0.15	-0.03	0.18
SE*Time*Monitor	-0.02	0.05	-0.36	0.72	-0.12	0.08

Note: “SE” represents self-efficacy.

data better. However, the full model, including three-way interactions, was included in the final model. There was no significant two-way interaction between self-efficacy and time (Hypothesis 1a), or time and any parenting factors (Hypothesis 1b), and no three-way interactions (Hypothesis 2; see Table 3.11). Similar to the fruit outcome, this finding indicates that neither parenting factors nor adolescent self-efficacy interacted with time to predict adolescent vegetable intake. Additionally, self-efficacy did not interact with parenting factors to predict adolescent vegetable intake, nor did any variables independently predict vegetable intake.

3.7 Secondary Outcome Frequency of Family Mealtime. Model comparisons for frequency of family mealtime were completed using the same methods as the other models and a total of three chi-square comparisons were completed (Table 3.12). For the frequency of family mealtime outcome, the best-fitting model was Model 2 (main effects only; χ^2 (15) = 188.52, p<0.01). In other words, model fit was not improved with the addition of two-way interactions (χ^2 (20) = 7.05, p=0.22) or three-way interactions (χ^2 (28) = 12.62, p=0.13). However, two-way and three-way interactions are included in the final model, and all significant effects were interpreted.

Results indicated a significant three-way interaction between adolescent self-efficacy, time, and parental responsibility, *Estimate*=0.12, *SE* =0.04, *p*<0.01 (Table 3.13). As shown in Figure 3.5, low self-efficacy was associated with more frequent family meals among those with highly responsible parents in earlier timepoints (0- and 8-weeks). High self-efficacy was associated with more frequent family meals among those with highly responsible parents at 16-weeks. The moderated effects of parental responsibility increased over 16 weeks (Figure 3.5). There was no significant two-way

Table 3.12 Hierarchical Approach for frequency of family mealtime

Model	Df	logLikelihood	Test	Likelihood Ratio	P-value
1	10	-1021.32			
2	15	-927.06	1 vs 2	188.52	<0.01
3	20	-923.54	2 vs 3	7.04	0.22
4	28	-917.23	3 vs 4	12.62	0.13

Note. Model 1 included covariates and time; Model 2 included covariates, time, predictor variables (parenting variables and self-efficacy); Model 3 included covariates, time, predictor variables, and interactions with time; Model 4 included covariates, time, predictor variables, interactions with time, and three-way interactions with adolescent self-efficacy, parenting variables, and time.

Table 3.13 Model outcome analysis – frequency of family mealtime

	Estimate	SE	T-value	P-value	Lower 95% CI	Upper 95% CI
Intercept	-0.14	0.11	-1.26	0.21	-0.36	0.07
Group Randomization	0.00	0.07	-0.01	0.99	-0.15	0.14
Online Randomization	0.07	0.07	0.99	0.32	-0.06	0.19
Child Age	-0.01	0.02	-0.75	0.45	-0.05	0.02
Child Sex	0.07	0.07	1.05	0.30	-0.06	0.21
Parent Education	**0.27**	**0.07**	**3.95**	**<0.01***	0.14	0.41
Parent BMI	0.00	0.00	0.88	0.38	0.00	0.01
SE	0.06	0.09	0.69	0.49	-0.11	0.23
Time	-0.03	0.04	-0.76	0.45	-0.11	0.05
Responsiveness	**0.43**	**0.10**	**4.23**	**<0.01***	0.24	0.63
Demandingness	-0.04	0.10	-0.43	0.66	-0.24	0.15
Responsibility	**0.23**	**0.10**	**2.25**	**0.02**	0.03	0.43
Monitoring	-0.02	0.10	-0.19	0.85	-0.21	0.18
SE*Time	0.02	0.04	0.45	0.65	-0.06	0.10
SE*Responsiveness	0.17	0.10	1.66	0.10	-0.03	0.36
Time*Responsiveness	-0.06	0.05	-1.24	0.22	-0.15	0.03
SE*Demandingness	0.12	0.11	-1.13	0.26	-0.33	0.09
Time*Demandingness	0.05	0.05	1.21	0.23	-0.03	0.14
SE*Responsible	**-0.29**	**0.10**	**-2.75**	**0.01***	-0.49	-0.09
Time*Responsible	-0.08	0.05	-1.72	0.09	-0.17	0.01
SE*Monitor	0.10	0.10	1.03	0.31	-0.09	0.30
Time*Monitor	0.08	0.04	1.86	0.06	0.00	0.17
SE*Time*Responsiveness	-0.06	0.04	-1.46	0.15	-0.15	0.02
SE*Time*Demandingness	0.03	0.05	0.64	0.52	-0.06	0.12
SE*Time*Responsible	**0.12**	**0.04**	**2.84**	**0.00***	0.04	0.21
SE*Time*Monitor	-0.04	0.04	-0.86	0.39	-0.12	0.05

Note: “SE” represents self-efficacy.

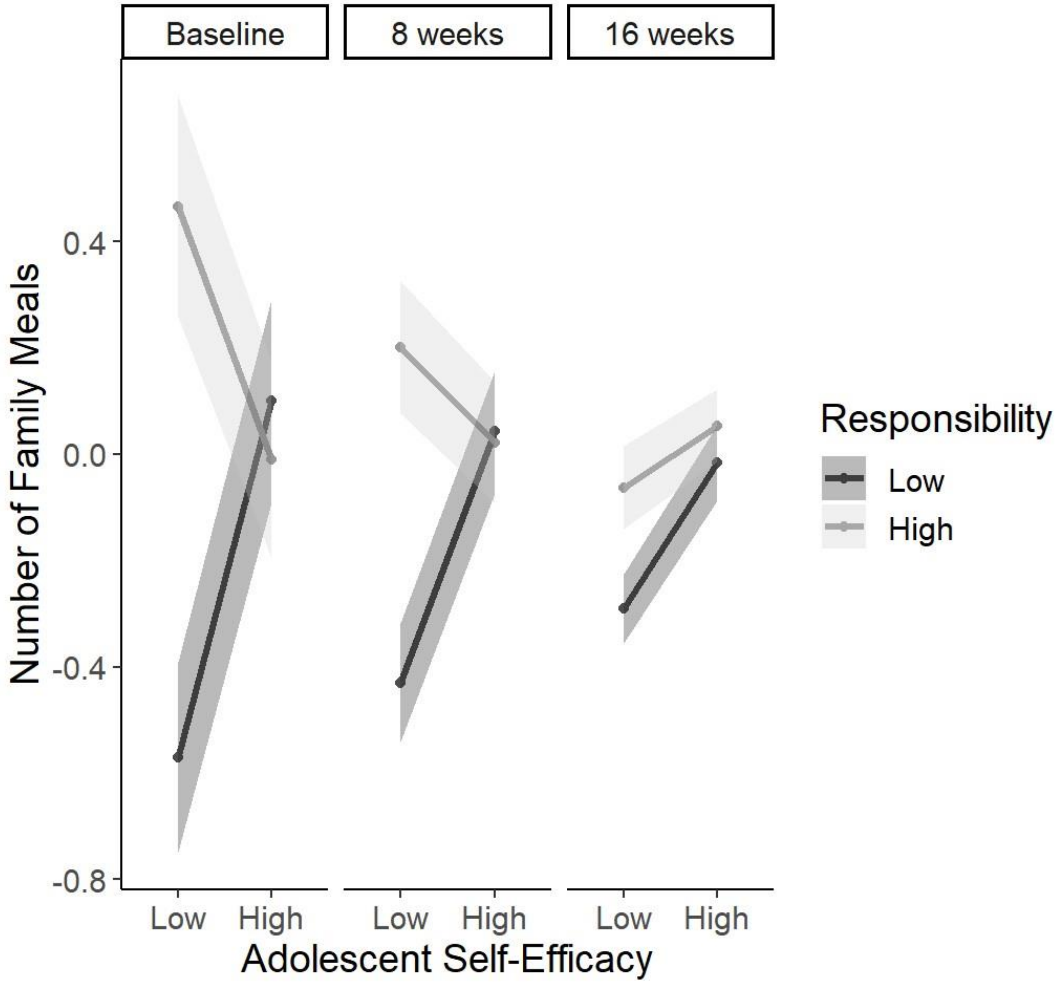

Figure 3.5 Interaction between adolescent self-efficacy and parental responsibility on frequency of family meals at baseline, 8 weeks, and 16 weeks.

interaction between self-efficacy and time (Hypothesis 1a), or time and any other parenting factors (Hypothesis 1b). There were no other significant three-way interactions (Hypothesis 2). However, two significant main effects existed for the frequency of family mealtime outcome. There was a significant positive relationship between parental responsiveness and mealtime frequency, *Coefficient*=0.43, *SE* = 0.10, p<0.01, indicating that greater parental responsiveness was associated with greater frequency of family mealtimes, and remained stable across time. Additionally, there was a significant positive relationship between parental responsibility for adolescent diet and mealtime frequency, *Coefficient*=0.23, *SE* = 0.10, p=0.02, indicating that greater parental responsibility was associated with more frequent family meals, and remained stable across time (see Table 3.13). Both findings were consistent with the hypotheses.

3.8 Secondary Outcome Quality of Family Mealtime. Model comparisons for quality of family mealtime were completed using the same methods as the other models and a total of three chi-square comparisons were completed (Table 3.14). For the quality of family mealtime outcome, the best-fitting model was Model 3 (two-way interactions with time; χ^2 (20) = 17.46, p<0.01). In other words, model fit was not improved with the addition of three-way interactions (χ^2 (28) = 8.87, p=0.35). However, three-way interactions are included in the final model and effects were interpreted. Results for the quality of family mealtime indicated a significant two-way interaction between parental responsiveness and time, *Coefficient*=0.16, *SE* = 0.08, p=0.04 (Table 3.15). The plot of this interaction revealed that quality of family mealtime increases over time for adolescents with highly responsive parents (Figure 3.6). Alternatively, quality of family

mealtime decreases over 16 weeks for adolescents whose parents practice low responsiveness.

There was also a significant two-way interaction between parental demandingness and time, *Coefficient*=-0.25, $SE = 0.08$, $p<0.01$. The result demonstrates that quality of family mealtime increases over 16 weeks for adolescents whose parents practiced low demandingness (Figure 3.6). Alternatively, quality of family mealtime decreases over 16 weeks for adolescents whose parents demonstrated high demandingness.

There were no significant three-way interactions (Hypothesis 2) nor any other significant two-way interactions between self-efficacy and time (Hypothesis 1a) and any other parenting factors (Hypothesis 1b). However, there was a significant main effect for parental responsibility, *Coefficient*=0.35, $SE = .18$, $p<0.05$, such that greater parental responsibility was associated with greater quality of family mealtime and remained stable across time. This finding was consistent with our hypotheses.

Table 3.14 Hierarchical Approach for quality of family mealtime

Model	Df	logLikelihood	Test	Likelihood Ratio	P-value
1	10	-1331.73			
2	15	-13.18.17	1 vs 2	27.13	<0.01
3	20	-1309.44	2 vs 3	17.46	<0.01
4	28	-1305.00	3 vs 4	8.87	0.35

Note. Model 1 included covariates and time; Model 2 included covariates, time, predictor variables (parenting variables and self-efficacy); Model 3 included covariates, time, predictor variables, and interactions with time; Model 4 included covariates, time, predictor variables, interactions with time, and three-way interactions with adolescent self-efficacy, parenting variables, and time.

Table 3.15 Model outcome analysis – quality of family mealtime

	Estimate	SE	T-value	P-value	Lower 95% CI	Upper 95% CI
Intercept	3.36	0.19	17.76	0.00	2.99	3.72
Group Randomization	0.21	0.11	1.81	0.08	-0.02	0.43
Online Randomization	0.11	0.11	0.94	0.35	-0.11	0.33
Child Age	**-0.13**	**0.03**	**-3.82**	**<0.01***	-0.19	-0.06
Child Sex	0.06	0.12	0.52	0.60	-0.17	0.30
Parent Education	0.19	0.12	1.64	0.10	-0.03	0.42
Parent BMI	-0.01	0.01	1.56	0.12	0.00	0.02
SE	-0.13	0.15	-0.85	0.39	-0.42	0.16
Time	-0.13	0.07	-1.79	0.07	-0.27	0.01
Responsiveness	-0.19	0.17	-1.09	0.27	-0.53	0.15
Demandingness	**0.47**	**0.17**	**2.71**	**0.01***	0.14	0.81
Responsibility	**0.35**	**0.18**	**1.98**	**<0.05***	0.01	0.69
Monitoring	0.21	0.17	1.24	0.22	-0.12	0.55
SE*Time	0.07	0.07	1.06	0.29	-0.06	0.21
SE*Responsiveness	0.23	0.17	1.31	0.19	-0.11	0.56
Time*Responsiveness	**0.16**	**0.08**	**2.09**	**0.04***	0.01	0.32
SE*Demandingness	-0.05	0.19	-0.24	0.81	-0.40	0.31
Time*Demandingness	**-0.25**	**0.08**	**-3.22**	**<0.01***	-0.40	-0.10
SE*Responsible	-0.15	0.18	-0.86	0.39	-0.50	0.19
Time*Responsible	-0.10	0.08	-1.33	0.18	-0.25	0.05
SE*Monitor	-0.08	0.17	-0.47	0.64	-0.42	0.25
Time*Monitor	-0.05	0.08	-0.67	0.50	-0.20	0.10
SE*Time*Responsiveness	-0.10	0.07	-1.33	0.19	-0.24	0.04
SE*Time*Demandingness	0.02	0.08	0.31	0.75	-0.13	0.18
SE*Time*Responsible	0.12	0.07	1.59	0.11	-0.03	0.26
SE*Time*Monitor	0.04	0.07	0.50	0.62	-0.11	0.18

Note: “SE” represents self-efficacy.

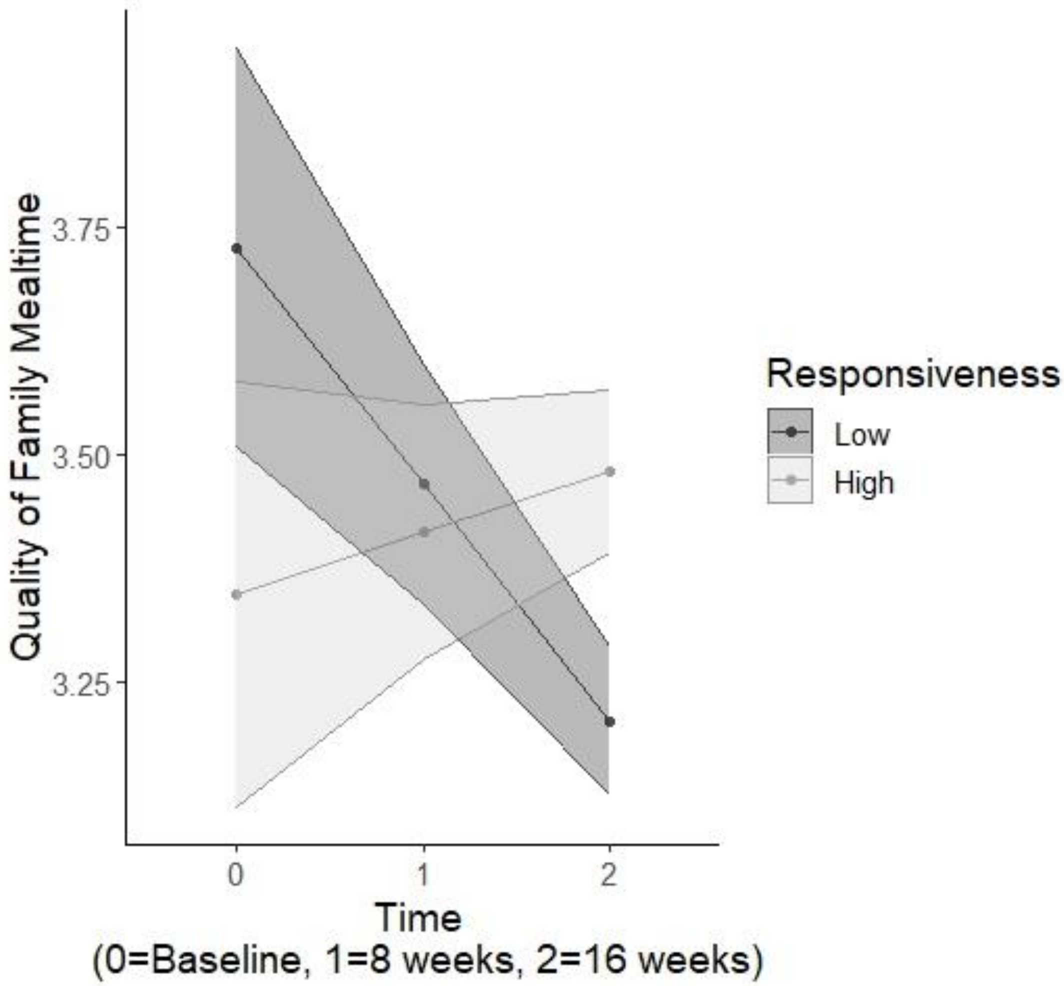

Figure 3.6 Parental responsiveness by time interactions predicting quality of family mealtime

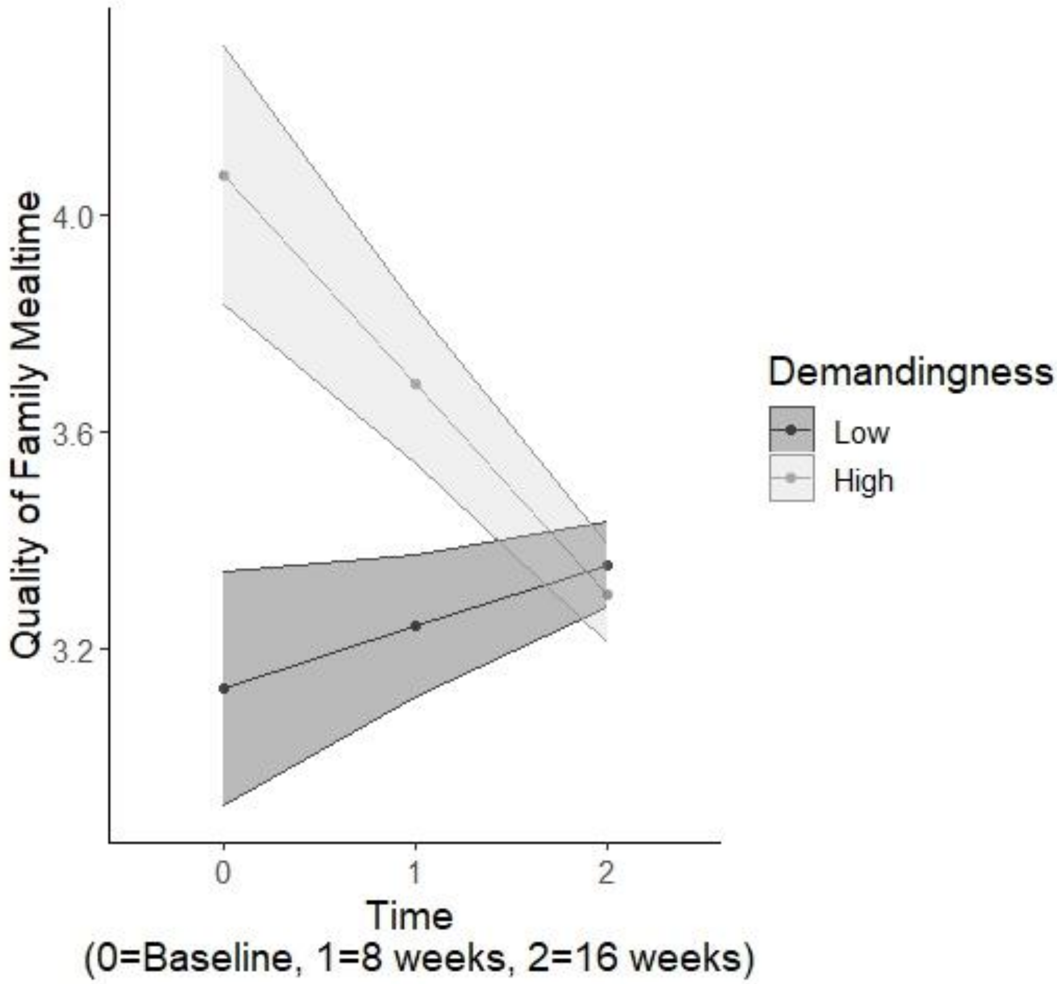

Figure 3.7 Parental demandingness by time interactions predicting quality of family mealtime

CHAPTER FOUR

DISCUSSION

This study examined relationships between adolescent self-efficacy, parenting factors, adolescent health outcomes (kCal, fat, fruit, and vegetable intake), and family mealtime outcomes in overweight African American families. A primary aim was to determine temporal stability of adolescent self-efficacy and parenting factors. It was hypothesized that increases in adolescent self-efficacy over time (16 weeks) would be associated with improvements in adolescent health outcomes (decreased zBMI, decreased kCal and fat intake, increased fruit and vegetable intake) and increased frequency and quality of family mealtime. However, the results of the study did not support this hypothesis and there were no significant main effects or interactions with time in predicting adolescent zBMI, dietary intake (kCal, fat, fruit, and vegetable) or family mealtime outcomes (frequency and quality). However, the results of the study showed stability of effects for two parenting factors, responsiveness (kCal intake, fat intake, and frequency of family meals), and responsibility for adolescents' diet (quality of family meals). As expected, greater parental responsiveness was associated with increased frequency of family meals and increased responsibility was associated with increased quality of family meals. These effects were not moderated by time, indicating that the parenting factors were stable across 16 weeks. The results also showed unexpected main effects, such that increased responsiveness was associated with greater kCal and fat

intake. These findings suggest parental responsiveness and parental responsibility may be associated with kCal intake, fat intake, frequency of family meals, and quality of family meals over time. Although there is temporal stability in these parenting variables, the dietary outcomes were not in the expected direction.

It was also hypothesized that increases in warm, responsive parenting (parental responsiveness, parental responsibility) would be associated with improved weight related outcomes (decreased zBMI, decreased kCal and fat intake, increased fruit and vegetable intake) and increased frequency and quality of family mealtime, while more demanding, controlling parenting (demandingness, parental monitoring) would be associated with poorer health outcomes (increased zBMI, increased kCal and fat intake, decreased fruit and vegetable intake) and poorer family mealtime outcomes (reduced frequency and quality) over time. Results demonstrated significant relationships for the zBMI outcome and quality of family mealtime outcome. Time moderated effects for zBMI were both in unexpected directions. For instance, lower parental responsibility was associated with decreased adolescent zBMI over time, while higher parental responsibility was associated with increased adolescent zBMI. Additionally, the relationship between parental monitoring and adolescent zBMI over time was in an unexpected direction, showing that higher parental monitoring was associated with lower zBMI over time and lower monitoring was associated with higher zBMI over time. On the other hand, some hypotheses for the quality of family mealtime outcome were confirmed., Results demonstrated that higher parental responsiveness was associated with greater quality of family mealtime over time, while lower parental responsiveness was associated with lower quality family mealtimes. Additionally, higher parental

demandingness was associated with lower quality of family mealtime over time. No other two-way interactions with time were significant.

A second aim of this study was to assess whether parenting factors moderate the relationship between dietary self-efficacy and adolescent health outcomes (zBMI and kCal, fat, fruit, and vegetable intake) and family mealtime outcomes (frequency and quality). It was hypothesized that warm parenting (responsiveness and parental responsibility) would be related to a more positive relationships between self-efficacy and health and family outcomes, while demanding parenting (demandingness and parental monitoring) would be related to a more negative association between self-efficacy and health and family outcomes. However, three significant three-way interactions were identified, and the findings were counterintuitive. Specifically, self-efficacy was associated with decreased kCal and decreased fat intake for individuals with more demanding parents. Self-efficacy was also associated with fewer family meals across time for individuals whose parents practiced greater responsibility for adolescent diet.

4.1 Findings Associated with Weight-Related Outcomes

The current study is one of a few studies that have investigated longitudinal associations between parental feeding practices and adolescent health outcomes and is the first study to show a longitudinal relationship between parental responsibility and adolescent zBMI. Previous cross-sectional research has shown that greater parental responsibility is associated with lower adolescent zBMI (Loncar et al., 2021). However, this finding has not been validated in other cross-sectional or longitudinal research. (Schmidt et al., 2017; Shloim et al., 2015). Despite limited evidence, the responsibility

factor was included in the present study as it was expected to capture adolescent perspectives regarding parental dietary support. Namely, it was hypothesized that parental responsibility would be associated with more desirable health and family outcomes, as adolescents may perceive greater parental responsibility to relate to greater nurturance and support. The relationship between parental responsibility and adolescent zBMI was opposite of the hypothesized direction, showing that high parental responsibility was associated with greater zBMI across 16 weeks. A few factors may explain this unexpected finding. First, this is one of the only studies to examine these relationships in an adolescent sample (Kaur et al., 2006; Polat & Erci, 2010; Schmidt et al., 2017). This is important as interpretation may vary for differing development stages. For instance, adolescents may feel that parents who are responsible for feeding them at home, deciding their portion sizes, and deciding which foods are the “right” kind of foods may have fewer opportunities to increase dietary self-efficacy and self-regulation in these domains, and subsequently have poorer health outcomes (Bandura, 1977; Hill et al., 1998; Chu et al., 2013). Alternatively, adolescents who have opportunities for shared dietary decision-making, autonomy for portions, and have an overall sense of agency in their diets may have better health outcomes, including healthier zBMI (Dallacker et al., 2019). Additionally, previous literature has also considered the internal consistency and reliability of the responsibility measure to be lower than other CFQ subscales for different populations (Kaur et al., 2006; Polat & Erci, 2010; Shloim et al., 2015).

The present study also demonstrates an interesting finding that adolescents whose parents practice high monitoring of their diet have lower zBMIs over time, while adolescents of low-monitoring parents have higher zBMIs over time. Previous research

has demonstrated mixed findings for the relationship between parental monitoring and adolescent BMI (Burton et al., 2017; Holland et al., 2014; Loncar et al., 2021; Schmidt et al., 2017; Towner et al., 2015)For instance, Towner and colleagues (2015) found that greater monitoring from female caregivers was associated with adolescent obesity, while Burton and colleagues (2017) only demonstrated a significant association between parental monitoring and younger youth. Studies where African American families were most represented found no evidence for a relationship between monitoring and adolescent BMI (Burton et al., 2017; Hennessy et al., 2010; Kaur et al., 2006; Loncar et al., 2021). However, these studies are cross-sectional and did not assess relationships over time. This is important as some studies have suggested that parental feeding practices are not stable over time, implying longitudinal relationships may differ from cross-sectional relationships. Potential temporal instability of the monitoring variable may explain the unexpected finding.

The finding adds to previous literature and offers a longitudinal perspective of the relationship between parental monitoring and adolescent zBMI. Namely, this finding demonstrates that African American adolescents who report their parents monitor their sweets, snack food, and high fat food intake, have lower zBMIs across 16-weeks when compared to adolescents who report fewer monitoring behaviors. This result is meaningful as it also suggests some monitoring behaviors for adolescents may be beneficial and relate to better health outcomes (i.e. healthier zBMI). It is important to consider cultural factors that may influence this finding. Namely, some research asserts that African American parents use more authoritarian parenting styles and practices when addressing their adolescents' diet (Polfuss et al., 2011). Other studies have noted that

authoritarian feeding practices may have different effects for African American adolescents as they may increase a sense of love and security (Hill et al., 2007).

This study also found a significant relationship between parental responsiveness and adolescent kCal intake, as well as parental responsiveness and adolescent fat intake. Literature has asserted that parenting style may affect adolescent health behaviors such as dietary intake (Berge et al., 2010a; Liang et al., 2016; Rhee et al., 2015). These studies have noted that greater responsiveness is typically associated with more desirable health outcomes in children and adolescents. However, few recent publications have assessed the relationship between kCal or fat intake and parental responsiveness (Haugland et al., 2019; Kim et al., 2008; Pearson et al., 2010b). The direction of the present findings, however, were opposite to the hypothesized direction. Specifically, the results indicated that greater parental responsiveness was associated with greater adolescent kCal intake and greater fat intake. These unexpected findings may be associated to limitations in dietary recall data, where additional data may have increased reliability (St. George et al., 2016).

4.2 Findings Associated with Dietary Outcomes

The current study is the first to assess moderating effects of parenting factors in the relationship between adolescent self-efficacy and health outcomes (kCal intake, fat intake) over time. Theoretically, self-efficacy relates to the degree of engagement in health behaviors, such as self-monitoring dietary intake for weight maintenance or weight loss (Bandura, 1997, 2004). There have been limited studies assessing relationships between adolescent self-efficacy and health outcomes, therefore the present study offers novel perspectives guided by theory. A significant relationship between self-efficacy,

parental demandingness, and time was found, such that self-efficacy related to greater kCal/fat intake in adolescents with lower parental demandingness and lower kCal/fat intake in adolescents with higher parental demandingness at baseline. This was contrary to the hypothesized direction that greater parental demandingness would moderate the relationship between self-efficacy and kCal/fat intake, resulting in higher kCal/fat consumption for adolescents with highly demanding parents. While this finding appears counterintuitive, there may be several factors that influence the finding. One consideration relates to the items included from the API scale (Jackson et al., 1998). Specifically, the present study includes three items from this scale, asking adolescents to endorse to what degree their parents have rules they must follow, tell them when they have to be home, and know where they are after school. Endorsing these items may indicate the presence of developmentally-appropriate boundaries and expectations rather than overly-controlling parenting practices. In so, adolescents who endorse perceived parental demandingness may have parents who are appropriately engaged in other aspects of their lives, such as providing nutritional meals and encouraging energy balance. From this perspective, it may be reasonable that higher demandingness be associated with lower kCal/fat intake among adolescents. Despite being in an unexpected direction, this finding provides insight into moderating role of parenting factors on adolescent self-efficacy and health outcomes.

There were no significant main effects, two-way interactions, or three-way interactions with either the adolescent fruit or the vegetable dietary outcome. However, previous research has established relationships between parenting factors, adolescent self-efficacy, and fruit and vegetable intake (Blissett, 2011; Kremers et al., 2003;

Luszczynska et al., 2016; Pearson et al., 2011a; Quattlebaum et al., 2021). For instance, Luszcynska and colleagues (2016) found that greater adolescent self-efficacy was associated with greater fruit and vegetable intake in their cross-sectional analysis (Luszczynska et al., 2016). Longitudinal analyses have also indicated relationships between adolescent self-efficacy and fruit and vegetable intake. For instance, Pearson and colleagues (2011) found that adolescent self-efficacy positively predicted fruit and vegetable intake one year later (Pearson et al., 2011b). Additionally, many studies that have assessed the relationship between parenting and adolescent dietary intake have shown that more authoritative (high responsiveness) parenting was associated with greater fruit and vegetable intake (Franchini et al., 2011; Kremers et al., 2003; Monge-Rojas et al., 2010; Pearson et al., 2010b; Watts et al., 2017).

Some factors that may have affected this study's lack of fruit and vegetable findings. One important consideration is the amount of dietary recall data that was collected for the present study. Three dietary recalls were required of each adolescent at both the baseline (0 weeks) and post-online (16 weeks) timepoints. In this process, adolescents self-reported the meals they had 24 hours prior and dietary data was calculated using their report. However, there is growing evidence that more than three dietary recalls are required to achieve reliability standards. In fact, recent research shows that ten dietary assessments are needed for data to be reliable, thus there are considerable limitations with reliability of dietary recalls in this study (St. George et al., 2016). The limited dietary recall data may have influenced the findings for the fruit and vegetable outcome.

4.3 Findings Associated with Frequency and Quality Family Mealtime

This study found that parental responsiveness was positively related to frequency of family meals. This finding is consistent with the hypothesis that more responsive parenting would be associated with more family meals. This finding is consistent with previous literature, which demonstrates that more authoritative parenting may coordinate more frequent family meals (Berge, 2009). In addition to mealtime frequency, this study found a positive, direct effect between parental responsibility and quality of family mealtimes. In other words, adolescents who reported that their parents were more responsible for their diets perceived family mealtimes to be more enjoyable. This finding was consistent with the hypothesized direction of this relationship. While other studies have established that authoritative parenting is associated with healthier child and adolescent dietary intake, no known studies have established a significant and positive associations between related constructs, parental responsibility and quality of family mealtime. The finding also demonstrates temporal stability of parental responsibility, suggesting that this factor remains consistent across timepoints. Taken together, the findings are particularly meaningful when considering the ripple effects of family mealtime. Namely, previous studies have demonstrated that eating meals together as a family may be a predictor of adolescent health (Ardakani et al., 2023; Berge, 2009; Boles & Gunnarsdottir, 2015; S.M. Robson et al., 2020). For instance, in their recent meta-analysis, S.M. Robson and colleagues (2020) described evidence that eating together as a family more often is associated with positive dietary outcomes such as increased fruit and vegetable intake (S.M. Robson et al., 2020). Other studies have shown direct relationships between frequency of family mealtime and other health outcomes, such as

adolescent BMI (Berge, 2009). Furthermore, Berge and colleagues (2015) found that greater frequency of family mealtime in adolescence went on to predict health 10 years later, demonstrating significantly better health for individuals who had more meals with their family in childhood (Berge et al., 2015). The findings of the current study provide support for the relationship between parenting factors and family mealtime, which may have ripple effects for adolescent health.

This study also found a significant relationship between parental demandingness and quality of family meals over time in the expected direction. Specifically, the finding shows that adolescents with more demanding parents perceive mealtime to be lower quality, while adolescents with less demanding parents report higher quality mealtime. This is consistent with previous literature that suggests that demandingness may negatively impact familial interactions (Berge, 2009; Dallacker et al., 2019; Kitzman-Ulrich et al., 2010). This result is also meaningful as it provides further evidence for the importance of positive quality family mealtimes.

This study demonstrated moderating effects of parental responsibility on the relationship between self-efficacy and frequency of family mealtime over time. However, the hypothesized direction was not fully supported. Specifically, greater parental responsibility for their adolescent's diet was associated with more frequent family meals for adolescents with low self-efficacy (compared to adolescents with high self-efficacy) for the baseline (0-weeks) and post-group (8-weeks) timepoints. At the post-online (16-weeks) timepoint, higher parental responsibility was associated with more frequent family meals compared to adolescents whose parents practiced low responsibility for their diet. High parental responsibility was associated with greater frequency of family

meals for adolescents with low self-efficacy across timepoints. As previously discussed, the responsibility measure may have been interpreted differently by adolescents and may limit adolescents' opportunities to build self-efficacy and practice health behaviors. However, it is reasonable to expect that parents who perceive themselves to be more responsible for their adolescents' diets may initiate family meals more often. Prior literature has outlined the potential adolescent health benefits from increased family mealtime (Ardakani et al., 2023).

As expected, this study found a positive two-way interaction between parental responsiveness and time, adolescents with responsive parents endorsed better quality of family meals across time. This is a novel finding as previous research has not outlined the longitudinal relationship between parental responsiveness and perceived quality of mealtime in African American families. However, a growing body of literature indicates the benefits of enjoyable family meals. For instance, Berge and colleagues (2014) found that when children and adolescents enjoyed family mealtime, they were less likely to be overweight (Berge et al., 2014b). In fact, Dallacker and colleagues (2019) recently conducted a meta-analysis where they concluded that quality, even more so than quantity, of family mealtime is related to adolescent health (Dallacker et al., 2019). This aligns with established findings that positive familial interactions, such as those during family meals, promote child and adolescent health (Kitzman-Ulrich et al., 2010).

4.4 Study Limitations and Strengths

There are a few limitations of this study that should be considered when interpreting the results. Regarding dietary outcomes, additional dietary recalls were needed to meet a standard of reliability (St. George et al., 2016). While the current study

collected three dietary recalls for adolescents at two timepoints, increased recalls at each of the three timepoints may have provided further insights regarding relationships between adolescent self-efficacy, parenting factors, and health outcomes. Regarding design, future research may expand on the current findings by including observing longitudinal relationships across longer timespans. Namely, examining relationships over the longer periods of time may provide additional insights regarding the temporal stability of variables, moderation effects, and direct relationships between adolescent self-efficacy, parenting, and health outcomes. More causal study designs would also expand our understanding of how these factors directly and indirectly influence weight-related outcomes.

Another limitation of this study relates to the self-efficacy data. As the dietary self-efficacy data was not imputed and ready for analysis, a self-efficacy for health behaviors (i.e. exercise) measure was used in its place. While the two measures are moderately correlated (r = 0.57 – 0.73), use of the specific dietary self-efficacy measure would provide stronger insights into the tested relationships.

A significant strength of this study relates to the study sample. The entire sample was comprised of overweight African American adolescents between the ages of 11-16 and a parent or caregiver. Very few studies exist that adequately represent African American families, and few studies examine relationships in entirely overweight samples. The current study expands on existing literature by evaluating these relationships in an underrepresented sample, providing supporting and novel insights regarding relationships between adolescent self-efficacy, parenting factors, and health outcomes. Lastly, this

study was longitudinal and allowed for the exploration of temporal stability in adolescent self-efficacy and parenting factors.

Overall, a strength of this study is that it provides meaningful insights into the complexities of the relationships between parenting, self-efficacy, dietary outcomes, and BMI outcomes. Findings demonstrate the need for further investigation into these variables and how they relate to adolescent health and weight-related outcomes.

4.5 Implications and Future Directions

Findings in the present study may guide future research endeavors. An interesting aspect of the present study is the incorporation of family mealtime outcomes. As literature grows to assess factors of adolescent health, frequency and quality of family mealtime are proving to become significant predictors of child and adolescent health outcomes(Ardakani et al., 2023; Berge, 2009; Berge et al., 2015; Dallacker et al., 2019). An expansion of the current study may consider the direct relationships between family mealtime variables and adolescent health outcomes, such as zBMI and dietary intake. Additionally, future research may consider the relationships between family mealtime variables and cognitive variables such as self-efficacy and self-regulation.

Additionally, future studies may incorporate different parenting measures. While the present study focused on analyzing the aspects of parenting style and parental feeding practices, broader literature emphasizes varying perceptions of parenting factors. For instance, some developmental literature outlines the role of parental coercion and family conflict in child/adolescent development (Patterson, 2015). Namely, parental harshness through coercive behaviors may cause parent-child conflict and influence the

development of child self-regulatory behaviors. Consideration of parenting factors beyond the scope of parenting style and parental feeding practices may provide valuable insights into the relationships between parenting and adolescent health outcomes.

More so, further consideration regarding parenting differences with overweight and obese children/adolescents may contribute to the literature. Namely, research suggests that parents engage with overweight and/or obese children differently compared to normal-weight children (Berge et al., 2016). Further investigation regarding the specific differences in parenting style and parenting behaviors with overweight compared to normal weight children would provide further context for understanding the role of parenting in adolescent health.

Overall, continued investigation of factors influencing adolescent health behaviors and related factors (e.g. self-efficacy and self-regulation) is critical to determine appropriate interventions and preventative measures to address overweight and obesity in children and adolescents.

4.6 Conclusion

In summary, childhood overweight and obesity continue to be a significant health concern and especially affects African American families (Ogden, Carroll, Kit, et al., 2016). Identifying factors that influence adolescent weight and weight-related behaviors is essential in creating efficacious interventions to address overweight and obesity. Literature has demonstrated that parenting factors, such as parenting style and parental feeding practices, are associated with adolescent weight and related health behaviors. Additional research has shown that cognitive factors, such as self-efficacy and self-

regulation may also determine adolescent health. More so, these factors may influence family mealtime variables, which a growing body of research establishes to be related to adolescent weight and weight-related outcomes. The current study filled a gap in literature by assessing the temporal stability of parenting factors and adolescent self-efficacy. It expanded on previous research by assessing longitudinal relationships between self-efficacy and adolescent health and family mealtime outcomes, as well as parenting factors and adolescent health and family mealtime outcomes. More so, it provided insight into the moderating effects of parenting factors in the relationship between adolescent self-efficacy and health and family mealtime outcomes. However, only some findings of this study were in expected directions, while other findings were unexpected. While some moderating effects were determined, they were in counterintuitive and unexpected. Outside of these interactions, there were no significant findings relating to self-efficacy. While self-efficacy may be an important determinant of health behavior engagement and health outcomes, additional research is needed to provide a clearer understanding of its role. Of the expected findings in this research, there were significant positive effects of parental responsiveness on quality of family mealtime over time. A growing body of literature supports the importance of family mealtime and its implications of child and adolescent development. Future research may further investigate the family to provide further insights into family environment and its relationships with adolescent health and development.

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