# PARENTING STYLES AND PATTERNS OF CHILD WEIGHT ACROSS TIME

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Master of Science in

Human Development and Family Science

Oklahoma State University

Stillwater, Oklahoma

2007

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
December, 2009

PARENTING STYLES AND PATTERNS OF

CHILD WEIGHT ACROSS TIME

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# ACKNOWLEDGMENTS

"They have achieved success who have lived well, laughed often, and loved much; who have gained the respect of intelligent people and the love of little children; who have filled their niche and accomplished their task; who have left the world better than they found it, whether by an improved poppy, a perfect poem, or a rescued soul; who have never lacked appreciation of earth's beauty or failed to express it; who have always looked for the best in others and given them the best; whose lives were an inspiration." (adapted from Stanley, 1905).

There are many people to whom I would like to express gratitude for their help, guidance, and support throughout my dissertation journey. First, I would like to thank my advisor, Amanda Harrist, for her unwavering support and for teaching me to be a better researcher. She has not only been one of the keys to my success in graduate school but has also become a friend. I would also like to extend thanks to the members of my committee, Laura Hubbs-Tait, Robert Larzelere, Melanie Page, and Glade Topham, for their support and feedback during this process. I would like to give a special acknowledgment to Dr. Larzelere, my statistics mentor throughout my project. Not only do I greatly appreciate his suggestions, feedback, and mentoring; but, he always maintained a positive and supportive attitude with me. My appreciation for all of his time and knowledge is immeasurable.

My family has been a constant source of support and love. They made the highs twice as high and the lows half as low. I would like to thank my husband, Corey, for his unconditional love and unfailing support. Thank you to my dad for being my lifelong friend and for always believing in my ability to succeed. My mom's daily encouragement and love has kept me motivated and focused. Thank you for everything you have done for me. Thank you to my brother, Jeremy, for being the best big brother a girl could ever hope for and for always being a phone call away. I would also like to thank my sister-in-law, April, for her friendship and support. To my special friend, Caroline, I want to thank you for being my sounding board and confidante. Last, Ptolemy and Zelda are waiting at home with joy for me every day and they bring happiness to every part of my life.

I would like to dedicate my dissertation to my grandma, Marguerite Rutledge. She is a beautiful, wonderful, and independent woman. She is one of the biggest influences in my life. I love her more everyday and am so thankful to call her my own. I hope to always live my life by her example of goodness, integrity, and grace.

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# CHAPTER I

## INTRODUCTION

Today, one child in every four is overweight in the United States. Fifty years ago that number was 1 out of 25 (Center for Disease Control [CDC], 2008a). These staggering numbers are why obesity has been labeled the "disease of the twenty-first century" (Rössner, 2002, p. 52). Childhood obesity is not only on the rise statistically, but also in severity (Strauss & Pollack, 2001). In other words, more children can be categorized as obese and the levels of obesity are also increasing. Hospitalizations for obesity-related health issues tripled for children between 1979 and 1999 (Dietz, 2004). Understanding the environment that surrounds children who are obese is more essential now in order to improve prevention and intervention programs aimed at reducing this potentially life-threatening condition.

Being obese during childhood puts one at risk physically, mentally, and socially. Childhood obesity increases the risk for being obese in both adolescence and adulthood. Six-year-olds who are obese have more than a 50% likelihood of being obese in adulthood. This likelihood increases to more than 70% for obese adolescents (Higgins & Grayson, n.d.). Nader and colleagues (2006) found that young overweight children (overweight refers to children above the 85$^{th}$ percentile on BMI-for-Age-% chart, whereas obese refers to those who are above the 95$^{th}$ percentile) were over five times more likely than non-overweight children to be overweight at age 12. As these young

obese children become obese adults, they are more likely to develop diseases linked with adult obesity, including type 2 diabetes, hypertension, and hyperlipidemia (e.g., high cholesterol).

Beyond physical effects, obesity is linked with having a negative body image, having low self-esteem, developing binge eating habits, and having increased psychological distress in both childhood and adolescence (Mellin, Neumark-Sztainer, Story, Ireland, & Resnick, 2002). Academically, obese children have been found to have lower grade point averages and lower test scores than non-obese children (Datar, Sturm, & Magnabosco, 2004). Further, teachers tend to report more behavior problems for obese children (Stradmeijer, Bosch, Koops, & Seidell, 2000).

Another serious consequence facing young obese persons is social discrimination (Dietz, 1998; USDHH, 2001), although this consequence has not been greatly studied (Strauss & Pollack, 2003). Strauss and Pollack found that children who are obese are much less likely to be nominated as a friend than their normal-weight peers and are more likely to be socially isolated. Further, obese adults are more likely to be labeled as both unattractive and undesirable (Puhl & Brownell, 2001). Thus, the effects of child obesity are more far-reaching than the physical ones that often first come to mind. This further increases the importance of decreasing the numbers of children who are obese.

Child obesity research began with a child-centered approach, including examination of children's emotion, cognition, and biology related to child obesity. Although these components are important, they are not the entire story. Research next needs to examine influences outside of the child but entities with which the child has direct and frequent contact, like family and school. This study sought to examine in detail one of these

influences, family, specifically parenting. Following is a brief review of the literature related to parenting and child obesity as well as demographic influences that may also play a role in the parenting/child obesity relation: gender, socioeconomic status, and ethnicity. This literature is explored to answer the research question: Is parenting related to child obesity and is this relation moderated by any of three demographic factors?

# CHAPTER II

# REVIEW OF LITERATURE

## Parenting

Many of children's early life experiences are shaped by their parents, thus making parenting an important factor to consider in regard to child weight. The beliefs, attitudes, and behaviors that shape parenting are described as parenting style. These are global parenting styles that span across time and situation. According to Baumrind (1966), who introduced the concept, there are three main types of parenting styles: authoritative, authoritarian, and permissive. Authoritative parents tend to set boundaries and limits on their children while maintaining an overall warm and loving atmosphere. Authoritarian parents set rigid boundaries and, typically, have little responsiveness toward their children. Permissive parents, in contrast, do not set rigid boundaries and can be responsive or non-responsive, dependent upon whether they are neglectful permissive parents (non-responsive) or indulgent permissive parents (responsive; Baumrind, 1991). Parenting styles have been empirically linked to psychosocial outcomes such as self-esteem, trust, aggression, and self-regulation (Aunola et al., 2000; Baumrind, 1989; Chipman, Olsen, Klein, Hart, & Robinson, 2000).

Since parenting styles are founded in a set of attitudes, they are presumed to have relative stability, though not absolute stability. There is research that supports the assumption of relative stability across different parenting behaviors and attitudes (e.g., positive parenting, monitoring, discipline, supervision), especially during one

developmental epoch (e.g., middle childhood, CDC, 2008b; Fite, Colder, Lochman, & Wells, 2006; Holden & Miller, 1999; Loeber, Drinkwater, Yin, Anderson, Schmidt, & Crawford, 2000; Stoolmiller, 1994; Vuchinich, Bank, & Patterson, 1992). In a study using Baumrind's longitudinal data from the Family Socialization and Developmental Competence program, Baumrind, Larzelere, and Owens (in press) found support for relative but not absolute stability. Specifically, when testing whether time one (preschool age) parenting predicted time two (elementary school age) or time three (middle school age) parenting patterns, they reported that 30% of parents remained in the same of seven parenting categories between time one and time two (and 31% between time 2 and time 3) while only 20% stayed in the same pattern from time one to time three. These findings suggest that there is support for relative short-term stability but over a longer range of time (i.e., time one to time three), the likelihood of staying in the same parenting patterns drops by 10%. In a study examining parenting behaviors over the first six years of life, the researchers found support for relative stability of sensitive ($r$ = . .26, $p$ < .01 between 6 and 24 months), supportive ($r$ = .47, $p$ < .01 between 54 and 72 months), and stimulating ($rs$ range from .22, 6 to 24 months, to .43, 36 to 54 months, all $ps$ < .01) parenting but did not find support for the relative stability of more negative parenting behaviors (all $rs$ less than .20; Dallaire & Weinraub, 2005). Dallaire and Weinraub (2005) did not find evidence of absolute stability using repeated-measures analysis of variance. When assessing the stability of authoritative parenting among a sample of inner-city African-American families, Forehand and Jones (2002) reported test-retest correlation ($r$ = .46, $p$ < .01) over a period of four years for parental monitoring and

warmth; however, they did not find evidence for absolute stability with their repeated measures analysis of variance.

Forehand and Jones (2002) also noted that earlier parental monitoring accounted for unique variance in later monitoring, indicating that even if some parenting behaviors or methods of monitoring have changed, there is stability across developmental epochs for having monitoring attitudes. These findings lead to the conclusion that attitudes may be stable over an extended amount of time (i.e., the entire childhood) and behaviors are, at the least, somewhat stable within a developmental epoch. Some literature suggests that changes in parental behaviors tend to occur during periods of transition (i.e., changing from one developmental epoch to another; for example, transitioning childhood to adolescence; Fite et al., 2006; Holmbeck, Paikoff, & Brooks-Gunn, 1995). The conclusion that changes in parenting practices can occur during periods of transition is supported in a meta-analysis of parenting behavior across time (Holden & Miller, 1999). Understanding the stability of parenting is of particular importance in longitudinal analyses and, as a result of the conclusion that parenting is relatively stable within a developmental epoch, it was only assessed in the current study one time as opposed to at every wave.

Global (i.e., non food-related) parenting styles have not only been related to varying psychosocial child outcomes, as aforementioned, but have also been found to be related to child obesity (e.g., Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006). This literature is sparse and typically limited to the nutrition field which focuses on food related parent feeding practices. Recently there has been more focus on this approach of examining global (non-food related) parenting styles and child obesity; however the

results are mixed (Rhee, 2008). Several studies have found no associations between global parenting styles and child obesity (Agras, Hammer, McNicholas, & Kraemer, 2004; Wake, Nicholson, Hardy, & Smith, 2007). In contrast, Rhee and colleagues found that authoritative parenting was less likely to predict child obesity than either authoritarian or permissive parenting (Rhee et al., 2006). Rhee et al. (2006) measured parenting both through observation and self-report among a large sample of mothers of first grade children. Also, the current study is an extension of the results found in the author's unpublished master's thesis (Rutledge, 2007). In that study, it was found that more permissive mothers were more likely to have children who were obese than less permissive mothers. Also, it was found that more authoritarian mothers were less likely to have a child who was at-risk or obese than less authoritarian mothers. This last finding was contrary to what would be predicted by the literature and was presumed to be a sample-specific finding (i.e., authoritarian parenting is more normative in regions similar to the one in the study and, thus, these results may not generalize to the greater population). Topham and colleagues found that the permissive parenting/child obesity relation was moderated by depression in that more depressed mothers with higher permissiveness predicted child obesity as opposed to non-depressed mothers (Topham, Page, Hubbs-Tait, Rutledge, Kennedy, Shriver, & Harrist, in press).

Several international studies have examined the link between global parenting styles and child obesity. In two of these studies, the mothers' global parenting styles were not related to children's BMI-for-Age-%. One of these studies was with preschool-aged children and their parents and no direct relation was found between global parenting styles and children's BMI-for-Age-%; however, they did find relations using parent

feeding practices (Blissett & Haycraft, 2008). The other study consisted of a sample of Australian preschool-aged children and their parents and also found no direct link between maternal parenting styles and children's BMI-for-Age-% (Wake, Nicholson, Hardy, & Smith, 2007). However, there were associations found with paternal parenting styles, specifically children whose fathers utilized more permissive styles had a higher odds of being overweight than those who had authoritative fathers. In a study of Chinese and Chinese American mother-child pairs, authoritarian parenting was not related to child weight while democratic parenting was associated with higher levels of weight (Chen & Kennedy, 2004).

As aforesaid, often cited in nutrition literature are parent feeding practices which are proposed to encompass more of the "practice" in parenting style as opposed to the "philosophy" (i.e., as Baumrind typology describes; for a review see Ventura & Birch, 2008). As Birch and colleagues described parent feeding practices, "parents' feeding attitudes and practices shape what foods the child is offered, exert control over the timing, size, and social context of meals and snacks, and set the emotional tone of eating occasions" (Birch et al., 2001, p. 202). The names of the types of parent feeding practices are based on Baumrind's more global parenting styles (authoritative, etc.). However, until recently, there has been little research on the relations among non-food related (global) parenting styles and food related parent feeding practices. Hubbs-Tait and colleagues recently published an article specifically exploring these relations (Hubbs-Tait, Kennedy, Page, Topham, & Harrist, 2008). They found that the parallel named constructs in parent feeding practices predicted the global parenting style (e.g., authoritarian parenting feeding practices predicted global authoritarian parenting style).

Interestingly, similar to the findings regarding stability of global parenting styles, parent feeding practices also have been found to be stable within developmental epochs (Faith, Berkowitz, Stallings, Kerns, Storey, & Stunkard, 2004). Thus, the literature that has examined the relation between parent feeding practices and child obesity can be used to better understand the global parenting style/child obesity relation.

Parents who utilize authoritative feeding practices work on balancing between serving food that is healthy for their children and what their children want to eat (Birch & Fisher, 1995). In the literature, authoritative feeding practices have been associated with more healthful eating and attitudes among their children. In one study, adolescents of authoritative parents consumed more fruit than those of authoritarian and permissive parents (Kremers, Brug, de Vries, & Engels, 2003).

Parents who utilize authoritarian feeding practices, in contrast, exhibit excessive control (of type of food, of portion size, etc.) over all components of the meal which has been linked with higher rates of obesity (Birch, Fisher, & Davison, 2003; Gable & Lutz, 2000; Kremers et al., 2003; Patrick et al., 2005). Faith et al. (2004) found that this relation was moderated by the child's genetic predisposition to obesity, such that restrictive feeding was related to increased weight only in children already at a high risk for obesity.

Parents who utilize permissive feeding practices typically have little to no monitoring or restriction of what their children eat (Fisher & Birch, 1999). Blissett and Haycraft (2008), whose sample consisted of preschool-aged children and their parents, found that global permissive parenting was related to lower monitoring of food intake which is indicative of permissive feeding practices. Overly permissive patterns, too, have

been associated with elevated child obesity rates in the literature (Kremers et al., 2003; Lissau & Sorensen, 1994). A recent Belgian study found that adolescents whose parents utilized this more permissive feeding style ate breakfast less often as well as consuming more sweets and less vegetables and fruit (Vereecken, Legiest, de Bourdeaudhuij, & Maes, 2009). This same study also tested the relation of global parenting styles with children's food preferences and found no significant associations. Perceptibly, there is more to the parenting/child obesity relation than what happens during food consumption, but many of these food related actions may be indicators of what is going on in the larger parent-child relationship. There is more confidence in this statement based on Hubbs-Tait et al.'s recent findings (2008).

There are several reasons parents are critical to any efforts to treat/prevent child obesity (Kitzmann, Dalton, & Buscemi, 2008). One of the key roles parents should play in an intervention is socializing their children into healthy patterns of eating and activity. First, children do not typically buy or prepare their own food. Parents control the type and quantity of food available in the house (Golan & Crow, 2004; Strauss, 1999). Second, parents model eating and physical activity habits for their children and can actively encourage a healthy lifestyle (Golan & Crow, 2004; Strauss, 1999). Third, studies have found that maternal obesity is among the best predictors of child obesity (e.g., Strauss & Knight, 1999). Last, it would be very difficult for children to maintain any physical effects or lifestyle changes made in an intervention without full parental support and involvement.

**Gender**

When creating effective prevention and intervention programs to fight childhood obesity, factors that could moderate the relation between parenting style and child obesity must be better understood and utilized. One factor that should be considered is child gender. In the current study, child gender was measured only by a report of the child's biological sex. However, Glasser and Smith (2008) recommend using the terminology "child gender" when the influence of biological and environmental factors cannot be disentangled. Thus, here, child gender is used because of the inability to disentangle the influence of biological and environmental factors in child weight or in the parent-child relation for the purposes of this study. Several studies have found child gender differences in prevalence of child obesity. For example, in a sample of 4-year-olds and 10-year-olds, girls were more likely to be overweight than boys (Blackwell Publishing, 2007). However, other studies have not found gender differences (Ogden, Flegal, Carroll, & Johnson, 2002; Strauss & Knight, 1999). Further, in Wang's (2001) study, more American girls were obese (above the $95^{th}$ percentile) but more boys were overweight (between the $85^{th}$ and $95^{th}$ percentiles). Based on the conflicting findings in the literature, gender should be further studied to obtain a better understanding of the gender/weight relation.

Further, parental influences may vary by gender. Parenting and child gender are linked theoretically. Surprisingly, in the United States, little research has been done on parenting differences based on child gender, as opposed to parent gender (Raley & Bianchi, 2006). In a meta-analysis on differing parenting behaviors based on child gender, few differences were actually found (Lytton & Romney, 1991). Raley and

Bianchi (2006) argue that this may be due to the fact that the gender differences in parenting may be too subtle to be detected in the way most studies are conducted. For example, in studies where parenting is assessed more globally and parents report on their parenting attitudes and behaviors, they may not report any differences because their "philosophy" about child-rearing does not differ for male or female children. The differences may be found, for instance, when reading a story together. If reading to a male child, principles such as autonomy may be stressed and if reading to a female child, principles such as nurturance may be stressed. Thus, the action, time spent together, and interaction may not differ but what may differ is the subtle emphasis on principles. Therefore, parenting, child obesity, and gender relations will be explored here as research questions.

**Socioeconomic Status**

Another factor to consider is socioeconomic status (SES). Much like gender, there is controversy in the literature about the relations between obesity and SES. Sobal and Stunkard (1989) conducted a meta-analysis on the relation between child obesity and family SES and concluded that approximately one-third of studies examining SES and obesity found a positive association between SES and obesity; approximately one-third found a negative association; and the last third found no association at all. As Strauss and Knight (1999) pointed out, this may be a function of age. For children in the same age range as the current study, higher obesity rates are more typical of lower SES children. Wang (2001) found this to be the case in a cross-national study, as did Strauss and Knight (1999).

In a chapter reviewing research on the relation between SES and parenting since the 1930s, Hoff, Laursen, and Tardif (2002) point out that regardless of other potential moderating variables (e.g., gender, age, ethnicity), more authoritative parenting has been associated in the literature with middle to higher SES. Further, lower SES has been related to both authoritarian and permissive parenting. It should be noted that many of the studies cited in this chapter also looked at maternal education separately from SES and found strong relations between authoritative parenting and higher maternal education and between authoritarian and permissive parenting and lower maternal education. Notably, previous research using the current study's sample found that it was the interaction of high permissiveness and high SES that predicted the highest weight in children (Rutledge, 2007; Topham et al., in press); although, "high SES" in this sample is relative in that it is not necessarily the same as national high SES.

**Ethnicity**

Last, ethnicity can play a role in obesity. In the current study, the ethnic groups used in analyses are European Americans and Native Americans. Mother and child ethnicity were examined separately because they are not always the same. Obesity is a particularly prevalent problem in the Native American community (Broussard et al., 1995). In a school district similar to those in the current study, Native American children had the highest prevalence of obesity and European Americans had the lowest (Eichner et al., 2008). Although European American children are less at-risk for obesity than their Native American (and other ethnic minority) counterparts, their prevalence rates are also on the rise (Strauss & Pollack, 2001).

The literature on Native American parenting is sparse; however, what is available shows that Native American parents tend to view their children more as autonomous individuals capable of making their own choices. As a result, Native American parents tend to be more permissive (Dilworth-Anderson & Marshall, 1996; Jones et al., 2001). For European American parents, on the other hand, there is ample empirical literature, most of which indicates that they tend to be more authoritative than their ethnic minority counterparts and that the positive outcomes associated with authoritative parenting (e.g., academic success) are highest for European American children (Darling & Steinberg, 1993).

**Weight Trajectories**

There is a need for longitudinal analyses to identify key factors in the development of childhood obesity. In response to this need, this project will introduce an alternative way of analyzing children's weight as opposed to the typical uses of the Body Mass Index percentile score. In most studies, BMI-for-Age-% is examined as either a continuous variable or as a binary categorical variable (e.g., Is the child obese? Yes or No; Is the child overweight? Yes or No; Hedley et al., 2004; Wang, 2001; Wang & Beydoun, 2007).

The current study proposed a new methodology by introducing nine weight trajectories that will allow the researcher to focus more on children who are moving in and out of obesity risk. Additionally, the new methodology will allow the researcher to compare children who stay in the healthiest weight range (5 – 50%) across all three waves to those who stay at higher weight ranges across all three waves (e.g., stay between 50-75%; stay between 75-85%). There were five stable and four change

trajectories defined. The word trajectory is used to highlight the path that children take over the course of three waves and is not indicative of the statistical method that is used in data analysis.

These trajectories are in part based on Nader et al.'s (2006) examination of children's BMI-for-Age-% longitudinally (starting at 24 months and ending at 12 years of age; seven measurement points across the age range). There were several findings pertinent to the current study's proposed trajectories: (1) children who were above the 85$^{th}$ percentile (at-risk for obesity) at any of the three "preschool period" points before age 12 were five times more likely to be obese at age 12 than those who were below the 85$^{th}$ percentile (an indication of both stable at-risk and increasing risk); (2) the more times children were above the 85$^{th}$ percentile at any of the four "elementary period" points before age 12, the higher their likelihood of being obese at age 12 than children who were never at an at-risk weight (an indication of both stable at-risk and increasing risk); (3) children who were above the 75$^{th}$ but below the 85$^{th}$ percentile were 50% more likely to be obese at age 12 than those were below the 75$^{th}$ percentile (i.e., some increased and some did not; an indication of both stable low risk and increasing risk); (4) children (age 54 months only) above the 50$^{th}$ but below the 75$^{th}$ percentile were four times more likely to be obese at age 12 than those who are below the 50$^{th}$ percentile (an indication of increasing risk); and, finally, (5) children who were above the 75$^{th}$ but below the 85$^{th}$ were six times more likely to be overweight at age 12 than those children who were below the 50$^{th}$ percentile (an indication of increasing risk).

Nader et al.'s (2006) findings suggest two factors applicable to the proposed weight trajectories: (1) there needs to be an examination of stable weight trajectories; and

(2) there needs to be an examination of increasing and decreasing (i.e., change) weight trajectories. Specifically, understanding the demographic factors related to children staying in a pattern of stable healthy weight versus those who stay at a stable risk weight would be beneficial for both general knowledge of obesity and in the creation of interventions. It is also relevant to understand what differs for increasing or decreasing weight trajectories and how they differ from stable trajectories. Nagin's (1999) work on developmental trajectories used similar groupings (i.e., increasers, decreasers, no changers).

Literature on children's growth rates indicate that there are several critical time periods (infancy, adolescence) when weight gain has the most impact on later obesity (Lagström et al., 2008). Early childhood is not included in the suggested critical times but it is between these times and, thus, may be of critical importance for early school-based obesity intervention/prevention programs. According to Lagström et al. (2008), after 5 years of age (earlier than the youngest child in this sample) until 13 years of age (older than the oldest child in this sample), the mean annual rate of weight gain for children who were already overweight was approximately 10 lbs. as opposed to 6 lbs. of weight gain, on average, for non-overweight children. Additionally, they found that for girls who were overweight, BMI-for-Age-% gradually increased from age five to age 13 and for girls who were normal weight, BMI-for-Age-% declined steadily during this same period (both groups steadily declined for boys). The implication of this article is that the time between 5 years and the beginning of adolescence is critical for studying how children are entering into risk levels, dropping out of risk levels, or maintaining

either a healthy or at-risk weight status because this may be the most effective time to intervene.

**Conclusion**

There are several studies that have examined the link between parenting style and child obesity and this relation is beginning to be better understood (e.g., Rhee et al, 2006; Rutledge, 2007; Topham et al., in press). The current study is intended to build upon these past studies by looking at these relations longitudinally. The potential moderating factors of gender, socioeconomic status, and ethnicity will also be explored.

**Hypotheses**

The overarching hypothesis is that there is a relation between parenting style and patterns of child weight across three time points and that these relations are moderated by gender, SES, and ethnicity. Several specific hypotheses were tested. All were tested first with Structural Equation Modeling (SEM) using ordinal weight status groups at each wave and then were tested with Multinomial Logistic Regression (MLR) using categorical weight trajectories. Mplus software was utilized to test all structural equation models (Muthén & Muthén, 2001). The following specific hypotheses were tested:

- There is a relation between parenting style and child weight. Specifically, in SEM analyses, authoritarian and permissive parenting were expected to predict both higher initial weight and increases across time than authoritative parenting. In MLR analyses, authoritarian and permissive parenting were expected to predict an increased likelihood of children's membership in a higher weight trajectory or increasing weight trajectory than in a lower weight trajectory than authoritative parenting.

- Gender was explored here as the research question: Does gender moderate the relation between parenting style and child weight?
- The parenting style/child weight relation was expected to be moderated by family socioeconomic status (SES). Specifically, in SEM analyses, the interaction of high SES and permissive parenting predicts higher initial weight and increases over time over any other SES/parenting combination. In MLR analyses, the interaction of high SES and permissive parenting predicts an increased likelihood of those children's membership in a higher weight trajectory than a lower weight trajectory over any other SES/parenting combination.
- The parenting style/child weight relation is moderated by both child and mother ethnicity. Specifically, in SEM analyses, the interaction of Native American ethnicity and permissive parenting predicts higher initial weight and increases over time over any other ethnicity/parenting combination. In MLR analyses, the interaction of Native American ethnicity and permissive parenting predicts an increased likelihood of those children's membership in a higher weight trajectory than a lower weight trajectory over any other ethnicity/parenting combination.

The following chapter will focus on the characteristics of the sample, the procedures used to collect data, and how the variables were measured and operationalized. Additionally, descriptive statistics of the sample and defined variables are given.

# CHAPTER III

# METHODOLOGY

## Participants

Participants included 356 mother-child pairs for whom a measure of parenting style was available in the child's first grade year and BMI-for-Age-% was available for the child's first (waves 1 and 2) and second (wave 3) grade years. All participants were part of Families and Schools for Health (FiSH), a grant funded by the U. S. Department of Agriculture designed to develop useful interventions for both decreasing the rate of weight gain and improving psychosocial functioning in children. The intervention was not of interest for the research questions in the current study. For more in-depth information on the FiSH project, please refer to Harrist et al. (2007).

**Children**. There were 356 total children in this sample from two cohorts across three waves of data (183 male, 173 female). The children's age for wave 1 ranged from 6.02 to 8.14 years, with a mean age of 6.87 years (*SD* = .39). The age range for wave 2 was 6.39 to 8.56 years, with a mean age of 7.34 years (*SD* = .39). The age range for wave 3 was 7.37 to 9.57 years, with a mean age of 8.28 years (*SD* = .39). The ethnicity distribution for the children was as follows: 73.9% European American, 19.7% Native American, 1.7% African American, 3.4% Hispanic, and 1.4% Multiethnic. The numbers of children who fit the CDC's (2008c) definition for Obese (above the 95$^{th}$ percentile on BMI-for-Age-% chart) or At-Risk (above the 85$^{th}$ percentile) Status were as follows:

Wave 1 – Obese: 50 (14.0%), At-Risk: 49 (13.8%); Wave 2 – Obese: 49 (13.8%), At-Risk: 52 (14.6%); Wave 3 – Obese: 60 (16.9%); At-Risk: 61 (17.1%).

**Mothers**. The mean age of the mothers at wave 1 was 34.4 years ($n$ = 322 valid scores; $SD$ = 6.55). The ethnicity distribution for the mothers ($n$ = 317) was as follows: 78.5% European American, 14.8% Native American, 1.6% Hispanic, 0.6% African American, 0.3% Asian, 0.3% Other, and 3.8% Multiethnic. The median household income for mothers was $2000-$2499/month before taxes ($n$ = 308). This would equate to approximately $26,994/year which is almost $10,000 below the median household income for women in the United States in 2006 and 2007 ($34,269; U. S. Census Bureau, 2008). Almost 5% (4.9%) of mothers did not complete high school; 13.9% completed high school; 6.3% completed some career-tech; 26.3% completed some college courses; 11.7% completed career-tech; and 36.7% completed college ($n$ = 316).

**Procedure**

Anthropometric assessments for children were conducted by trained research assistants. Height was measured using a wooden height board. Each child's height was the mean of two measurements. If the first two measurements were not within ±.3cm, a third measurement was taken. Weight was measured using a digital scale after removing any bulky clothing. Children's Body Mass Index-for-Age (BMI-for-Age-%) was calculated for each child using these height and weight measurements. BMI-for-Age-% was used as opposed to BMI-% as it takes into account age and gender. Anthropometric assessments were measured a total of three times. For wave 1, anthropometric measurements were taken once during the first four months of the child's first grade year. For wave 2, they were taken once during the last 3 months of the child's first grade year.

For wave 3, they were taken once during the last 3 months of the child's second grade year.

Parents were sent or given a packet of questionnaires for which they were modestly financially compensated upon completion. Only the mother data from wave 1 were examined in this study. A measure of parenting style was among the questionnaires included in the packet. Family socioeconomic status (SES), child ethnicity, mother ethnicity, and child gender were all based on parent report on a demographic questionnaire. However, some missing demographic information for children was obtained from school records (e.g., ethnicity and birth date).

**Measures**

**Child overweight**. BMI-for-Age-% was calculated for each child at each wave. BMI-for-Age-% is calculated using the formula [weight (lb) / [height (in)]$^2$ x 703] (CDC, 2008d). Epi Info, a program provided by the CDC, was utilized to calculate BMI-for-Age-% (CDC, 2008c). Once a child's BMI-for-Age-% is calculated, the resulting number is a percentile which falls on a chart specifying whether a child is underweight, normal range, at-risk for overweight, or overweight. Epi Info uses the formula as well as the child's birth date, gender, date of measurement, height, and weight to determine the percentile. A child whose BMI-for-Age-% falls between 5% and 85% is typically described as having a healthy weight. A percentile between 85$^{th}$ and 95$^{th}$ is considered to be at-risk for overweight and 95% and above is described as obese. A percentile below 5% is considered underweight and all children who fit in this category were removed from the analyses for this study. There is some evidence that being between the 75$^{th}$ and

85th percentile at a younger age can put children at risk for later obesity (Nader et al., 2006).

Five *Weight Status Groups* were created in order to better understand the parenting and child obesity relation (see Table 1). In some analyses, children were placed into one of nine *Weight Trajectories* (see Table 2) across the three waves as a way to describe their BMI-for-Age-% change across time. For a detailed account of each observed pattern and figures displaying the trajectories, please refer to Appendices B and C. It should be noted that in structural equation modeling analyses, the five category *Weight Status Group* variable is analyzed as a continuous variable with a range of one to five and referred to as *Weight Status*.

Table 1

*Weight Status Group Names, Ranges, and Descriptive Statistics (within wave)*

| Weight Status Group Name | BMI-for-Age Theoretical Range | Wave 1 | | | | Wave 2 | | | | Wave 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *n* | *M* | *SD* | Actual Range | *n* | *M* | *SD* | Actual Range | *n* | *M* | *SD* | Actual Range |
| 1. Low Healthy Weight | 5-49.9% | 95 | 31.08 | 12.11 | 7.96 - 49.99 | 99 | 30.92 | 13.73 | 5.00 - 49.40 | 92 | 29.19 | 12.99 | 6.00 - 49.97 |
| 2. High Healthy Weight | 50-74.9% | 109 | 63.55 | 6.50 | 50.41 - 74.97 | 111 | 63.20 | 7.36 | 50.01 - 74.64 | 101 | 63.55 | 6.86 | 50.01 - 74.79 |
| 3. Low At-Risk Weight | 75-84.9% | 53 | 79.74 | 3.02 | 75.00 - 84.98 | 45 | 79.56 | 3.00 | 75.06 - 84.76 | 42 | 79.38 | 3.09 | 75.26 - 84.96 |
| 4. High At-Risk Weight | 85-94.9% | 49 | 90.34 | 2.74 | 85.10 - 94.77 | 52 | 90.75 | 2.43 | 85.14 - 94.67 | 61 | 90.03 | 2.96 | 85.53 - 94.95 |
| 5. Obese Weight | 95% & above | 50 | 98.31 | 1.32 | 95.02 - 99.81 | 49 | 98.25 | 1.34 | 95.07 - 99.86 | 60 | 98.14 | 1.31 | 95.31 - 99.79 |

Table 2

*Weight Trajectory Names and Definitions (across wave)*

| Trajectory Name | Definition | *n* |
|---|---|---|
| Stable Low Healthy | In Low Healthy Weight Status across all 3 waves; or, begins and ends in Low Healthy Weight Status[a] | 72 |
| Stable High Healthy | In High Healthy Weight Status across all 3 waves; or, begins and ends in High Healthy Weight Status[ab] | 65 |
| Stable Low At-Risk | In Low At-Risk Status across all 3 waves; or, begins and ends in Low At-Risk Status[ab] | 15 |
| Stable High At-Risk | In High At-Risk Status across all 3 waves; or, begins and ends in High At-Risk Status[b] | 26 |
| Stable Obese | In Obese Weight Status across all 3 waves; or, begins and ends in Obese Weight Status | 43 |
| Small Increasing Risk | Increases from one Weight Status to another between consecutive waves but not at every wave and not into the High At-Risk or Obese Weight Status | 35 |
| Large Increasing Risk | Increases from one Weight Status to another between consecutive waves and ends in a High At-Risk or Obese Weight Status | 48 |
| Small Decreasing Risk | Decreases from one Weight Status to another between consecutive waves but not at every wave and not out of an At-Risk or Obese Weight Status | 45 |
| Large Decreasing Risk | Begins in an At-Risk or Obese Weight Status and decreases from one Weight Status to another between consecutive waves and ends in a non-risk Weight Status | 7 |

Note: See Appendix C for graphical depictions of the Weight Trajectories

[a] Not continuous weight gain; [b] Not continuous weight loss

**Parenting Styles and Dimensions Questionnaire (PSDQ)**. The PSDQ is a 32-item modified version of Robinson, Mandleco, Olsen, and Hart's (2001/1995) original 62-item scale which assesses parenting style through parent self-report. The measure was shortened for easier use by parents and it can be effectively used with school-age children (C. H. Hart and C. C. Robinson, personal communication, September 19, 2006). The items are answered on a five-point Likert scale ranging from (1) never to (5) always. The 32 items are divided into three subscales which assess *Authoritative Parenting* (Cronbach's $\alpha = .84$ in the current study), *Authoritarian Parenting* ($\alpha = .76$), and *Permissive Parenting* ($\alpha = .70$). To create the parenting style score, the mean of the items from that particular scale was calculated (see Table 3 for descriptive statistics). This results in a score for each parent on each subscale ranging from 1 (low) to 5 (high). The *Authoritative* and *Authoritarian Parenting* subscales are each made up of three dimensions (see Table 4 for a summary of questions associated with each subscale and dimension). Cronbach's alphas were calculated for these as well. *Permissive Parenting* is made up of one dimension (Indulgent). For *Authoritative Parenting* the dimensions are: Autonomy Granting ($\alpha = .66$), Reasoning/Induction ($\alpha = .83$), and Warmth/Support ($\alpha = .69$). For *Authoritarian Parenting* the dimensions are: Non-Reasoning Punitive ($\alpha = .58$), Physical Coersion ($\alpha = .73$), and Verbal Hostility ($\alpha = .68$).

Table 3

*Descriptive Statistics for Parenting Style Variables*

| | *M* | *SD* | Minimum | Maximum | Range |
|---|---|---|---|---|---|
| Authoritative Parenting | 4.12 | 0.44 | 2.27 | 5.00 | 2.73 |
| Authoritarian Parenting | 1.76 | 0.38 | 1.08 | 3.83 | 2.75 |
| Permissive Parenting | 2.19 | 0.61 | 1.00 | 4.20 | 3.20 |

$n = 356$

Table 4

*Parenting Styles and Dimensions Questionnaires Items, Subscales, and Dimensions*

| Item | Subscale | Dimension |
|---|---|---|
| 1 I am responsive to our child's feelings and needs. | Authoritative | Warmth/Support |
| 2 I use physical punishment as a way of disciplining our child. | Authoritarian | Physical Coersion |
| 3 I take our child's desires into account before asking the child to do something. | Authoritative | Autonomy Granting |
| 4 When our child asks why he/she has to conform, I state: because I said so, or I am your parent and I want you to. | Authoritarian | Non-Reasoning Punitive |
| 5 I explain to our child how we feel about the child's good and bad behavior. | Authoritative | Reasoning/Induction |
| 6 I spank when our child is disobedient. | Authoritarian | Physical Coersion |
| 7 I encourage our child to talk about his/her troubles. | Authoritative | Warmth/Support |
| 8 I find it difficult to discipline our child. | Permissive | Indulgent |
| 9 I encourage our child to freely express himself/herself even when disagreeing with parents. | Authoritative | Autonomy Granting |
| 10 I punish by taking privileges away from our child with little if any explanations. | Authoritarian | Non-Reasoning Punitive |
| 11 I emphasize the reasons for rules. | Authoritative | Reasoning/Induction |
| 12 I give comfort and understanding when our child is upset. | Authoritative | Warmth/Support |
| 13 I yell or shout when our child misbehaves. | Authoritarian | Verbal Hostility |
| 14 I give praise when our child is good. | Authoritative | Warmth/Support |
| 15 I give into our child when the child causes a commotion about something. | Permissive | Indulgent |

| | | | |
|---|---|---|---|
| 16 | I explode in anger towards our child. | Authoritarian | Verbal Hostility |
| 17 | I threaten our child with punishment more often than actually giving it. | Permissive | Indulgent |
| 18 | I take into account our child's preferences in making plans for the family. | Authoritative | Autonomy Granting |
| 19 | I grab our child when being disobedient. | Authoritarian | Physical Coersion |
| 20 | I state punishments to our child and does not actually do them. | Permissive | Indulgent |
| 21 | I show respect for our child's opinions by encouraging our child to express them. | Authoritative | Autonomy Granting |
| 22 | I allow our child to give input into family rules. | Authoritative | Autonomy Granting |
| 23 | I scold and criticize to make our child improve. | Authoritarian | Verbal Hostility |
| 24 | I spoil our child. | Permissive | Indulgent |
| 25 | I give our child reasons why rules should be obeyed. | Authoritative | Reasoning/Induction |
| 26 | I use threats as punishment with little or no justification. | Authoritarian | Non-Reasoning Punitive |
| 27 | I have warm and intimate times together with our child. | Authoritative | Warmth/Support |
| 28 | I punish by putting our child off somewhere alone with little if any explanations. | Authoritarian | Non-Reasoning Punitive |
| 29 | I help our child to understand the impact of behavior by encouraging our child to talk about the consequences of his/her own actions. | Authoritative | Reasoning/Induction |
| 30 | I scold or criticize when our child's behavior doesn't meet our expectations. | Authoritarian | Verbal Hostility |
| 31 | I explain the consequences of the child's behavior. | Authoritative | Reasoning/Induction |
| 32 | I slap our child when the child misbehaves. | Authoritarian | Physical Coersion |

**Demographic questionnaire**. Information obtained from this mother-report questionnaire included *Child Gender*, Family Socioeconomic Status (*SES*), *Child Ethnicity*, and *Mother Ethnicity* (refer to Appendix A). Mothers reported on *Child Gender* (male or female). If this information was not filled out by mothers, it was obtained through school records or during the child interview conducted in the schools.

*SES* was created using the mother report on level of education and occupational status using the four-factor Hollingshead scores (Hollingshead, 1975). If educational and occupational status were available for more than one parent, both scores were calculated and then the mean was computed for an overall family socioeconomic status score. Scores can range from 8 to 66, with specified ranges being defined into five social strata (e.g., 55-66 is considered major business and professional). The mean *SES* score in the current sample was 38.55 ($SD$ = 9.99, $n$ = 290; this mean score falls in the skilled craftsperson, clerical, sales worker strata). After calculating the Hollingshead *SES* score, a tertile split was calculated based on scores: High SES (those one standard deviation above the mean; $n$ = 50, $M$ = 53.94, $SD$ = 3.68), Middle SES (those between one standard deviation above and below the mean; $n$ = 191, $M$ = 38.18, $SD$ = 5.55), and Low SES (those one standard deviation below the mean; $n$ = 49, $M$ = 24.32, $SD$ = 3.38). It should be noted that these groupings are relative to the current sample and not to a national sample. Hollingshead proposed five strata into which the SES scores can be grouped. In the current study, of those for whom an *SES* score was calculated, 1.4% fell in the unskilled laborers, menial service workers strata, 17.2% fell in the machine operators, semiskilled workers strata, 36.9% fell in the skilled craftsperson, clerical, sales workers strata, 37.9% fell in the medium business, minor professional, technical strata, and 6.6% fell in the major business and professional strata.

Mothers reported on both their child's (*Child*) and their own (*Mother) Ethnicity*. Again, if the child's information was not filled out by mothers, it was obtained through school records. For the purposes of these analyses, only European and Native American ethnicity differences were explored due to smaller sample sizes for the other ethnic classifications. *Child* and *Mother Ethnicity* were examined separately because their ethnicities did not always match. In this sample, there were 220 cases where *Child* and *Mother Ethnicity* matched, 97 cases where they did not, and 39 cases where the mother's ethnicity was missing so it could not be determined if they matched or not.

# CHAPTER IV

# RESULTS

## Overview

This chapter will summarize the results of the four hypotheses and one research question that were tested in the current study. Each hypothesis/research question will first be explored with SEM quadratic growth modeling and then with multinomial logistic regression (MLR).

## Parenting Style Predicting Weight Across Time

**Structural Equation Model (SEM).** A quadratic growth model was utilized to examine change among the children's *Weight Statuses* across three waves of data as predicted by the three parenting styles (see Figure 1; $n = 356$). In examining the structural equation models, there were two outliers identified. In both cases the outlier was given the next nearest score. The model was just identified (Kline, 2005) and, like all just identified models, the model fit the data exactly, $\chi^2$ (0) = 0.00, CFI = 1.00, RMSEA < .001. According to this model, two of the parenting styles were significant predictors of *Weight Status*.

Two aspects of the quadratic growth model should be noted. First, the parameters for linear change reflect the portion of a year between the waves (two-thirds of a year between waves 1 and 2; a full year between waves 2 and 3). Second, there are two inter-related reasons for using a quadratic model rather than the more typical linear model. The quadratic growth model tests whether the parenting style variables predict linear

change at wave 1, which is primarily determined by change in *Weight Status* during first grade in a quadratic model (i.e., change from wave 1 to wave 2). The usual linear-only model would instead predict the best-fitting linear change from wave 1 to wave 3. If parenting styles as measured at wave 1 do indeed influence changes in *Weight Status*, they are more likely to do so during the next several months than over a longer period of time. In addition, the quadratic-change model checks that assumption, by testing whether changes in *Weight Status* due to parenting styles are maintained through the end of the second grade or not. Investigating both short-term and longer-term changes help address the problem that results may vary by longitudinal interval (Cohen, 1991). It is best to match the longitudinal interval for analyzing change to the theoretically expected time for a causal variable to have maximum influence over changes in the outcome variable (Gollub & Reichardt, 1991).

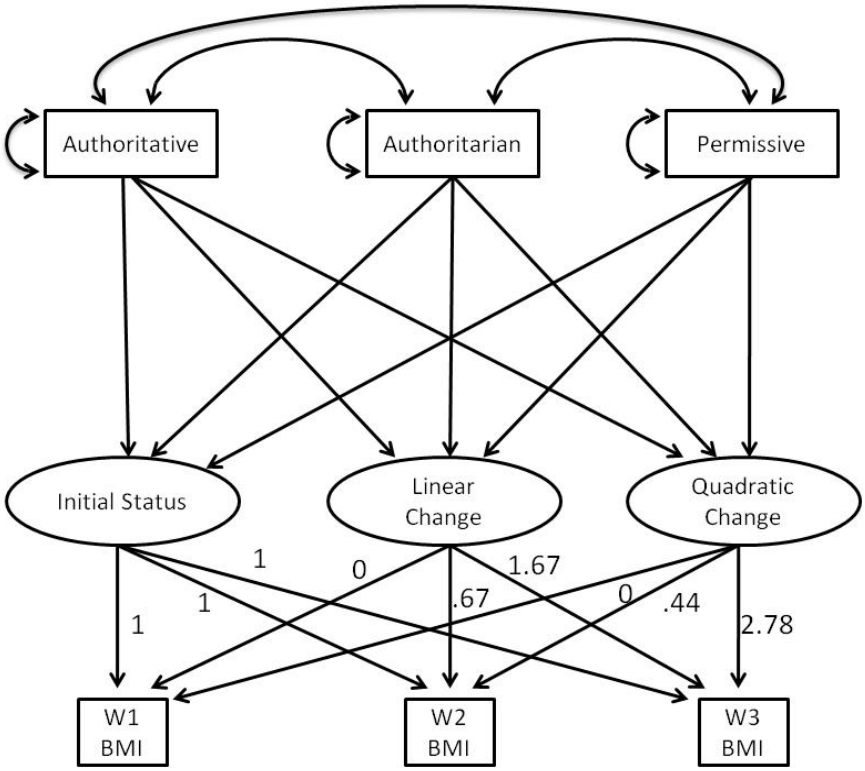


*Figure 1*. Conceptual and final quadratic growth model.

*Authoritarian Parenting* did not predict the intercept ($b$ = -.09, $p$ = .30) but it did predict both the slope (i.e., change between wave 1 and wave 2; $b$ = .19, $p$ = .02) and the quadratic coefficient ($b$ = -.11, $p$ = .02). In other words, *Authoritarian Parenting* did not predict any differences in initial *Weight Status* but it did predict changes in *Weight Status* across time (see Figure 2). Specifically, an increase of one standard deviation in *Authoritarian Parenting* predicted an initial increase in *Weight Status* group at the rate of .19 per year, but that rate of increase decreased thereafter. These findings are graphed in Figure 2. The "reference" line on the graphs represents the mean changes in *Weight Status* across time for mean parenting scores. The dashed line for "high" *Authoritarian Parenting* represents the trajectory predicted for parents who are one standard deviation (*SD*) above the mean for *Authoritarian Parenting* style and at the mean for the other two parenting styles. The "low" line represents the trajectory predicted for parents who are one *SD* below the mean for *Authoritarian Parenting* style and at the mean for the other

two parenting styles. The graph indicates that, on average, children stayed in the same *Weight Status* from wave 1 to wave 2, but increased in *Weight Status* thereafter. In comparison to this average trajectory, children of high *Authoritarian* parents begin at a non-significantly lower risk status, but increase their *Weight Status* from wave 1 to wave 2 and increase in *Weight Status* thereafter less than the average trajectory.

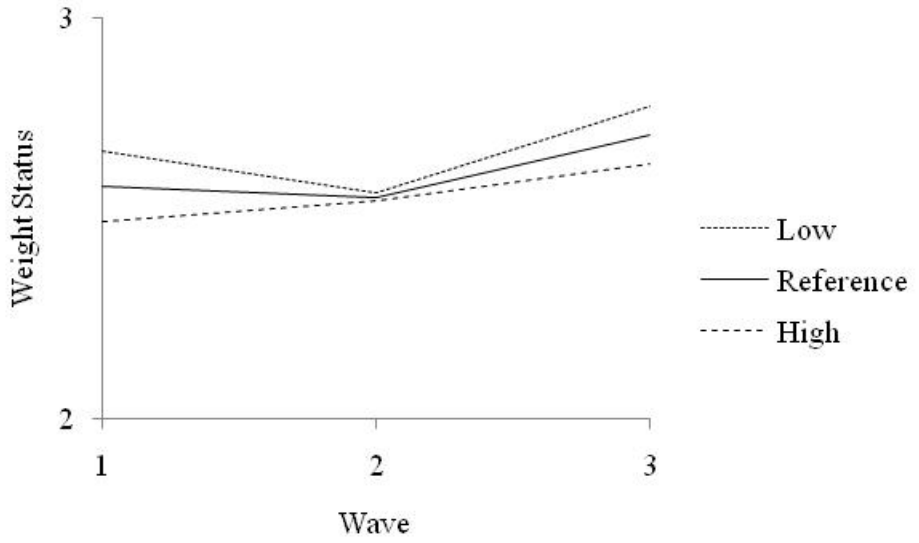


*Figure 2*. *Authoritarian Parenting*. Predicted changes in mean *Weight Status* across time.

*Permissive Parenting* (see Figure 3) predicted the intercept ($b$ = .19, $p$ = .02), had a trend toward predicting a decreasing slope from wave 1 to wave 2 ($b$ = -.13, $p$ = .08), and did not predict a quadratic trend ($b$ = .06, $p$ = .15). In other words, *Permissive Parenting* only predicted initial differences in *Weight Status* but did not predict any changes in *Weight Status* across time. The graph indicates that children with parents who exhibit high *Permissive Parenting* have a significantly higher initial *Weight Status* than the average child, a difference which does not change significantly through wave 3.

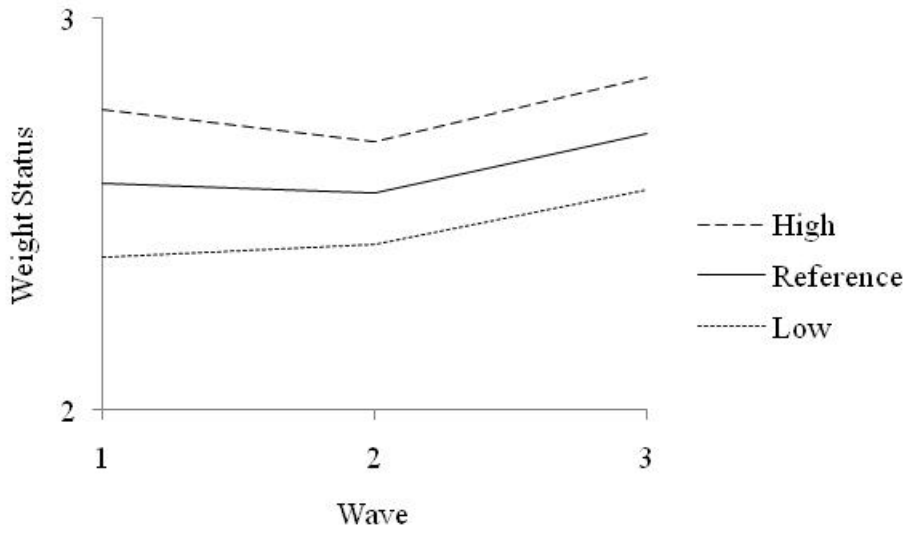


*Figure 3. Permissive Parenting*. Predicted changes in mean *Weight Status* across time.

As a check for this model, some multiple regression analyses were conducted. First, two new variables were created: *Wave 2-Wave 1 Change* (created by deducting the wave 1 *Weight Status Group* from the wave 2 *Weight Status Group*) and *Wave 3-Wave 1 Change* (created by deducting the wave 1 *Weight Status Group* from the wave 3 *Weight Status Group*). In order for the multiple regressions to support the model, it would be hypothesized that *Authoritarian Parenting* would predict *Wave 2-Wave 1 Change* but not the *Wave 3-Wave 1 Change* or wave 1 *Weight Status Group* and that *Permissive Parenting* would not predict either change variable but would predict wave 1 *Weight Status Group*. All predictions were supported. *Authoritarian Parenting* significantly predicted *Wave 2-Wave 1 Change* [F (1, 354) = 4.67, $p$ = .03] but not *Wave 3-Wave 1 Change* [F (1, 354) = .02, $p$ = .89] or wave 1 *Weight Status Group* [F (1, 354) = .06, $p$ = .81]. *Permissive Parenting* did not predict either of the change variables [F (1, 354) = 1.04, $p$ = .31 and F (1, 354) = 1.27, $p$ = .26] but did significantly predict wave 1 *Weight Status Group* [F (1, 354) = 4.55, $p$ = .03].

The SEM quadratic growth model examined the changes across the three waves. As a further exploration of differences among the five *Weight Status Groups* at each wave, six one-way ANOVAs were conducted, three with *Authoritarian Parenting* and three with *Permissive Parenting* as the outcome variable. None of the three relevant ANOVAs indicated that *Authoritarian Parenting* differed among the five *Weight Status Groups* significantly.

When examining *Permissive Parenting* differences at wave 1, ANOVA results indicated statistically significant *Permissive Parenting* differences among the five *Weight Status Groups* [F (4, 351) = 2.62, $p$ = .04]. A Tukey post-hoc analysis indicated that *Permissive Parenting* was significantly greater for mothers who had children in the High At-Risk *Weight Status Group* ($M$ = 2.35, $SD$ = .63) than for mothers who had children in the Low Healthy *Weight Status Group* ($M$ = 2.05, $SD$ = .62). When examining *Permissive Parenting* differences at wave 2, ANOVA results indicated statistically significant [F (4, 351) = 2.84, $p$ = .03] *Permissive Parenting* differences among the five *Weight Status Groups*. The Tukey post-hoc analysis indicated that *Permissive Parenting* was significantly greater for mothers who had children in the Low At-Risk *Weight Status Group* ($M$ = 2.45, $SD$ = .64) than for mothers who either had children in the Low Healthy ($M$ = 2.10, $SD$ = .61) or High Healthy ($M$ = 2.16, $SD$ = .53) *Weight Status Groups* (see Table 5 for a summary of mean *Permissiveness* by *Weight Status Group* and wave).

Table 5

*Mean Permissiveness Scores by Weight Status Group and Wave*

| | Wave 1 | | Wave 2 | | Wave 3 | |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Low Healthy Weight | 2.05 | 0.62 | 2.10 | 0.61 | 2.09 | 0.61 |
| High Healthy Weight | 2.21 | 0.54 | 2.16 | 0.53 | 2.17 | 0.56 |
| Low At-Risk Weight | 2.28 | 0.67 | 2.45 | 0.64 | 2.34 | 0.65 |
| High At-Risk Weight | 2.35 | 0.63 | 2.18 | 0.62 | 2.26 | 0.68 |
| Obese Weight | 2.19 | 0.59 | 2.24 | 0.65 | 2.19 | 0.54 |

**Multinomial Logistic Regression (MLR)**. Three multinomial logistic regressions were run to examine differences among the nine *Weight Trajectories* as predicted by each parenting style ($n$ = 356). In all of these analyses, the Stable Low Healthy Weight Trajectory was used as the reference category. Neither *Authoritative* nor *Authoritarian Parenting* was a significant predictor of differences among these nine groups. *Permissive Parenting* did significantly predict differences among the groups, $\chi^2$ (8) = 21.87, $p$ = .005 (see Appendix D for SPSS output). Here, a significant chi-square indicates that one of the predictor variables is not equal to zero (see the Likelihood Ratio Tests Table in Appendix D). If there is a significant predictor variable indicated in the overall model, the individual predictors are examined to determine which levels of the dependent variable they significantly differentiate from the reference category (see the

Parameter Estimates Table in Appendix D). The series of Wald Chi-Square tests in the Parameter Estimate Table are similar to post-hoc tests from the overall model test to determine where there are significant differences. Specifically, *Permissive Parenting* played a statistically significant role in differentiating both the Low At-Risk [Wald $\chi^2$ (1) = 7.60, $p$ = .006] and the High At-Risk [Wald $\chi^2$ (1) = 4.14, $p$ = .04] Weight Trajectories from the Low Healthy Weight Trajectory. For each increase of 1 in mothers' *Permissive Parenting* score, children were three-and-a-half times (a 249% increased odds) more likely to be in the Low At-Risk Weight Trajectory and more than twice (a 119.4% increased odds) as likely to be in the High At-Risk Weight Trajectory rather than the Low Healthy Weight Trajectory.

**Gender Moderation**

**SEM**. In order to test the possible interaction of parenting style and *Child Gender*, the original quadratic growth model was changed to include *Child Gender* as a grouping variable ($n$ = 356). The first run of this model did not include any constraints on the parameters to be equal across groups. The fit statistics were mixed for this model, $\chi^2$ (3) = 9.15, $p$ = .03, CFI = 1.00, RMSEA = .11 (see Tabachnick & Fidell, 2001 for a summary of acceptable structural equation modeling fit statistics; "good fit" is indicated by chi-square with a $p$-value above .05, CFI close to 1.00 and RMSEA of below .06). In order to ensure that the findings of the unconstrained model were not due to chance, the model was run constraining the parameters for one parenting style at a time (e.g., constraining the intercept, slope, and quadratic parameters for *Authoritative Parenting* only; see Kline, 2005 for a detailed summary on this technique). For each of the three constrained models, the chi-square difference test was not significant, supporting gender

equivalence for all parenting effects. As a final test, a fully constrained model was run (i.e., all parameters were constrained) and this model indicated good fit, $\chi^2$ (12) = 11.34, $p$ = .50, CFI = 1.00, RMSEA < .001. The overall chi-square difference test was also non-significant. As a result, it was concluded that the relationship between parenting styles and *Weight Status* was not moderated by *Child Gender*.

**MLR**. Before examining the interaction of parenting style and *Child Gender*, two multinomial logistic regressions were run to examine the main effects of *Child Gender* in predicting differences among the nine *Weight Trajectories* ($n$ = 356). When testing for interactions, multinomial logistic regression results do not indicate the significance of main effects, and, thus, they are generally tested before interactions. Both runs were non-significant. In order to examine the possible moderating effects of *Child Gender* on the parenting style and *Weight Trajectories* relation, three multinomial logistic regressions were run. The *Permissive Parenting x Child Gender* Interaction Model had an overall trend toward significance, $\chi^2$ (24) = 34.03, $p$ = .08; however, when determining which predictors were significantly differentiating levels in the outcome variable, it was indicated that the interaction term was non-significant ($p$ = .53).

**SES Moderation**

**SEM.** In order to test the interaction of parenting style and the three *SES* categories, the original quadratic growth model was changed to include *SES* as a trichotomous grouping variable ($n$ = 290). The first run of this model did not include any constraints on the parameters to be equal across groups. The model fit reasonably well, $\chi^2$ (3) = 4.265, $p$ = .23, CFI = 1.00, RMSEA = .07. Next, the model was run constraining the parameters for one parenting style at a time. Additionally, a fully constrained model

was run and this model indicated reasonably good fit, $\chi^2$ (21) = 26.38, $p$ = .19, CFI = 1.00, RMSEA = .05. All four chi-square difference tests were non-significant. As a result, it was concluded that the association between parenting styles and child weight was not moderated by *SES*.

**MLR**. In addition to examining the interaction of parenting style and the three *SES* categories, two multinomial logistic regressions were run to examine the main effects of *SES* in predicting differences among the nine *Weight Trajectories* ($n$ = 290). Both runs were non-significant. In order to examine the possible moderating effects of *SES* on the parenting style and *Weight Trajectories* relation, three multinomial logistic regressions were run. The overall *Permissive Parenting x SES* Interaction Model was significant, $\chi^2$ (40) = 56.17, $p$ = .05; however, the interaction was non-significant ($p$ = .12). All *SES* runs were replicated using *SES* as a continuous variable (range = 8 to 66) and both main effects and interactions were non-significant.

**Child Ethnicity Moderation**

**SEM**. In order to test the interaction of parenting style and *Child Ethnicity* (Native American and European American only), the original quadratic growth model was changed to include *Child Ethnicity* as a grouping variable ($n$ = 333). The first run of this model did not include any constraints on the parameters to be equal across groups. The model fit reasonably well, $\chi^2$ (3) = 5.60, $p$ = .13, CFI = 1.00, RMSEA = .07. In order to ensure that the findings of the unconstrained model were not due to chance, the model was run constraining the parameters for one parenting style at a time. These models also all fit reasonably well. Additionally, a fully constrained model was run and this model indicated reasonably good fit, $\chi^2$ (12) = 13.38, $p$ = .34, CFI = .99, RMSEA = .03. All

four chi-square difference tests were non-significant. As a result, it was concluded that the parenting style/child weight relation was not moderated by *Child Ethnicity*.

**MLR**. Before examining the interaction of parenting style and *Child Ethnicity* (Native American and European American only), two multinomial logistic regressions were run to examine the main effects of *Child Ethnicity* in predicting differences among the nine *Weight Trajectories* ($n$ = 333). Both runs were non-significant. In order to examine the possible moderating effects of *Child Ethnicity* on the parenting style and *Weight Trajectories* relations, three multinomial logistic regressions were run. The overall *Permissive Parenting x Child Ethnicity* Interaction Model had a trend toward significance, $\chi^2$ (24) = 35.55, $p$ = .06; however, the interaction was non-significant ($p$ = .89).

**Mother Ethnicity Moderation**

**SEM**. In order to test the interaction of parenting style and *Mother Ethnicity* (Native American and European American only), the original quadratic growth model was changed to include *Mother Ethnicity* as a grouping variable ($n$ = 296). The first run of this model did not include any constraints on the parameters to be equal across groups. This model was just identified, $\chi^2$ (0) = 0, CFI = 1.00, RMSEA < .001. In order to ensure that the findings of the unconstrained model were not due to chance, the model was run constraining the parameters for one parenting style at a time. These models all fit reasonably well. Additionally, a fully constrained model was run and this model indicated good fit, $\chi^2$ (9) = 10.56, $p$ = .31, CFI = 1.00, RMSEA = .03. The chi-square difference test was marginally significant between the constrained *Authoritative Parenting* model and the unconstrained model, $\chi^2$ (3) = 7.55, $p$ < .10. The chi-square

difference tests for the other two partially constrained models were not significant and it is concluded that these paths should remain constrained.

A final model was run which let the *Authoritative Parenting* parameters be free to vary between ethnicities but constrained the *Authoritarian* and *Permissive Parenting* parameters to be equal. This model fit well, $\chi^2$ (6) = 2.86, $p$ = .83, CFI = 1.00, RMSEA < .001. Since the *Authoritarian Parenting* and *Permissive Parenting* parameters were set to be equal, they will not be interpreted. *Authoritative Parenting* did not predict *Weight Status* for children with European American mothers. For children who had Native American mothers (see Figure 4), *Authoritative Parenting* did not predict the intercept ($b$ = -.21, $p$ = .32) but it did significantly predict both the slope ($b$ = .42, $p$ = .006) and the quadratic coefficient ($b$ = -.22, $p$ = .03). In other words, *Authoritative Parenting* did not predict differences in initial *Weight Status* but did predict changes in *Weight Status* across time for children with Native American mothers. Specifically, each increase of one standard deviation in *Authoritative Parenting* predicted a .42 increase in *Weight Status* per year during the first grade, but that rate of increase decreased significantly thereafter. The graph indicates that the average children with a Native American mother stayed at the 3rd risk level from wave 1 to wave 2, but increased their risk status further from wave 2 to wave 3. Relative to this average Native American trajectory, high *Authoritative Parenting* (i.e., scoring at or above one standard deviation above the mean) predicted greater increases in risk status from wave 1 to wave 2, but this merely eliminated the non-significant difference due to *Authoritative Parenting* at wave 1. The initial differences associated with *Authoritative Parenting* were partially restored at wave 3. Note that the

3rd weight range, between the 75th and 85th percentiles, is predictive of later obesity according to Nader et al. (2006).

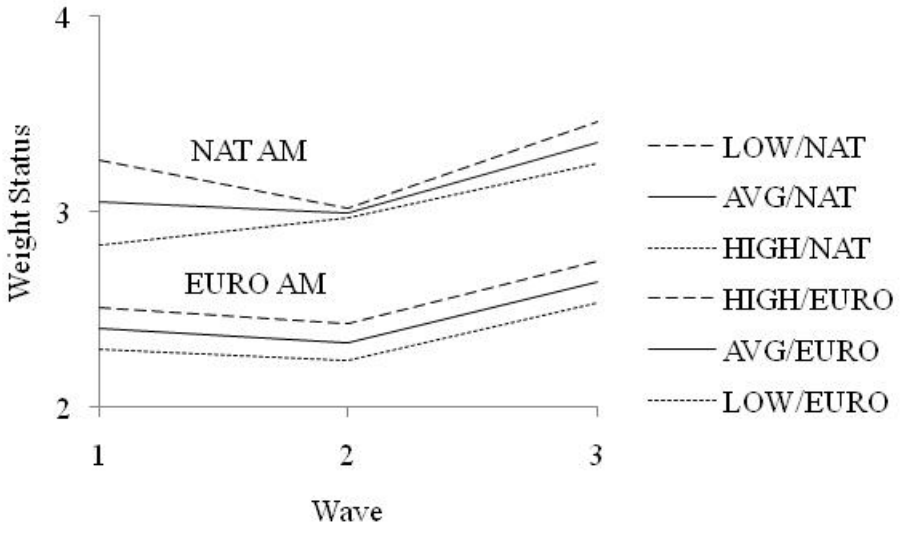


*Figure 4. Authoritative Parenting x Mother Ethnicity*. Predicted changes in mean *Weight Status* across time for children of Native American mothers. Mean *Weight Statuses* were graphed for children of European American mothers although there were no significant predictions.

Due to the unexpected findings with *Authoritative Parenting*, the subscales of *Authoritative Parenting* were explored to see if they differentially predicted *Weight Status* in children of Native American and European American mothers. The same model as above was used for each of the three *Authoritative Parenting* subscales (Autonomy Granting, Reasoning/Induction, Warmth/Support) except that the subscale score was substituted for the overall *Authoritative Parenting* score.

When substituting Autonomy Granting, significant chi-square difference tests revealed that the final model should have only *Permissive Parenting* constrained to be equal across ethnic groups and allow both Autonomy Granting and *Authoritarian Parenting* to be free to vary between the two ethnicities. This model fit reasonably well, $\chi^2$ (3) = 4.94, $p$ = .18, CFI = 1.00, RMSEA = .07. Here, both the Autonomy Granting and

*Authoritarian Parenting* parameters varied by ethnicity. Autonomy Granting did not predict *Weight Status* for children with European American mothers. For children with Native American mothers, Autonomy Granting predicted all three parameters: the intercept ($b$ = -.64, $p$ = .006), the slope ($b$ = .39, $p$ = .03), and the quadratic coefficients ($b$ = -.23, $p$ = .05), in contrast to the total *Authoritative Parenting* score which only predicted change. In other words, for children with Native American mothers, Autonomy Granting predicted both initial differences in *Weight Status* and changes across time (see Figure 5). Specifically, an increase of one standard deviation in Autonomy Granting predicted a .39 increase in *Weight Status* with the trend reversing subsequently. The graph indicates that children of Native American mothers with low levels of Autonomy Granting (i.e., score at or below one standard deviation below the mean) have the highest initial levels of *Weight Status* (just below "4" which is the 85$^{th}$ BMI-for-Age-%) and increase closer to this *Weight Status* by wave 3. Children of Native American mothers who exhibit high levels of Autonomy Granting (i.e., one standard deviation above the mean) do significantly increase between waves 1 and 2; however, their average score does not increase into a risk weight range and the increase seems to level off between waves 2 and 3.

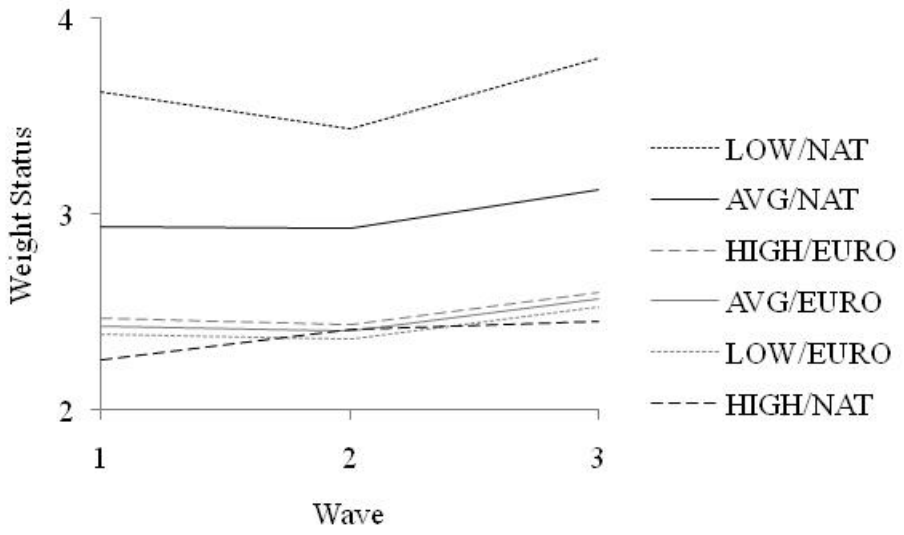


*Figure 5.* Autonomy Granting x *Mother Ethnicity*. Predicted initial *Weight Statuses* and changes across time for children of Native American mothers.

In the same model, *Authoritarian Parenting* did not predict the intercept for children with European American mothers, ($b$ = -.12, $p$ = .19), but it did predict both the slope ($b$ = .26, $p$ = .005) and the quadratic coefficients ($b$ = -.14, $p$ = .009). In other words, *Authoritarian Parenting* did not predict any differences in initial *Weight Status* but it did predict changes in *Weight Status* across time for children with European American mothers (see Figure 6). Specifically, an increase of one standard deviation in *Authoritarian Parenting* predicted a .26 increase in *Weight Status* with that slope decreasing and reversing thereafter. It should be noted that this is similar to the pattern found for *Authoritarian Parenting* for the overall model. For children with Native American mothers, *Authoritarian Parenting* did not significantly predict any of the parameter coefficients: intercept ($b$ = -.46, $p$ = .12), slope ($b$ = .07, $p$ = .76), quadratic ($b$ = -.11, $p$ = .45). The graph indicates that for children of European American mothers who exhibit high levels of *Authoritarian Parenting*, there is a statistically significant

increase from wave 1 to wave 2, which enables them to close the wave 1 gap, but subsequently they increase risk status less rapidly than the average reference category.

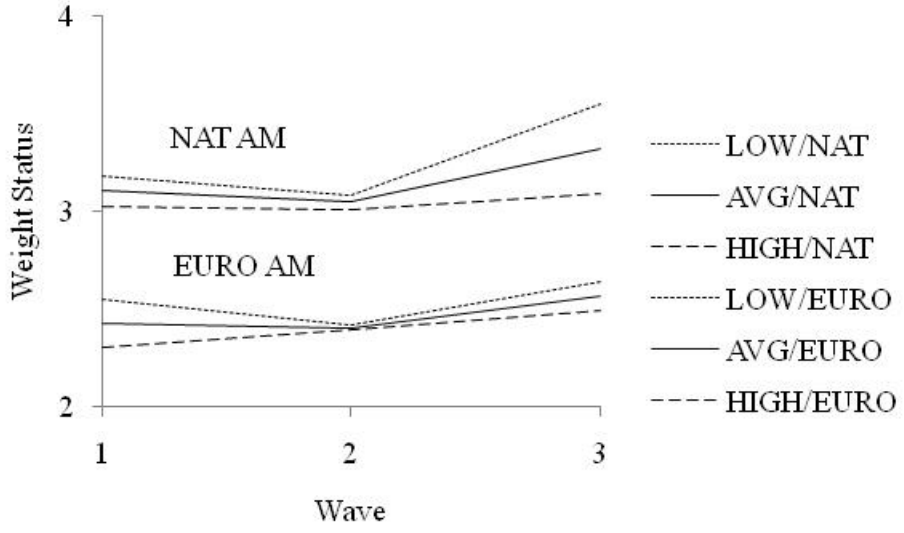


*Figure 6. Authoritarian Parenting x Mother Ethnicity*. Predicted changes across time for children of European American mothers.

When substituting the Reasoning/Induction subscale for *Authoritative Parenting*, significant chi-square difference tests revealed that neither Reasoning/Induction nor *Permissive Parenting* varied by ethnicity, but that the model should allow *Authoritarian Parenting* to be free to vary between the two ethnicities. So the Reasoning/Induction subscale of *Authoritative Parenting* does not account for the ethnic differences in how *Authoritarian Parenting* predicts *Weight Status*. This model was not interpreted because the point of interest was identifying which subscales of *Authoritative Parenting* predict weight changes.

Finally, when substituting Warmth/Support for *Authoritative Parenting*, there were no significant chi-square difference tests. It, therefore, was determined that there was no significant interaction between Warmth/Support and *Mother Ethnicity* in this case. This subscale of *Authoritative Parenting* did not predict any ethnic differences in

*Weight Status* in this model. Overall these subscale models led to the conclusion that only the Autonomy Granting subscale was accounting for the overall interaction of *Authoritative Parenting* and *Mother Ethnicity*.

**MLR**. Before examining the interaction of parenting style and *Mother Ethnicity*, two multinomial logistic regressions were run to examine the main effects of *Mother Ethnicity* in predicting differences among the nine *Weight Trajectories* ($n$ = 296). *Mother Ethnicity* did significantly predict differences among the groups, $\chi^2$ (8) = 17.65, $p$ = .02. Specifically, *Mother Ethnicity* played a statistically significant role in differentiating the Obese Weight Trajectory from the Low Healthy Weight Trajectory, Wald $\chi^2$ (1) = 8.06, $p$ = .005. When compared to Native American mothers, mothers who were European American were less likely to have children in the Stable Obese Weight Trajectory than the Low Healthy Weight Trajectory. Children with European American mothers, when compared to children with Native American mothers, were almost two times (78.2%) less likely to be in the Obese Weight Trajectory than the Low Healthy Weight Trajectory.

In order to examine the possible moderating effects of *Mother Ethnicity* on the parenting style and *Weight Trajectories* relations, three multinomial logistic regressions were run (one for each parenting style). Only the *Permissive Parenting x Mother Ethnicity* Interaction Model was significant, $\chi^2$ (24) = 47.97, $p$ = .003; however, the interaction was non-significant ($p$ = .08).

**Summary**

The SEM hypotheses that *Authoritarian* and *Permissive Parenting* would predict higher initial *Weight Status* and increases across time were partially supported. However, it should be noted that these predictions were never into overweight or obese weight

ranges. Thus, it cannot be determined if these increases matter but the children may be moving into risk later and longitudinal analyses would need to be conducted to determine if this is true. High *Authoritarian Parenting* predicted increases across all waves in *Weight Status* and High *Permissive Parenting* predicted a higher initial level of *Weight Status* which was maintained through all the waves. The MLR hypothesis that *Permissive Parenting* would predict an increased likelihood of children's membership in a higher *Weight Trajectory* was supported. Increases in *Permissive Parenting* significantly predicted greater odds of being in both risk trajectories rather than the reference trajectory.

When considering the moderation hypotheses and research question, only the SEM *Mother Ethnicity* moderation hypothesis was supported. Specifically, *Authoritative Parenting,* Autonomy Granting, and *Authoritarian Parenting* differentially predicted *Weight Status* for children of Native American and European American mothers. For children of Native American mothers, high *Authoritative Parenting* predicted increasing *Weight Status* across all waves. Although the increase was not into overweight or obese weight range, these children did end up above the "3" which is above the 75$^{th}$ percentile. Further analyses indicated that this was due to the Autonomy Granting subscale. The Autonomy Granting results indicated that, for children of Native American mothers, low Autonomy Granting predicted a relatively high initial level of *Weight Status* and nearly reaching the "4" level in *Weight Status* which is above the 85$^{th}$ percentile. For children of European American mothers, high *Authoritarian Parenting* predicted increasing *Weight Status* across all waves, although the increase was not into overweight or obese weight.

# CHAPTER V

# DISCUSSION

This study examined parenting style as a potential predictor of children's weight across time and explored whether this association was moderated by any of three demographic factors. Moderating factors are an important component of research involving parenting and children's weight as the parent-child relationship exists within a greater environmental and social context. Weight was examined in two ways: (1) using within-wave weight status groups and (2) using across-wave weight trajectories. Several of the study's hypotheses were supported.

Parenting style as a predictor of child weight across time was supported using both types of weight outcome variables. When utilizing quadratic growth modeling, high *Authoritarian Parenting* predicted short-term increases in *Weight Status* although this increase did not move the average child out of a healthy weight range. However, if children were to stay on this course, they would move into a risk category within a few years. High *Permissive Parenting* predicted higher *Weight Status* across all waves, differences fully detectable at wave 1. This supports Rhee et al.'s (2006) report that having either type of a permissive parent (indulgent or neglectful) predicted a two times greater likelihood of obesity. Although the higher levels of permissiveness did not predict the average child being in a risk weight range, children of highly permissive parents ended near the "3" level, which is the 75$^{th}$ percentile on the BMI-for-Age-% chart. This level has been associated in the literature with an increased likelihood of

obesity by age 12 (Nader et al., 2006). The SEM results were verified with multiple regression analyses.

Multinomial logistic regression analyses, using the across-wave *Weight Trajectories*, indicated that *Permissive Parenting* played a statistically significant role in differentiating two of the at-risk stable trajectories from the reference trajectory (Low-Healthy Weight Trajectory). The analyses are connected with the fact that *Permissive Parenting* predicted higher initial levels of *Weight Status* in the quadratic growth model but no changes over time, thus indicating a stable pattern of higher weight across time for those children with parents who exhibited higher levels of permissiveness. This is in line with the findings from the multinomial logistic regression which indicated that *Permissive Parenting* did not predict any of the change trajectories but did predict differences in the stable trajectories.

Four interactions also were tested. The interaction of *Permissive Parenting* and *Mother Ethnicity* in predicting child weight across time was supported, though only with multinomial logistic regression. The multinomial logistic regression analyses did indicate that the overall interaction model between *Mother Ethnicity* and *Permissive Parenting* was significant; however, the interaction parameter was only marginally significant. In other words, the interaction parameter was not significant but either the main effect of *Mother Ethnicity* or *Permissive Parenting* was strong enough to indicate an overall significant model. There were significant main effect differences in predicting the *Weight Trajectories* from *Mother Ethnicity* with European American mothers having a much lower likelihood than Native American mothers of having a child in the highest

stable weight trajectory, as would be expected based on literature (Story, Evans, Fabsitz, Clay, Holy Rock, & Broussard, 1999).

The results of the significant quadratic growth model analyzing the interaction of *Authoritative Parenting* and *Mother Ethnicity* are of particular interest. Contrary to what would be expected from past literature, where authoritative parenting predicted healthy weight (e.g., Rhee et al., 2006), in the current study among children with Native American mothers, low *Authoritative Parenting* predicted decreases in *Weight Status* from wave 1 to wave 2, whereas high *Authoritative Parenting* predicted increases in *Weight Status.* Here, the average child of low *Authoritative* mothers (i.e., one standard deviation below the mean) started out above the 75$^{th}$ percentile on the BMI-for-Age-% chart and ended near the threshold between 2 and 3 by wave 2. This would be a significant decrease out of obesity risk. In contrast, the average child of high *Authoritative* Native American mothers started out below the risk threshold and significantly increased almost to the threshold (2.96) by wave 2 and past it by wave 3 (3.24). Due to this surprising finding, each of the *Authoritative Parenting* subscales were substituted into the model to determine if *Authoritative Parenting* as a whole was driving these predictions or only particular subscales. Notably, only the Autonomy Granting subscale predicted the outcome variable when interacting with *Mother Ethnicity*.

In the quadratic growth model for Native American mothers, low Autonomy Granting predicted children starting out at the highest *Weight Status* (3.62) and ending near 4 on the continuum (3.80), which represents the 85$^{th}$ percentile on the BMI-for-Age-% scale. In other words, the pattern was somewhat stable (though not perfectly stable) at a higher *Weight Status*. One study of two- to five-year-olds and their parents found that

Native American parents tended to be more indulgent and less likely to use punishment than their European American and Hispanic American counterparts (MacPhee, Fritz, & Miller-Heyl, 1996). Additionally, they were least likely to emphasize independence (i.e., they exhibited low autonomy granting). Although the MacPhee et al. (1996) article does not focus on child obesity, it does note that the Native American children in their study had fewer cognitive and social skills, which have been associated with higher rates of obesity in the literature (Aunola et al., 2000; Chipman et al., 2000).

When considering high Autonomy Granting in Native American mothers, their children started out at the lowest *Weight Status* of both European and Native American groups. Additionally, high Autonomy Granting predicted short-term increases in *Weight Status* (consistent with the effect of *Authoritative Parenting* on short-term increases in *Weight Status*); however, the typical increase was only to the level of the European American groups and not into a risk group. This increase was counterbalanced by the fact that high Autonomy Granting was associated with substantially lower *Weight Status* over all three waves. Additionally, the increase seems to be leveling off between waves 2 and 3 since there was only an increase of .04 between these waves. Thus, the short-term effects of *Authoritative Parenting* and its Autonomy Granting subscale were merely reducing the differences in *Weight Status* associated with those parenting style variables in the opposite direction initially. Finally, the increase between waves 2 and 3 would not be of much concern if future research shows that weight does indeed level off and as long as the upward trend does not continue.

These children of high Autonomy Granting Native American mothers are significantly lower at the initial level than their low Autonomy Granting Native American

mother counterparts. In other words, being high or low on Autonomy Granting makes a significant difference in the weight of children of Native American mothers. Not fostering a sense of independence and respecting children's own voice seems to be particularly harmful in the Native American community in regard to child weight. Thus, when Native American mothers exhibit high levels of Autonomy Granting, their children's weight tends to follow the pattern typical of European American children and not be at-risk. This is notable because Native Americans tend to be among the highest groups in obesity and risk for obesity (Broussard et al., 1995) and would be of particular benefit in interventions directed toward decrease of obesity in Native American communities.

Both Autonomy Granting and *Authoritative Parenting* predicted increases in *Weight Status* during the first grade (from wave 1 to wave 2) for Native Americans. However, this may have been due to regression toward the mean, especially for Autonomy Granting. In any case, these unexpected results occurred only for Native Americans, perhaps due to their small sample size. Future research should investigate whether this surprising result replicates in larger samples.

There were no other moderating effects found beyond *Mother Ethnicity*. *Child Gender* differences were explored here as research questions due to the mixed findings available in current literature. Thus, the current study supports past findings of no gender differences in the effects of parenting style on child obesity. Additionally, the current study supports past findings of no *SES* differences in those associations. A possibility for the lack of SES differences may be due to the way in which it was operationalized. The

high, medium, and low categories were sample specific and, thus, the results may turn out differently if using more nationally normative categories.

It is noteworthy that no moderation was found with *Child Ethnicity* when there were significant results with the moderation of *Mother Ethnicity*. However, it should be noted that there were 39 cases where *Mother Ethnicity* was not available and, thus, there was a smaller sample size for analyses using the *Mother Ethnicity* variable. There are several explanations for why mother's ethnicity would make more of an impact. As previously discussed, one of the reasons that child obesity prevention interventions need parental support is that children do not buy or prepare their own food (Golan & Crow, 2004) and ethnicity has been shown to be related to food choices (Devine, Sobal, Bisogni, & Conners, 1999). Additionally, in the Native American community, the interaction of pervasive poverty and high-fat commodities (canned meat, cheese, butter, etc.) provided by the government may further exacerbate the availability of unhealthy food in the home (Story et al., 1999). Regardless of ethnicity, children's food preferences have been found to be significantly related to that of their mothers' (Skinner, Carruth, Bounds, & Ziegler, 2002), and mothers' behavior has been shown to influence their children's eating behavior (Drucker, Hammer, Agras, & Bryson, 1999). In particular, those mothers who prompted their children to eat the most had children who ate the fastest which could be related to later obesity due to the lack of self-regulation.

The current study introduced a new way to examine weight changes across time with the conceptualization and operationalization of the *Weight Trajectory* variable. Based on the results of this study, it can be concluded that there are some potentially promising uses for this type of longitudinal weight classification. *Permissive Parenting*

and *Mother Ethnicity* both differentially predicted among the levels of the stable *Weight Trajectories*. However, there were no predictions found among the change trajectories (i.e., the two increasing and two decreasing trajectories). This may be a function of the classifications used in this study and, thus, alternate classifications should be explored in later studies. For example, to increase a child had to move up one weight group (e.g., from High Healthy Weight to Low At-Risk Weight); so, more groups may need to be included to make the transition from one to another a shorter distance on the BMI-for-Age-% scale. The SEM quadratic growth model supported the significant findings from the techniques used to analyze the *Weight Trajectories*. This lends merit to, at the least, the validity of the definitions and classifications of the stable categories. Stability is more typical and this may be why significant results were only found with these trajectories. The SEM quadratic growth models, in contrast, did find some increasing trends that were not replicated with *Weight Trajectory* analyses. This is an indication that increasing (and possibly decreasing) trajectories are there, in reality, but were not found in this sample with these definitions. A benefit of exploring these weight trajectories further is the ease of interpretability when analyzing them.

The only effect of parenting styles on changes in *Weight Status* for the full sample was limited to short-term changes from wave 1 to wave 2 during the first grade. Adverse changes in *Weight Status* during those eight months were predicted by *Authoritarian Parenting*, but that effect disappeared by the end of the second grade. Because parenting styles may change somewhat over time, it might be that *Authoritarian Parenting* at the beginning of the second grade would predict increases in risk status during that year. The current study, however, only investigated the effects of parenting styles as measured at

the beginning of the first grade. An Authoritarian Parenting style has numerous adverse effects over time (e.g., Baumrind, Larzelere, & Owens, in press). Some parents may respond by changing their parenting style in a desirable manner, which might eliminate the adverse effects of Authoritarian Parenting on longer-term risk weight status. All that is known from the present study, however, is that the adverse effect of Authoritarian Parenting is evident during the next eight months, but not thereafter.

This study did have several limitations. First, the measure of parenting style was self-report. Although self-report measures tap into important components of how parents think about their parenting, the measure may be biased. Adams and colleagues found that in 8 out of 10 studies which included both observational and self-report measures, there were indicators of response bias in the self-report measures (Adams, Soumerai, Lomas, & Ross Degnan, 1999). Future research could combine both self-report and observational measures of parenting in order to assess similarities and differences between self-report and observed behavior as they related to child overweight and obesity. Any differences found may be the key to finding moderating effects such as the ones explored in this study. For example, parents may not have a different philosophy about parenting their sons and daughters; however, they may unconsciously act differently toward them which could differentially impact child eating and activity.

Another important limitation of the current study was that parenting style was only examined at one time point. Although there is literature on the stability of parenting (e.g., Fite et al., 2006; Holden & Miller, 1999; Loeber et al., 2000; Stoolmiller, 1994; Vuchinich et al., 1992), it would be better to examine parenting at multiple time points to determine if stability is present in the current sample and if concurrent parenting follows

the same prediction as past parenting. The findings with the *Authoritative Parenting* subscales suggest that the measure of parenting style used in this study may best be explored using the dimensions of the subscales in addition to the three primary subscales. Future research should explore the relations among the other dimensions and child weight. Additionally, only parenting data from one parent was used and, so, for households with two parents, only half of the story is potentially being told.

The two ways in which BMI-for-Age-% was categorized may not be easily generalizable since most research uses either continuous BMI-for-Age-% or binary classifications. Since this study did not use either of these methods, future research should explore whether the findings are generalizable with commonly used classifications of BMI-for-Age-%. Further, future research should examine the newly introduced weight trajectories in more depth. Specifically, studies could explore alternate versions and classifications, especially among the change trajectories.

The significant findings from this study serve to better define the relations between parenting style and child weight. Specifically, the relation between permissive parenting and child obesity was replicated with every type of analysis (SEM, MLR, ANOVA, and Multiple Regression). Although *Permissive Parenting* did not predict any changes in weight across time, it did predict higher initial levels of weight at wave 1 and the stability of higher levels of weight across time (i.e., there was not a "change" in weight but these children stayed at an elevated risk level across all three waves). Additionally, moderating effects were found that expand on the knowledge regarding ethnic differences in both parenting style and child weight. The lack of finding any additional moderation effects also serves to expand the current mixed literature available

on these factors. The most notable result from the current study was the discovery that only the Autonomy Granting subscale was driving the prediction between *Authoritative Parenting* and child weight among children who have Native American mothers. These results highlight the need for additional research concerning the dimensions of Baumrind's parenting styles. Specifically, research needs to be done using the PSDQ and other measures of parenting style to deconstruct the dimensions of each parenting typology to validate the nature of autonomy granting at this age in distinct cultural groups.

Child obesity has become a major epidemic worldwide, especially in the United States, underscoring the need to research the environment surrounding children with this disease. The current study enhances the limited knowledge available on global parenting style and child obesity. The results of this study can be applied to family interventions aimed at weight reduction and maintaining a healthier lifestyle. Further, the interaction of parenting and mother ethnicity findings can be utilized with interventions in communities in which child obesity is the most pervasive.

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# APPPENDICES

APPENDIX A

SELECTED ITEMS FROM THE DEMOGRAPHIC QUESTIONNAIRE

1. Your date of birth: _____

Month Day Year

2. Gender of your child (check one): _____Male _____Female

3. Birth date of your child: _____

Month Day Year

4. What is your relationship to your child?

(example: mother, father, stepmother, foster father)_____

6. Your current household income per month before taxes (please check one):

_____ $ 0-100 _____ $ 2000-2499

_____ $ 100-499 _____ $ 2500-2999

_____ $ 500-999 _____ $ 3000-3499

_____ $ 1000-1499 _____ $ 3500-3999

_____ $ 1500-1999 _____ $ 4000 plus

7. Ethnic group of the child's biological mother (please check one):

_____ Native American Tribe: _____

_____ African-American

_____ Hispanic

_____ Asian

_____ White

_____ Multiethnic Describe: _____

_____ Other

8. Ethnic group of the child's biological father (please check one):

_____ Native American Tribe: _____

_____ African-American

_____ Hispanic

_____ Asian

_____ White

_____ Multiethnic Describe: _____

_____ Other

10. Are you currently employed or unemployed in this occupation (please check one)?

_____ employed _____unemployed

11. Please place an "X" next to the highest grade you completed in school.

_____ 6th grade _____ 11th grade

_____ 7th grade _____ 12th grade

_____ 8th grade _____ some vo-tech

_____ 9th grade _____ some college courses

_____ 10th grade _____ vo-tech graduate

_____ college graduate

13. Monthly income of your spouse/partner before taxes (please check one):

_____ $ 0-100 _____ $ 2000-2499

_____ $ 100-499 _____ $ 2500-2999

_____ $ 500-999 _____ $ 3000-3499

_____ $ 1000-1499 _____ $ 3500-3999

_____ $ 1500-1999 _____ $ 4000 plus

15. Is your spouse/partner currently employed or unemployed in this occupation (please check one)?

_____ employed _____unemployed

16. Please place a check mark next to the highest grade your spouse/partner completed in school.

_____ 6th grade _____ 11th grade

_____ 7th grade _____ 12th grade

_____ 8th grade _____ some vo-tech

_____ 9th grade _____ some college courses

_____ 10th grade _____ vo-tech graduate

_____ college graduate

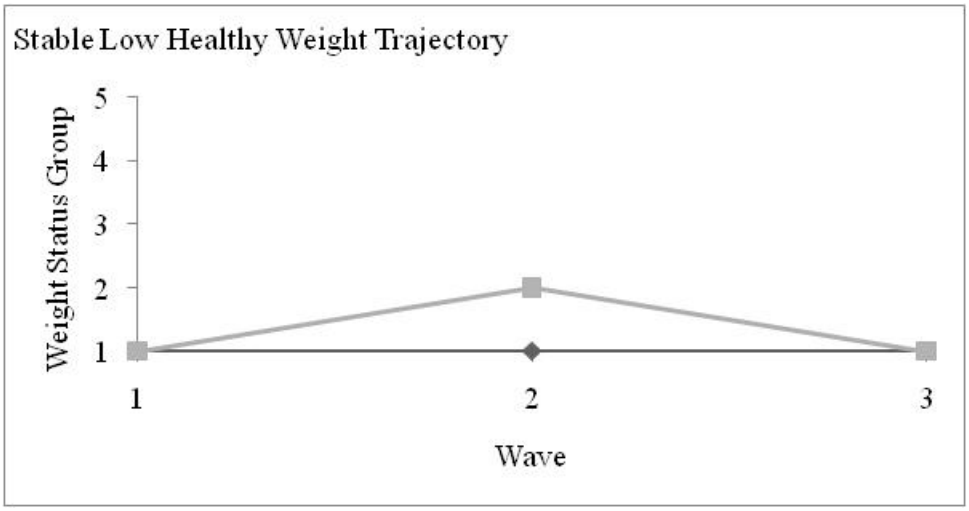
# APPENDIX B

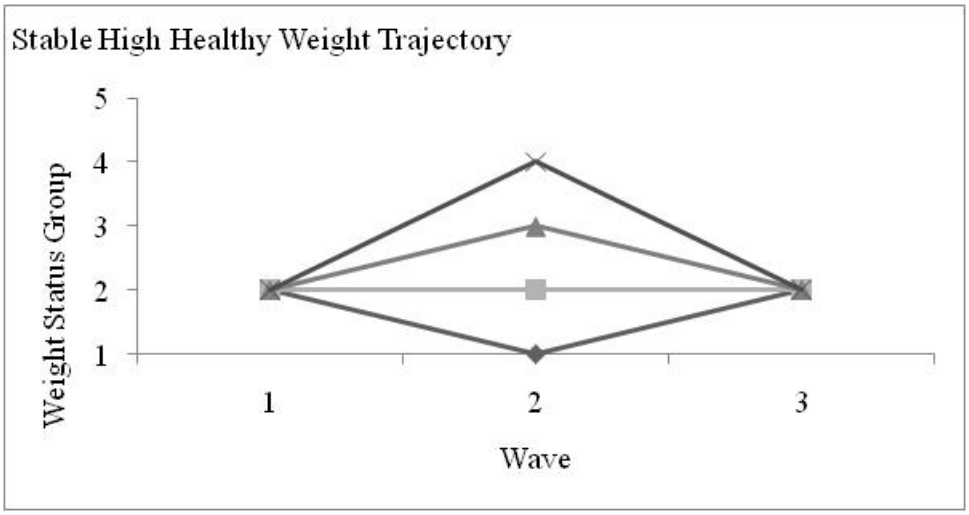
## OBSERVED WEIGHT TRAJECTORIES

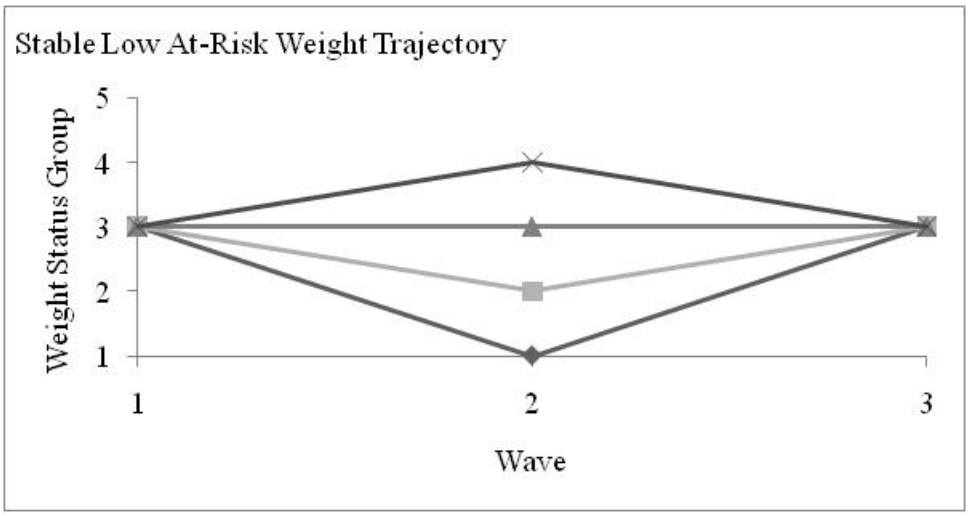
| Weight Trajectory Decision Log | | | |
|---|---|---|---|
| W1 | W2 | W3 | Trajectory |
| 1 | 1 | 1 | 1 |
| 1 | 1 | 2 | 6 |
| 1 | 1 | 3 | 7 |
| 1 | 1 | 4 | 7 |
| 1 | 2 | 1 | 1 |
| 1 | 2 | 2 | 6 |
| 1 | 2 | 3 | 7 |
| 1 | 4 | 4 | 7 |
| 2 | 1 | 1 | 8 |
| 2 | 1 | 2 | 2 |
| 2 | 1 | 3 | 6 |
| 2 | 2 | 1 | 8 |
| 2 | 2 | 2 | 2 |
| 2 | 2 | 3 | 6 |
| 2 | 2 | 4 | 7 |
| 2 | 3 | 2 | 2 |
| 2 | 3 | 3 | 6 |
| 2 | 3 | 4 | 7 |
| 2 | 4 | 2 | 2 |
| 2 | 4 | 4 | 7 |
| 3 | 1 | 3 | 3 |
| 3 | 2 | 2 | 8 |
| 3 | 2 | 3 | 3 |
| 3 | 2 | 4 | 7 |
| 3 | 3 | 2 | 8 |
| 3 | 3 | 3 | 3 |
| 3 | 3 | 4 | 7 |
| 3 | 3 | 5 | 7 |
| 3 | 4 | 3 | 3 |
| 3 | 4 | 4 | 7 |
| 3 | 5 | 4 | 7 |
| 4 | 5 | 3 | 9 |
| 4 | 2 | 4 | 4 |
| 4 | 3 | 3 | 9 |
| 4 | 3 | 4 | 4 |
| 4 | 4 | 3 | 9 |
| 4 | 4 | 4 | 4 |
| 4 | 4 | 5 | 7 |
| 4 | 5 | 5 | 7 |
| 5 | 4 | 4 | 8 |
| 5 | 4 | 5 | 5 |
| 5 | 5 | 4 | 8 |
| 5 | 5 | 5 | 5 |

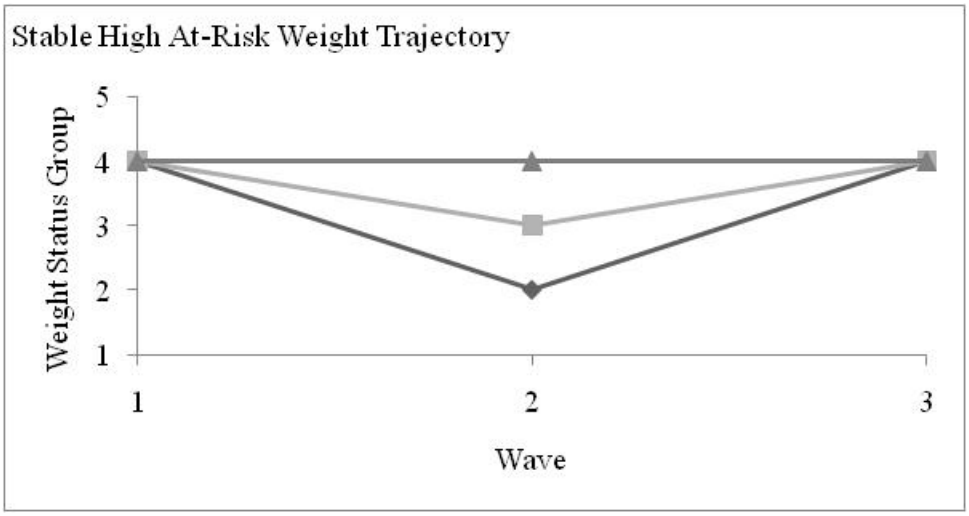
APPENDIX C

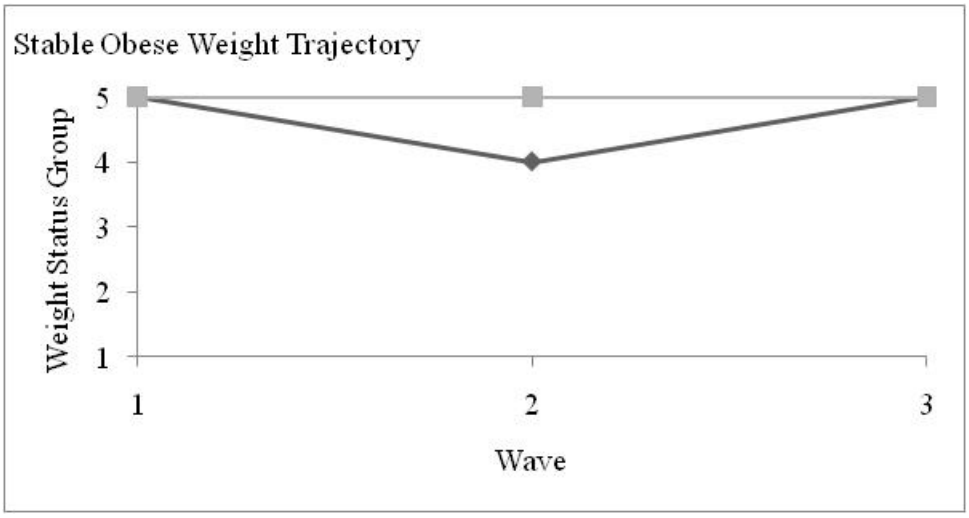
WEIGHT TRAJECTORY FIGURES

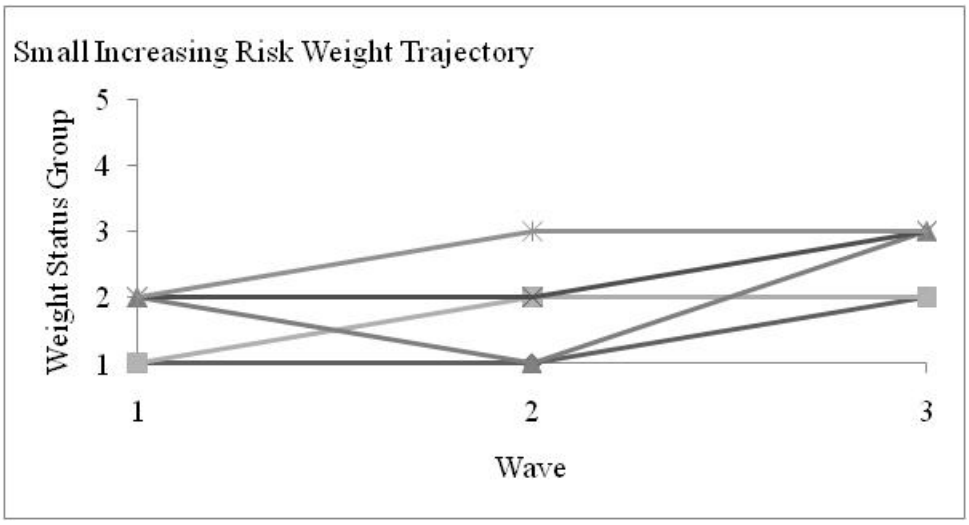


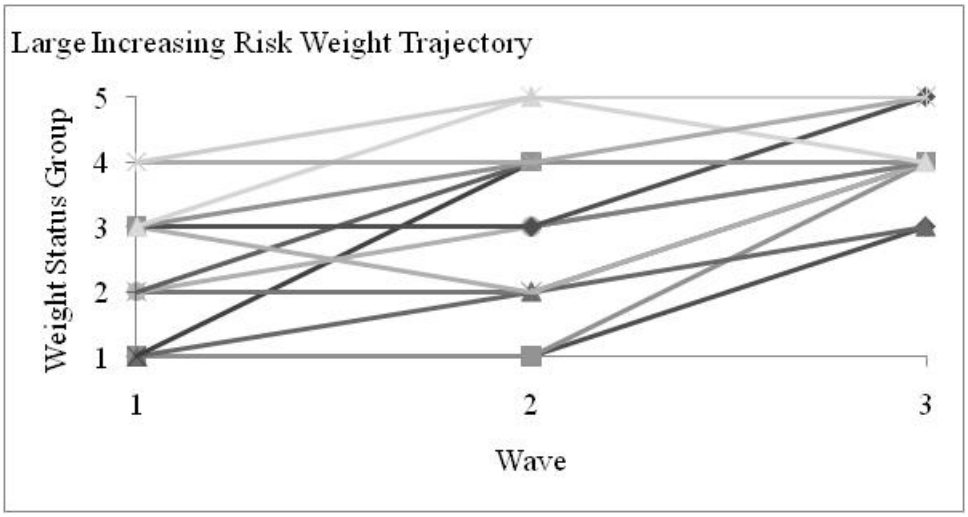



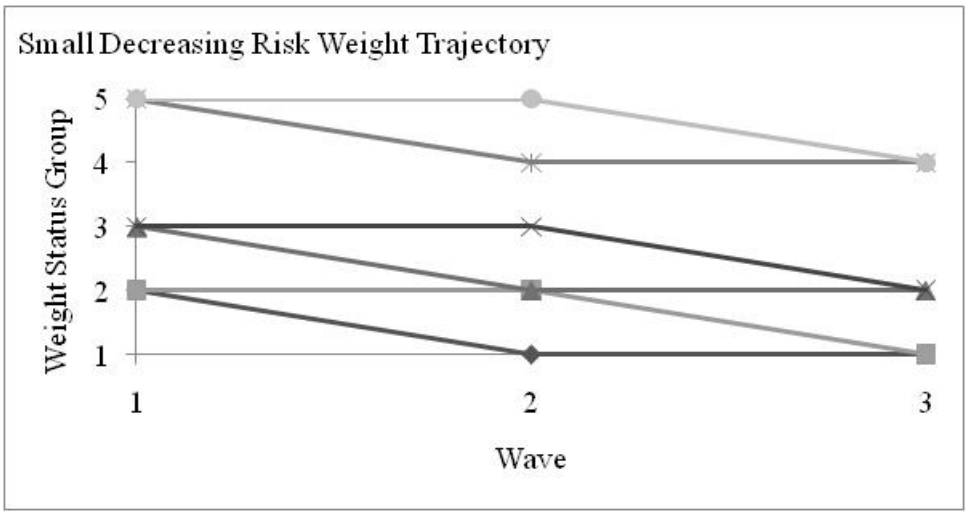

Stable Low At-Risk Weight Trajectory
Weight Status Group
5
4
3
2
1
1
2
3
Wave

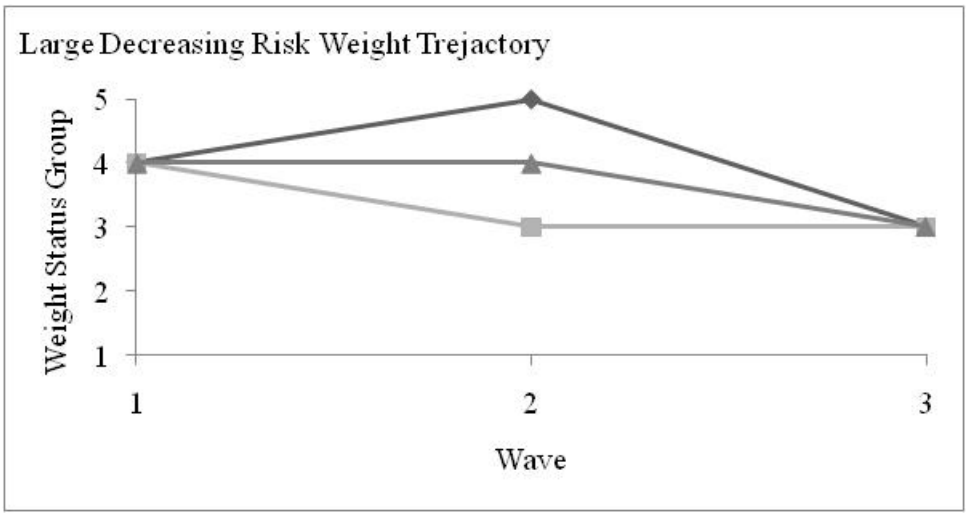

Stable High At-Risk Weight Trajectory
Weight Status Group
5
4
3
2
1
1
2
3
Wave


Stable Obese Weight Trajectory
Weight Status Group
5
4
3
2
1
1
2
3
Wave


Small Increasing Risk Weight Trajectory
Weight Status Group
5
4
3
2
1
1
2
3
Wave


Large Increasing Risk Weight Trajectory
Weight Status Group
5
4
3
2
1
1
2
3
Wave


Small Decreasing Risk Weight Trajectory
Weight Status Group
5
4
3
2
1
1
2
3
Wave


Large Decreasing Risk Weight Trejactory
Weight Status Group
5
4
3
2
1
1
2
3
Wave

APPENDIX D

EXAMPLE MULTINOMIAL LOGISTIC REGRESSION SPSS OUTPUT

**Case Processing Summary**

| | | N | Marginal Percentage |
|---|---|---|---|
| Traj85 3 wave trajectory based on the 85th percentile threshold | 1 Stable Low Healthy | 72 | 20.2% |
| | 2 Stable High Healthy | 65 | 18.3% |
| | 3 Stable Low At-Risk | 15 | 4.2% |
| | 4 Stable High At-Risk | 26 | 7.3% |
| | 5 Stable Obese | 43 | 12.1% |
| | 6 Small Increasing Risk | 35 | 9.8% |
| | 7 Large Increasing Risk | 48 | 13.5% |
| | 8 Small Decreasing Risk | 45 | 12.6% |
| | 9 Large Decreasing Risk | 7 | 2.0% |
| Valid | | 356 | 100.0% |
| Missing | | 0 | |
| Total | | 356 | |
| Subpopulation | | 22[a] | |

a. The dependent variable has only one value observed in 3 (13.6%) subpopulations.

**Model Fitting Information**

| | Model Fitting Criteria | Likelihood Ratio Tests | | |
|---|---|---|---|---|
| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
| Intercept Only | 378.035 | | | |
| Final | 356.169 | 21.866 | 8 | .005 |

**Pseudo R-Square**

| | |
|---|---|
| Cox and Snell | .060 |
| Nagelkerke | .061 |
| McFadden | .015 |

**Likelihood Ratio Tests**

| Effect | Model Fitting Criteria: -2 Log Likelihood of Reduced Model | Likelihood Ratio Tests: Chi-Square | df | Sig. |
|---|---|---|---|---|
| Intercept | 399.470 | 43.301 | 8 | .000 |
| MPER | 378.035 | 21.866 | 8 | .005 |

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

**Parameter Estimates**

| Traj85 3 wave trajectory based on the 85th percentile threshold[a] | | B | Std. Error | Wald | df | Sig. | Exp(B) | 95% Confidence Interval for Exp(B) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Lower Bound | Upper Bound |
| 2 Stable High Healthy | Intercept | -1.207 | .669 | 3.258 | 1 | .071 | | | |
| | MPER | .516 | .302 | 2.924 | 1 | .087 | 1.676 | .927 | 3.028 |
| 3 Stable Low At-Risk | Intercept | -4.411 | 1.130 | 15.227 | 1 | .000 | | | |
| | MPER | 1.250 | .453 | 7.598 | 1 | .006 | 3.490 | 1.435 | 8.486 |
| 4 Stable High At-Risk | Intercept | -2.737 | .896 | 9.329 | 1 | .002 | | | |
| | MPER | .786 | .386 | 4.141 | 1 | .042 | 2.194 | 1.029 | 4.677 |
| 5 Stable Obese | Intercept | -1.494 | .751 | 3.961 | 1 | .047 | | | |
| | MPER | .459 | .338 | 1.848 | 1 | .174 | 1.583 | .816 | 3.070 |
| 6 Small Increasing Risk | Intercept | -.635 | .801 | .628 | 1 | .428 | | | |
| | MPER | -.042 | .377 | .013 | 1 | .911 | .959 | .457 | 2.009 |
| 7 Large Increasing Risk | Intercept | -1.347 | .726 | 3.440 | 1 | .064 | | | |
| | MPER | .442 | .328 | 1.820 | 1 | .177 | 1.556 | .818 | 2.959 |
| 8 Small Decreasing Risk | Intercept | -1.061 | .739 | 2.062 | 1 | .151 | | | |
| | MPER | .281 | .338 | .691 | 1 | .406 | 1.325 | .683 | 2.569 |
| 9 Large Decreasing Risk | Intercept | -7.717 | 1.749 | 19.464 | 1 | .000 | | | |
| | MPER | 2.178 | .602 | 13.091 | 1 | .000 | 8.829 | 2.713 | 28.728 |

a. The reference category is: 1 Stable Low Healthy.

APPENDIX E

INSTITUTIONAL REVIEW BOARD APPROVAL

**Oklahoma State University Institutional Review Board**

| | |
|---|---|
| Date: | Wednesday, September 23, 2009 |
| IRB Application No | HE0948 |
| Proposal Title: | Parenting Styles and Patterns of Child Weight Across Time |
| Reviewed and Processed as: | Exempt |

**Status Recommended by Reviewer(s): Approved Protocol Expires: 9/22/2010**

Principal Investigator(s):

Julie Rutledge
233 HES
Stillwater, OK 74078

Amanda W Harrist
323 HES
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

[ ] The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Sheila Kennison, Chair
Institutional Review Board

VITA

Julie Marie Rutledge

Candidate for the Degree of

Doctor of Philosophy

Thesis: PARENTING STYLES AND PATTERNS OF CHILD WEIGHT ACROSS TIME

Major Field: Human Environmental Sciences

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy in Human Environmental Sciences at Oklahoma State University, Stillwater, Oklahoma in December, 2009.

Completed the requirements for the Master of Science in Human Development and Family Science at Oklahoma State University, Stillwater, Oklahoma in 2007.

Completed the requirements for the Bachelor of Arts in Psychology at Oklahoma State University, Stillwater, Oklahoma in 2003.

Name: Julie Marie Rutledge Date of Degree: December, 2009

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: PARENTING STYLES AND PATTERNS OF CHILD WEIGHT ACROSS TIME

Pages in Study: 82 Candidate for the Degree of Doctor of Philosophy

Major Field: Human Environmental Sciences

Scope and Method of Study: There is a need for longitudinal analyses to identify key factors in the development of childhood obesity. This study sought to examine the links between parenting styles and child obesity across three waves (beginning of first grade, end of first grade, and end of second grade) and further examine the potential moderating factors of gender, socioeconomic status, and ethnicity among a sample of 356 children. Parenting style was assessed by the Parenting Styles and Dimensions Questionnaire. Child obesity was operationalized in two ways: (1) five distinct weight status groups into which children were classified at each wave and (2) nine weight trajectories which accounted for their weight statuses across waves. Quadratic growth modeling, a type of structural equation modeling (SEM) and multinomial logistic regression (MLR) were used to examine parenting styles' potential prediction of these different weight classifications.

Findings and Conclusions: SEM results showed that high permissive parenting significantly predicted higher initial weight than both the average reference group and low permissive parenting. MLR results showed that permissive parenting predicted stability of higher weight across time; specifically, with each increase of one standard deviation in permissiveness, children were 3.5 times more likely to be between the $75^{th}$ and $85^{th}$ and 2 times more likely to be between the $85^{th}$ and $95^{th}$ BMI-for-Age percentile when compared to children below the $50^{th}$ percentile. Additionally in SEM, children of high authoritarian parents began at a non-significantly lower weight relative to the average reference group and low authoritarian parents but increased their weight significantly, primarily from wave 1 to wave 2. Contrary to hypothesis, a significant interaction between mother ethnicity and authoritative parenting was found due only to the autonomy granting subscale. Children of Native American mothers with low levels of autonomy granting had the highest initial levels of weight when compared to the average reference group and high autonomy granting parents and increased close to the $85^{th}$ BMI-for-Age percentile by wave 3. Children of Native American mothers who exhibited high levels of Autonomy Granting significantly increased in weight between waves 1 and 2; however, their average weight did not increase into a risk range. Parenting style appears to play some role in the prediction of child weight longitudinally and this relation is moderated by the ethnicity of the child's mother.

ADVISER'S APPROVAL: Amanda W. Harrist, PhD