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# Capstone: Child Temperament and Parenting Styles as Predictors of BMI

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Child Temperament and Parenting Styles as Predictors of BMI

A Capstone

Presented in

Partial Fulfillment of the

Requirements for the Degree of

Master of Science

By

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June 2016

Department of Psychology

College of Sciences and Health

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**Thesis Committee**

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## **Biography**

The author was born in Hoffman Estates, Illinois on December 3, 1989. She graduated from Wheaton Warrenville South High School, in Wheaton. She received her Bachelor of Science degree in Psychology from Loyola University Chicago in 2012.

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## **Abstract**

This capstone examines how child temperament and parenting style predict child BMI in a sample of low income, ethnic minority children 1-4 years old, as well as the moderating role of parenting style in child temperament predicting child BMI. Dimensions of both child temperament and parenting style have been found to be protective of high child BMI in pediatric populations. Few studies have explored the longitudinal relationship between child temperament and parenting style and child BMI, and even fewer have examined the interaction between the two in predicting child BMI. This study includes measures of child temperament, parenting style, and child BMI from Wave 1 and Wave 2 of the Three City Study, and presents a dimensional framework of child temperament and parenting style, and the interaction between the two, in predicting child BMI. Dimensions of child temperament were not found to predict child BMI, longitudinally. Authoritarian parenting style was longitudinally predictive of child BMI, but in the opposite direction in which higher authoritarian parenting style was predictive of lower BMI. This finding may be due to differences in ethnic minority children's authoritarian parenting style. No interaction effects between child temperament and parenting style were found to be predictive of child BMI. The findings of this study illustrate that authoritarian parenting style may serve as a protective factor of child BMI in children in low income, ethnic minority populations. Future research should focus on understanding underlying mechanisms, as well as obtain more comprehensive measures of parenting style and child temperament, to assist in the development of prevention and intervention obesity programs.



## Child Temperament and Parenting Styles as Predictors of BMI

Child obesity is a public health epidemic. Obesity is defined as abnormal or excessive fat accumulation that may impair health, and overweight is defined as having excess body weight for a particular height from fat, muscle, bone, water, or a combination of these factors (Centers for Disease Control, 2015). Approximately 32% of U.S. children and adolescents are currently either overweight or obese, and there is an increasing national trend in childhood obesity. The percentage of children aged 6–11 years in the United States who were obese increased from 7% in 1980 to nearly 18% in 2012. Similarly, the percentage of adolescents aged 12–19 years who were obese increased from 5% to nearly 21% over the same period (Ogden, Carroll, Kit, & Flegal, 2014; CDC, 2015).

Pediatric obesity is linked to several deleterious effects, both physical and psychological. Children and adolescents who are obese have a significantly higher risk for chronic diseases (e.g., cardiovascular disease and metabolic problems) and poor psychosocial outcomes (e.g., poor quality of life and low self-esteem and self-image) (Freedman, Zugno, Srinivasan, Berenson, & Dietz, 2007; Israel & Ivanova, 2002). In addition, childhood obesity appears to have long-term effects, in which it may reduce overall adult life expectancy (Fontaine, Redden, Wang, Westfall, & Allison, 2003).

Given the significant physical and psychosocial problems associated with pediatric obesity, as well as its long lasting effects, it is imperative to identify and carefully examine early predictors of pediatric obesity. Past research has shown

that parental obesity is a significant predictor of child obesity (Parsons, Power, & Manor, 2005; Francis, Ventura, Marini, & Birch, 2007). Socioeconomic status differences have also been studied, in which research has shown that low-income, ethnic minority populations have significantly higher levels of childhood obesity compared to the rest of the general population. More specifically, African American and Hispanic groups have significantly higher levels of childhood obesity than other ethnic populations (Ogden et al., 2014). These significantly higher rates of pediatric obesity rates are due to multiple factors including environmental barriers that low income, ethnic minority population face, such as less access to educational and healthy living options, including fresh fruits and vegetables. Individual health behaviors also contribute to obesity. Compared with other urban youth, African American and Hispanic youth have higher levels of television viewing and more televisions in bedrooms, higher consumption of sugar-sweetened beverages, increased fast food consumption, and lower levels of physical activity (Dawson-McClure et al., 2014).

Child and parenting characteristics have also been linked to child obesity and obesogenic behaviors. Past research has shown that specific dimensions of child temperament and parenting styles have significantly predicted obesogenic behavior and child obesity, although the current literature remains limited and includes major gaps. Even more limited is research that has examined the interaction or joint effects of child temperament and parenting styles in predicting pediatric obesity.

## **Child Temperament**

Child temperament can be defined as biologically based, self-regulatory and reactivity characteristics that often remain stable within an individual (Braungart-Rieker, Moore, Planalp, & Lefever, 2014). These self-regulatory and reactivity characteristics often determine a child's emotional, attentional, and motor responses to a situation or the environment early in life and serve as a basis for later personality traits (Goldsmith et al., 1987). The literature is inconsistent and vague about which self-regulatory aspects should be included when measuring child temperament. Despite this inconsistency, major patterns have emerged in which self-regulatory aspects are included under the umbrella of child temperament. In a widely accepted model developed by Buss and Plomin (1975), there are three constituents of child temperament: activity, emotionality, and sociability. In addition, previous research has also studied impulsivity as a component of child temperament, emphasizing its role in capturing self-regulatory ability (Braet, Claus, Verbeken, & Van Vlierberghe, 2007).

Four specific self-regulatory dimensions that could contribute to pediatric obesity are activity, impulsivity, sociability, and emotionality. Children who are high in activity often have escalated energy output, which is revealed by a child's frequency and intensity of motor movements. Impulsivity is often related to attentional control. Emotionality captures a child's predisposition to get easily upset and distressed, where a child who has positive emotionality is less likely to get upset and distressed, and a child with negative emotionality is more likely to get upset and distressed. Sociability focuses on a child's tendency to desire being

with others or being alone. Children with high sociability prefer being with others, whereas children with low sociability prefer to be alone (Buss & Plomin, 1975; Pulkki-Raback, Elovainio, Kivimaki, Raitakari, and Keltikangas-Jarvine, 2005).

### **Temperament and BMI**

Existing evidence has revealed that there is a relationship between child temperament and BMI fluctuations, including overweight and obese statuses, since poor difficult temperament can serve as a risk factor for weight gain and increased BMI (Agras, Hammer, McNicholas & Kraemer, 2004; Faith & Hittner, 2010; Haycraft, Farrow, Meyer, Powell & Blisset, 2011). Specifically, having low activity, emotionality, and sociability, along with high impulsivity, can contribute to increased caloric intake and decreased physical activity resulting in increased BMI and weight gain.

Previous research has analyzed various dimensions of child temperament within single studies in relation to BMI or pediatric obesity. A longitudinal study done by Agras et al. (2004) investigated both emotion regulation (specifically, child's emotional regulation of anger/frustration) and activity (i.e. active personality) in predicting childhood overweight statuses. Results revealed that child's emotional regulation and activity level were a significant mediator in understanding how parental overweight predicts child overweight.

Using a predominantly White sample of 262 boys and 225 girls, Faith and Hittner (2010) investigated the role of infant emotion regulation and impulsivity in weight status and obesity risk at 6 years of age. Results showed that lower impulsivity, as measured by greater attention span, was a significantly related to

lower weight status and lower obesity risk, among boys. Among girls, lower emotion regulation, as measured by greater negative reaction to food, was associated with higher weight status and higher obesity risk. Thus, results of this study reveal gender differences in child temperament in predicting weight status and obesity.

In a study conducted by Haycraft et al. (2011), emotion regulation, activity levels, and sociability were all examined in relation to eating behaviors in a cross sectional study using young children. Findings indicated that while children with poor emotional temperaments were reported to display more food avoidant eating behaviors, such as lower levels of enjoyment and food fussiness, activity levels and sociability were not associated to children's eating behavior. Even more interesting is that while higher child BMI is significantly associated with more food avoidant eating behaviors, child temperament, itself, was not significantly related to higher BMI. In a similar study Pulkki-Raback et al. (2005) also studied the relation between emotion, activity levels, and sociability. This longitudinal study analyzed how negative emotionality, low sociability, and high activity in childhood predicts body mass in adulthood. Consistent with Haycraft et al. (2011), the emotion aspect of temperament was the only significant predictor of increased BMI, whereas activity and sociability were not significant predictors of increased BMI.

These studies reveal the very important point that current research is still ambiguous in determining which dimensions of temperament are most closely related to BMI. The results showed consistent patterns, in which lower

emotionality and emotion regulation, as well as higher impulsivity, seems to predict increased BMI compared to other dimensions of child temperament such as sociability and activity. The present study aims to distinguish the different dimensions of temperament in relation to BMI.

### **Activity**

The mechanism through which activity reduces body adiposity levels is explained through non-resting energy expenditure (NREE) (Anderson, Bandini, Dietz, & Must, 2004; Anderson, Bandini, & Must, 2005). The human body achieves energy balance equilibrium when energy expenditure is in balance with energy intake. When increasing energy expenditure, and not offsetting it with energy intake, the result is reduced adiposity. Having a high activity temperament, which includes non-volitional movements, such as fidgeting, can increase NREE, and thus contribute to reduced adiposity levels (Anderson et al., 2004; Anderson et al., 2005). One cross sectional study and one longitudinal study have examined the effects of activity on adiposity levels in pre-adolescent and adolescent girls. Activity was measured using four subscales: activity, persistence, intensity, and distractibility by a maternal report (Anderson et al., 2004; Anderson et al., 2005). Anderson et al. (2004) found in a cross sectional study of girls from ages 8-12 years old those with a high activity temperament were significantly leaner than girls with a lower activity temperament. Interestingly, these effects were not seen longitudinally. In a follow up study, Anderson et al. (2005) found that high activity levels were not associated with lower adiposity longitudinally in this same cohort of girls, with a four year follow up. A possible explanation for such

findings is that although temperament tends to remain stable developmentally, social context may alter how temperament is expressed. This change in social context, as the girl emerged into adolescence, may have caused mothers to rate child temperament differently (Anderson et al., 2005).

### **Emotionality**

One major mechanism in which emotionality relates and impacts weight gain is through emotional eating and external eating. Emotional eating is described as eating or overeating in response to emotion, rather than hunger. External eating is referred to as eating in response to cues from the environment, such as smelling or seeing food, rather than physiologically based cues. The two types of emotion regulation, inhibition and reactivity, are overcontrol and undercontrol in eating, respectively. Emotional inhibition and emotional eating are both internalizing processes, in which the child holds their negative feelings in and eats to cope with such negative feelings. Emotional reactivity and external reactivity are considered externalizing processes in which the child behaves negatively towards the environments and eats in response to the environment. Due to these poor emotion regulation strategies, both emotional eating and external eating result in increased weight gain (Harrist, Hubbs-Tait, Topham, Shriver, & Page, 2013).

Longitudinal studies have shown that emotional regulation predicts changes in BMI over time. In a longitudinal study conducted by Graziano, Calkins, and Keane (2010), it was found that 57 toddlers with poorer emotion regulation at 2 years of age were more likely to be found to be overweight/obese

at 5 years. Harrist et al. (2013) found similar results using a sample of 782 rural second graders, in which increases in external and emotional eating from second to third grade were associated with higher BMI.

Cross sectional studies have revealed a significant link between emotional regulation and risk and protective factors associated with increased BMI. Isasi, Ostrovsky, and Wills (2013) found that there was a significant positive relationship between emotional regulation and higher fruit/vegetable intake and greater physical activity. In addition, lower emotion regulation was linked to higher depressive symptoms in girls, which subsequently related to unhealthier lifestyle patterns. A mechanism explaining the relationship between emotion regulation and unhealthy lifestyle behaviors that may lead to obesity is that those with poor regulation of negative emotions may turn to food for comfort, increasing caloric intake, and thus increasing chances of obesity and/or higher BMI. Similarly, those with poor emotion regulation are more likely to partake in sedentary behaviors, such as watching television, as a coping method to deal with negative emotions. Similar to emotional eating, this increased sedentary behavior, becomes a risk factor for higher BMI or increased risk of obesity.

### **Sociability**

No existing studies have specifically analyzed sociability in relation to BMI changes. However, previous research has examined the role of social competence, a closely related construct, in relation to BMI. Social competence can be operationally defined as child skills and ability to obtain desired social status and outcomes (Jackson & Cunningham, 2015). The mechanisms underlying



the relationship between social competence and BMI are based on the role of social competence as a protective factor against weight gain. Those with higher social competence are at a lower risk for other obesogenic behaviors, such as being sedentary and emotional eating, due to higher interest and capability of interactions with others. Another possible mechanism is that youth with higher social competence are more attuned to peer and societal cues about ideal body type. A longitudinal study conducted by Jackson and Cunningham (2015) has shown that among normal weight children, having high social competence in third grade is linked to lower likelihood of developing obesity or being overweight in fifth grade. In addition, among obese children, having high social competence in third grade was linked to higher likelihood of losing weight between third and fifth grade, and having lower social competence in third grade was linked to increased weight gain. The limited research on sociability as a predictor of BMI indicates less support for this relation. The present study aims to further explore the role of sociability as a predictor of BMI.

### **Parenting Style**

Previous research has revealed a strong relationship between parenting styles and child BMI, in which certain parenting styles is associated with higher BMI. The parenting styles discussed in the present study are classic parenting styles outlined by Baumrind (1991). Baumrind (1971) described parenting styles to either be 1) authoritative, 2) authoritarian, 3) permissive and 4) neglectful. Taking one step forward, Maccoby and Martin (1983) characterized each

parenting style by varying degrees of two dimensions: 1) demandingness for self-control and maturity and 2) sensitivity and emotional involvement.

An authoritative parenting style is characterized by high sensitivity and high demand for self-control. An authoritative parent has high demands for their children for appropriate self-control and maturity, however also displays high sensitivity and emotional warmth. The authoritative parenting style is considered the most ideal parenting style and has been associated with highly beneficial child outcomes, such as better academic achievement, increased self-regulation, and lower psychosocial problems, and better psychological outcomes (Baumrind, 1991; Steinberg, Dornbusch, & Brown, 1992). An authoritarian parenting style is characterized by low sensitivity and high demand for self-control. Similar to the authoritative parent, an authoritarian parent has high demands for their children for appropriate self-control and maturity, however, are insensitive to the child's needs and provide minimal emotional support. The authoritarian parenting style is linked with poorer child outcomes such as lower academic achievement compared to the authoritative parenting style (Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987). A permissive parenting style is characterized by high sensitivity and low demands for self-control. Similar to the authoritative parenting style, the parent is emotionally warm and sensitive, however, the parent provides low discipline and has low expectations of appropriate self-control. Children raised with permissive parenting style tend to have less self-control compared to authoritarian and authoritative parenting styles (Frankel et al., 2012). Lastly, neglectful parenting style is characterized by low sensitivity and low

demandingness. In this parenting style, the parent is highly uninvolved and does not set any rules. Neglectful parenting style has been linked to harmful child outcomes, such as poor academic performance, high depressive symptoms, and high psychosocial problems (Aunola, Stattin, & Nurmi, 2000; Lamborn, Mounts, Steinberg, & Dornbusch, 1991).

Parenting styles have been significantly predictive of lower BMI or obesity. Parenting styles have been studied as a protective factor in relation to child BMI and child weight gain by deterring extra weight gain, especially through poor eating habits and low physical activity. For example, parental warmth and sensitivity serve as a protective factor during children's development, allowing for better emotion regulation and self regulatory behavior, which allows for lower caloric intake and decreased BMI (Rhee, Lumeng, Appugliese, Kaciroti, & Bradley 2006). On the contrary, low sensitivity and low parental warmth may serve as a risk factor, as children may compensate for such comfort through emotional eating (Fuemmeler et al., 2012).

Three longitudinal studies have examined the relationship between parenting styles and BMI and obesity. Results consistently revealed that for all three longitudinal studies, authoritarian parenting style predicts higher BMI or obesity, whereas authoritative parenting style predicts lower BMI and lower levels of obesity. Permissive and neglectful parenting styles predict BMIs and obesity statuses that are intermediate between authoritative and authoritarian parenting styles (Rhee et al., 2006; Fuemmeler et al, 2012; Berge, Wall, Loth, & Neumark-Sztainer, 2010). This research has been conducted on various age

groups, including how parenting styles at 4.5 years determine child BMI in first grade (Rhee et al., 2006), an adolescent cohort with an age span from 12-26 years (Fuemmeler et al., 2012), and another adolescent cohort in which parenting style information was collected at 12 years with a 5 year follow up on child BMI at age 17 (Berge et al., 2010).

### **Child Temperament and Parenting Style**

Very little research has examined the interactive effects of child temperament and parenting styles on child BMI. From existing research conducted solely on either child temperament or parenting styles, it is well established that better child temperament and warm and sensitive parenting styles serve as significant protective factors against child BMI. However, there is a gap in the literature in understanding how the protective aspects of child temperament (which includes better emotion regulation, high sociability, higher activity, and lower impulsivity) and the protective aspects of parenting styles (which includes high parental warmth and sensitivity) interact with one another in predicting child BMI. An interesting question that still needs to be addressed is how either child temperament or parenting style can serve as a protective factor of child BMI if one of the two is lacking (i.e. having a parenting style that is low in warmth and sensitivity combined with the protective aspects of child temperament). Another area that has not been studied in the literature is understanding the joint, most likely exacerbating, effects of a child temperament reflective of risk factors (i.e. low emotion regulation, low sociability, lower activity, and higher impulsivity) AND poor parenting style (i.e. low sensitivity and low parental warmth) on child

BMI. These are all gaps in the literature which are crucial to investigate since child temperament and parenting styles coexist and interact with each other throughout a child's development. One possible mechanism that explains the exacerbating role of poor parenting styles in conjunction with average or difficult temperaments is that children of controlling parents, as seen in authoritarian parenting, may be linked to higher child BMI or obesity since such high control may result in the undermining of developing self regulatory skills (Fuemmeler et al., 2012).

Only one cross sectional study and one longitudinal study have examined the joint effects of child temperament and parenting style in predicting child BMI or child obesity. Results have consistently revealed that parents who are less sensitive and demonstrate lower warmth (characteristics of an authoritarian parenting style) in combination with difficult child temperament was associated with increased BMI and weight gain, compared to other temperament and parenting style combinations. Zeller, Boles, & Reiter-Purtill (2008) investigated the interaction effects of parenting style and child temperament using a clinical sample of 77 obese youth ranging from 8-16 years old ( $M=12$ ). Comparison youth were included in the study, which were the obese youth's classmates, matched on gender, race, and age. Mothers rated their child's temperament based on ten aspects, including activity, mood, and attention control. Mothers provided self-reports of their parenting styles, reflecting their behavioral control and warmth. Results indicated that mothers of obese youth reported their children as having a more difficult temperament and rated themselves as having a parenting style

lower in behavioral control, when compared to the non-obese youth. Perhaps, the most interesting finding is that the interaction of low maternal warmth and difficult child temperament was associated with increased obesity. Thus, a parenting style similar to authoritarian and neglectful parenting styles, in combination with a child temperament reflective of lower emotionality and lower activity/impulsivity, seemed to be associated with increased obesity.

The results reflected in Zeller et al. (2008) were found consistent in a longitudinal study conducted with the same research question. Wu, Dixon, Dalton, Tudiver, and Liu (2011) conducted a longitudinal study analyzing the joint effects of maternal sensitivity and child temperament in predicting childhood obesity. Infant temperament was assessed at 6 months using a maternal report. Several dimensions of child temperament were analyzed, including approach, activity, and mood and were categorized easy, average, and difficult. Maternal sensitivity was assessed by research assistants in semi structured interviews and were categorized into two groups: insensitive and sensitive. Results were consistent with Zeller et al (2008) in that insensitive parenting style was the most significant predictor of obesity and overweight status in children. Children with insensitive mothers, combined with an average or difficult temperament, had the highest risk of obesity compared to sensitive mothers and an easy temperament. Therefore, results from this longitudinal study follow a consistent pattern that an authoritarian parenting style, in combination with difficult child temperament, yield higher BMI and weight gain.

### **Rationale and Statement of Research Questions and Hypotheses**

Given the serious short- and long-term implications of child overweight and obesity, it is extremely important to examine associated risk factors that may contribute to these statuses. Although past literature has reviewed the associations between child temperament and parenting styles in predicting pediatric obesity and BMI changes, the literature is still limited, especially in its analysis of studying multiple dimensions of temperament within a single study as predictors. In addition, previous research is even more limited in examining the interaction between child temperament and parenting style in predicting BMI. The present study seeks to address these gaps in the literature by investigating the following hypotheses:

Hypothesis I. Child temperament will be longitudinally predictive of higher BMI two years later. Specifically, child temperament reflective of negative emotionality or low emotion regulation, low levels of activity, low sociability, and high impulsivity will have higher levels of BMI.

Hypothesis II. Parenting style will be longitudinally predictive of higher BMI two years later. Specifically, authoritarian parenting styles will be predictive of higher levels of BMI, and authoritative parenting styles will be predictive of lower levels of BMI.

Research Question 1. The interaction effects of child temperament and parenting style will be longitudinally predictive of higher BMI. Due to the exploratory nature of this hypothesis, specific hypotheses cannot be made. The general prediction is that authoritarian parenting style combined with dimensions

of child temperament that include negative emotionality or low emotion regulation, low levels of activity, low sociability, and high impulsivity will be predictive of higher levels of BMI, and authoritative parenting style with protective dimensions of temperament (positive emotionality or high emotion regulation, high levels of activity, high sociability, and low impulsivity) will be predictive of lower levels of BMI.

## **Method**

### **Participants**

The current study analyzed secondary data collected from the first two waves of the Welfare, Children, and Families: A Three-City Study (Winston et al., 1999). The Three-City Study is a longitudinal, multi-method study, which aimed to examine low income children and families' well-being in the post welfare era. It utilized a household based, stratified random sample, which included 2,402 children and their primary caregiver in three low-income neighborhoods in Boston, Chicago, and San Antonio. The families were randomly selected from more than 40,000 screened households, in which the response rate was 90%. Families were eligible to participate in the study if they had an income below 200% of the poverty line, had a child 0–4 years or 10–14 years old, and were of White, African American, or Latino ethnicity. The first in-home questionnaire, considered to be Wave 1 data collection, was administered to children and primary caregivers in 1999. The response rate for Wave I was 82%. The second in-home questionnaire, considered to be Wave 2 data collection, was administered to children and primary caregivers 16 months later in 2000–2001



and included the same questions administered in Wave 1 with a few slight changes. The response rate for Wave II was 88%. Participants used for the present study were those with accessible information from the public The Three-City Study database. The database provides interview information for 652 children and 313 primary caregivers.

Children included in the present study were from the 0–4 years old subset. Children in Wave 1 included 299 girls (45.9%) and 353 boys (54.1%) ranging from 1-4 years ( $M = 3.18$ ,  $SD = .88$ ). Children in Wave 2 included 273 girls (53.7%) and 316 boys (46.3%) ranging from 2 to 6 years of age ( $M = 4.50$ ,  $SD = .93$ ).

Primary Caregivers in Wave 1 included 100% women ranging from 15-74 years of age ( $M = 32.79$ ,  $SD = 9.9$ ). Primary Caregivers in Wave 2 was composed of 99.8% women and 0.2% men ranging from 16 to 75 years of age ( $M = 34.35$ ,  $SD = 9.9$ ). Among children reporting ethnicity, 42% reported African American, 6% reported White (Non-Hispanic), and 47% reported Latino. The distribution of the participants across the three cities was mostly equal, with 33% of the participants recruited from Boston ( $SD = .47$ ), 32% from Chicago ( $SD = .47$ ), and 35% from San Antonio ( $SD = .48$ ).

### **Procedure**

The Three City Study interviewed participants at three separate waves from 1991 to 2006. A wide range of questions regarding children and their primary caregivers' physical and mental health, behavioral, and socioemotional development were assessed in the in-home questionnaire. The interview was

completed in approximately two hours, depending on the age and experience of participants. Interviewers read questions aloud from the questionnaire to the participants, and all corresponding answers were then recorded into a laptop computer. Procedures for in-home interview data collection were the same for both Wave 1 and Wave 2.

The current study specifically investigated items from the Wave 1 and Wave 2 in-home interviews retrieved from the Three City Study public database. These items were utilized to conduct analyses to test the hypotheses and research questions of interest. The predictor variables were child temperament and parenting styles, and the outcome variable is BMI.

### **Measures**

**Child temperament.** Child temperament was measured by examining 20 items from the Emotional, Activity, Sociability, and Impulsivity (EASI) Temperament Survey (Buss & Plomin, 1984). The EASI Temperament Survey assesses four aspects of children's temperament: emotionality, activity, sociability, and impulsivity, and is used to assess participants' social inclinations, emotional characteristics, and related personality traits. It was completed by the primary caregiver. Sample items include: (1) "[CHILD] gets upset easily"; (2) "[CHILD] is always on the go"; (3) "[CHILD] likes to be with others" and (4) "[CHILD] tends to be impulsive." Items have a 5-point response scale, and responses include 1 = *never like this child*, 2 = *rarely like this child*, 3 = *sometimes like this child*, 4 = *often like this child*, or 5 = *always like this child*. Pre-calculated composite scores were provided for each of these four aspects of child

temperament, in which activity and impulsivity were combined as a single composite score. Each composite score was calculated by averaging the corresponding items that characterize each type of aspect of child temperament. There were five items on each of the sociability and emotionality scales. There were ten items on the combined activity and impulsivity scale.

**Parenting style.** Parenting style was measured using by examining 20 items from the Parenting Style Questionnaire, a questionnaire designed and created specifically for the Three City Study. The items assessed the three parenting styles outlined by Baumrind (1991): authoritative, authoritarian, and permissive. Items were answered by the primary caregiver. Sample items include: (1) “I say something positive to [CHILD] when [he/she] does something I like” and (2) I let [CHILD] decide what [his/her] daily schedule will be.’ Items have a 4-point response scale, and responses include 1 = *definitely true*, 2 = *sort of true*, 3 = *sort of false*, or 4 = *definitely false*. Pre-calculated composite scores were provided for each of these three types of parenting styles. Each composite score was calculated by averaging the corresponding items that characterize each type of parenting style. There were 20 items on the parenting style scale.

**BMI.** BMI was measured by the calculated BMI score included in the dataset for each child. Interviewers obtained child weight and height during the in-home data collection and the calculated BMI was based on the attained weight and height for each child. Specifically, the equation used was: [(weight in pounds / height in inches squared)] \* 703. These scores are raw BMIs based on body

mass index in pounds per inches squared, which were converted into percentiles for age and gender

## **Results**

### **Overview**

The goal of the current study was to investigate the interrelationships between child temperament, parenting styles, and BMI. The moderating effects of parenting style on child temperament were examined, as well. First, preliminary analyses were conducted to determine means and standard deviations in all study variables. Correlations were conducted to test the associations between Wave 1 BMI, child gender, and child sex with the outcome variable, Wave 2 BMI and a one-way ANOVA was tested to test the effect of ethnicity Wave 2 BMI. Second, three hierarchical multiple regression analyses examined relations between Wave 1 dimensions of child temperament (emotionality, activity/impulsivity, and sociability) and Wave 2 BMI. Third, three hierarchical multiple regression analyses investigated relations between Wave 1 parenting style (authoritarian, authoritative, and permissive) and Wave 2 BMI. Fourth, hierarchical multiple regression analyses were used to test the interaction of the three dimensions of child temperament and the three dimensions of parenting style on the outcome of Wave 2 BMI. All regression analyses controlled for gender, age, and Wave 1 BMI.

### **Preliminary Analyses**

Preliminary analyses were conducted to first examine the means and standard deviations in all study variables at Wave 1 and Wave 2, which are

reported in Table 1. Correlations were conducted to test the association between child temperament, parenting style, covariates and Wave 2 BMI, which is reported in Table 2. Significant correlations were found between child age and Wave 2 BMI, child gender and Wave 2 BMI, and Wave 1 BMI and Wave 2 BMI. Because significant correlations were found, these variables were controlled for in all regression analyses.

A one-way ANOVA was conducted to determine ethnic differences on Wave 2 child BMI. No significant ethnic differences were found,  $f(3, 1043) = .590, p > .05$

Table 1

*Descriptive Statistics on Study Variables at Wave 1 and Wave 2*

	<i>M</i>	<i>SD</i>	<i>Range</i>
<i>Wave 1</i>			
Child Temperament			1-5
Emotionality	3.04	0.98	
Impulsivity/Activity	3.32	0.76	
Sociability	4.37	0.80	
Parenting Style			1-4
Authoritarian	2.48	1.09	
Authoritative	3.33	0.64	
Permissive	1.93	0.62	
Child BMI	18.10	5.21	
<i>Wave 2</i>			
Child Temperament			1-5
Emotionality	2.83	0.90	
Impulsivity/Activity	3.13	0.76	
Sociability	4.37	0.76	
Parenting Style			1-4
Authoritarian	2.21	0.98	
Authoritative	1.50	0.43	
Permissive	3.16	0.57	
Child BMI	17.72	4.47	

Table 2

*Intercorrelations Among Child Temperament, Covariates, and Parenting Style and Wave 2 BMI*

Variables	1	2	3	4	5	6	7	8	9	10
1. Wave 1 Body Mass Index	1.000									
2. Wave 1 Child's age (in years)	-0.153 **	1.000								
3. Child Gender	-0.014	0.014	1.000							
4. Wave 1 Emotionality	-0.049	-0.032	0.040	1.000						
5. Wave 1 Impulsivity/Activity	0.024	-0.092 *	-0.062	0.559 **	1.000					
6. Wave 1 Sociability	-0.018	0.055	-0.035	-0.097 *	0.051	1.000				
7. Wave 1 Authoritarian Parenting	0.014	0.289 **	-0.045	0.042	0.131 **	0.035	1.000			
8. Wave 1 Authoritative Parenting	-0.079 *	0.444 **	-0.016	-0.086 *	-0.048	0.097 *	0.333 **	1.000		
9. Wave 1 Permissive Parenting	-0.024	-0.045	0.010	0.048	0.109 *	0.060	0.028	0.034	1.000	
10. Wave 2 Body Mass Index	0.110 **	-0.125 **	-0.067 *	0.008	0.014	0.000	-0.101 **	-0.083 **	-0.041	1.000

*Note.* \* $p < .05$ ; \*\* $p < .01$

**Hypothesis I:** *Wave 1 child temperament (child emotionality, child impulsivity/activity, and child sociability) will be predictive of Wave 2 BMI.*

Hypothesis I predicted a relationship between the four different dimensions of child temperament at Wave 1 and child BMI at Wave 2. Specifically, it was predicted that higher child emotionality, lower impulsivity, higher activity, and higher child sociability would be predictive of lower BMI. Three separate linear regressions were used to test each of these dimensions of child temperament as a significant predictor of Wave 2 BMI. The first block included the covariates (gender, Wave 1 BMI, and age), and the second block included the primary predictor of emotionality, impulsivity/activity, and sociability. Wave 1 emotionality did not significantly predict Wave 2 BMI ( $b = -.186, p = .761$ ). Wave 1 impulsivity/activity did not significantly predict Wave 2 BMI ( $b = -.008, p = .855$ ). Wave 1 sociability did not significantly predict Wave 2 BMI ( $b = -.004, p = .922$ ). See Table 3. Examining the emotionality model, Wave 1 BMI significantly predicted Wave 2 BMI, in which higher Wave 1 BMI predicted higher Wave 2 BMI ( $b = .194, p = .000$ ). Similar results were found in

the impulsivity/activity model ( $b = .194, p = .000$ ) and sociability model ( $b = .193, p = .000$ ).

**Hypothesis II:** *Wave 1 parenting style (authoritarian, authoritative and permissive) will be predictive of Wave 2 BMI.*

Hypothesis II predicted a relationship between the three different dimensions of parenting styles at Wave 1 and child BMI at Wave 2. Specifically, it was predicted that authoritarian parenting styles would be predictive of higher levels of BMI, whereas authoritative parenting styles would be predictive of lower levels of BMI. In addition, permissive parenting styles would be predictive of lower levels of BMI than authoritarian parenting style, but higher levels than authoritative style. Three separate linear regressions were used to test each of the dimensions of parenting styles as a significant predictor of Wave 2 BMI. The first block included the covariates (gender, Wave 1 BMI, and age), and the second block included the primary predictor of authoritarian, authoritative, and permissive parenting style. Wave 1 authoritarian parenting style significantly predicted Wave 2 BMI ( $b = -.085, p = .010$ ), in which higher authoritarian parenting style predicted lower BMI. Wave 1 authoritative parenting style did not significantly predict Wave 2 BMI ( $b = -.041, p = .249$ ). Wave 1 permissive parenting style did not significantly predict Wave 2 BMI ( $b = -.043, p = .172$ ). See Table 4. Examining the authoritarian model, Wave 1 BMI significantly predicted Wave 2 BMI, in which higher Wave 1 BMI predicted higher Wave 2 BMI ( $b = .107, p = .001$ ). Similar results were found in the authoritative model ( $b = .098, p = .002$ ) and permissive model ( $b = .101, p = .002$ ). Additionally, in the

authoritarian model, gender significantly predicted Wave 2 BMI, in which boys were significantly linked to higher BMI ( $b = -.071, p = .023$ ). Similar results were found in the authoritative model ( $b = -.064, p = .043$ ) and permissive model ( $b = -.064, p = .042$ ). Moreover, in the authoritarian model, child age significantly predicted Wave 2 BMI, in which younger children were significantly related to higher BMI ( $b = .070, p = .036$ ). Similar results were found in the authoritative model ( $b = -.079, p = .026$ ) and permissive model ( $b = -.095, p = .003$ ).

Table 3

*Hierarchical Multiple Regressions Analyses Predicting Wave 2 Child BMI from Wave 1 Child Temperament*

<i>Predictor</i>	<i>Emotionality</i>		<i>Impulsivity/Activity</i>		<i>Sociability</i>	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	.03		.03		.03	
Gender		-.069		-.069		-.069
Age		.033		.032		.033
Wave 1 BMI		.194 **		.194 **		.193 **
Step 2	.03		.03		.03	
Emotionality		.013				
Impulsivity/Activity				-.008		
Sociability						-.004
Total $R^2$	.06		.06		.06	

Note. \*  $p < .05$ , \*\*  $p < .01$ . Beta's used in Step 1 were from the second block

Table 4

*Hierarchical Multiple Regressions Analyses Predicting Wave 2 Child BMI from Wave 1 Parenting Style*

<i>Predictor</i>	<i>Authoritarian</i>		<i>Authoritative</i>		<i>Permissive</i>	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	.02		.02		.02	
Gender		-.071 *		-.064 *		-.064 *
Age		-.070 *		-.079 *		-.095 **
Wave 1 BMI		.107 **		.098 **		.101 **
Step 2	.02		.02		.02	
Authoritarian		-.082*				
Authoritative				-.041		
Permissive						-.047
Total $R^2$	.04		.04		.04	

Note. \*  $p < .05$ , \*\*  $p < .01$ . Beta's used in Step 1 were from the second block



**Hypothesis III:** *Wave 1 child temperament (child emotionality, child impulsivity/activity, and child sociability) will be predictive of Wave 2 BMI, moderated by Wave 1 parenting style (authoritarian, authoritative, and permissive)*

Hypothesis III served as an exploratory aspect of the present study, in which it was predicted that the interaction between the four different dimensions of child temperament and the three different dimensions of parenting style would be predictive of Wave 2 BMI. Specifically, it was predicted that that difficult child temperament, in particular low emotionality, in combination with authoritarian parenting style will yield higher BMI.

The first block included covariates, which consisted of gender, Wave 1 BMI, and child age. The second block included the main effect of the specific Wave 1 child temperament dimension and the specific Wave 2 parenting style dimension (e.g. emotionality and authoritarian parenting style). The third block included the created interaction term of the specific child temperament dimension and the specific parenting style dimension, which was the product of the two predictor variables (e.g. emotionality X authoritarian parenting style). Nine interaction terms were created:

- Wave 1 emotionality X Wave 1 authoritarian parenting style
- Wave 1 emotionality X Wave 1 authoritative parenting style
- Wave 1 emotionality X Wave 1 permissive parenting style
- Wave 1 activity/impulsivity X Wave 1 authoritarian parenting style
- Wave 1 activity/impulsivity X Wave 1 authoritative parenting style

- Wave 1 activity/impulsivity X Wave 1 permissive parenting style
- Wave 1 sociability X Wave 1 authoritarian parenting style
- Wave 1 sociability X Wave 1 authoritative parenting style
- Wave 1 sociability X Wave 1 permissive parenting style

None of the interaction terms were predictive of Wave 2 BMI, which is reported in Table 5, 6, and 7. Thus, findings suggest that Wave 1 parenting style does not moderate the relation between Wave 1 child temperament and Wave 2 BMI.

Table 5

*Hierarchical Multiple Regressions Analyses Predicting Wave 2 Child BMI from Emotionality and Parenting Style Interactions*

Predictor	Emotionality/ Authoritarian		Emotionality/ Authoritative		Emotionality/ Permissive	
	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>
Step 1						
Gender	-.076	.078	-.072	.098	-.070	.105
Age	.024	.580	.035	.441	.029	.506
Wave 1 BMI	.194	.000 **	.191	.000 **	.196	.000 **
Step 2						
Emotionality	.106	.380	.433	.309	.080	.582
Parenting Style	-.018	.900	.124	.432	.013	.927
Step 3						
Interaction	-.142	.440	-.440	.320	-.096	.638

Note. \*  $p < .05$ , \*\*  $p < .01$ . Beta's used in Step 1 and Step 2 were from the third block

Table 6

*Hierarchical Multiple Regressions Analyses Predicting Wave 2 Child BMI from Impulsivity/Activity and Parenting Style Interactions*

Predictor	Impulsivity & Activity/ Authoritarian		Impulsivity & Activity/ Authoritative		Impulsivity & Activity/ Permissive	
	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>
Step 1						
Gender	-.075	.086	-.071	.105	-.072	.099
Age	.023	.596	.038	.411	.029	.513
Wave 1 BMI	.192	.000 **	.188	.000 **	.194	.000 **
Step 2						
Impulsivity/Activity	.034	.771	.557	.205	.102	.490
Parenting Style	-.077	.687	.238	.260	.096	.636
Step 3						
Interaction	-.056	.807	-.618	.198	-.193	.457

Note. \*  $p < .05$ , \*\*  $p < .01$ . Beta's used in Step 1 and Step 2 were from the third block

Table 7

*Hierarchical Multiple Regressions Analyses Predicting Wave 2 Child BMI from Sociability and Parenting Style Interactions*

Predictor	Sociability/ Authoritarian		Sociability/ Authoritative		Sociability/ Permissive	
	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>
Step 1						
Gender	-.076	.081	-.071	.103	-.074	.089
Age	.028	.521	.037	.422	.025	.578
Wave 1 BMI	.191	.000 **	.189	.000 **	.197	.000 **
Step 2						
Sociability	-.174	.154	.076	.846	.217	.142
Parenting Style	-.481	.045 *	.021	.928	.335	.187
Step 3						
Interaction	.412	.126	-.098	.836	-.459	.122

*Note.* \*  $p < .05$ , \*\*  $p < .01$ . Beta's used in Step 1 and Step 2 were from the third block

## Discussion

The present study examined the role of child temperament and parenting styles in longitudinally predicting child BMI. In addition, the current study also investigated the interacting effects between child temperament and parenting styles in longitudinally predicting child BMI. The study was designed to address the current gap in the literature concerning the longitudinal effects of child temperament and parenting styles. A dimensional model was used in the present study where four dimensions of child temperament (emotionality, impulsivity, activity, and impulsivity) were each separately analyzed as a predictor of child BMI. Likewise, three dimensions of parenting styles (authoritarian, authoritative, and permissive) were each separated analyzed as a predictor of child BMI. Lastly, the current study included a novel component by longitudinally examining the

interaction effects between each of the dimensions of both child temperament and parenting styles in relation to child BMI.

### **Major Findings**

It was hypothesized that each of the four dimensions of child temperament (emotionality, impulsivity, activity, and sociability) would separately and longitudinally predict child BMI. Findings from the current study failed to support this hypothesis, in which higher emotionality, lower impulsivity, higher activity, and lower sociability did not separately predict lower BMI. It was also hypothesized that each of the three dimensions of parenting styles (authoritarian, authoritative, and permissive) would separately and longitudinally predict child BMI. Specifically, it was hypothesized that authoritarian parenting styles will be predictive of higher levels of BMI, and authoritative parenting styles will be predictive of lower levels of BMI. The current study failed to support a direct relationship between authoritative and permissive parenting styles and child BMI. A significant relationship was found between authoritarian parenting style and child BMI, but in the contrary direction in which higher authoritarian parenting style was significantly predictive of lower BMI. Lastly, the current study hypothesized significant interaction effects between each dimension of child temperament and parenting style in longitudinally predicting child BMI. The present study failed to support this hypothesis, in which findings do not suggest a direct relationship between each of the nine child temperament/parenting style interactions and child BMI.

Several significant correlations were found among Wave 1 child temperament, Wave 2 parenting style, and Wave 2 BMI. Findings revealed a significant inverse correlation between Wave 1 authoritative parenting style and Wave 2 BMI. In addition, a direct correlation was found between Wave 1 impulsivity/activity and emotionality, as well as Wave 1 sociability and Wave 1 emotionality. Moreover, authoritative and authoritarian parenting styles were extremely correlated with each other in a direct relationship. Lastly, authoritarian parenting style was directly correlated with impulsivity. Authoritative parenting style was inversely correlated with emotionality, but was directly correlated with sociability.

### **Parenting Style and BMI**

Although the current study did not find significant relations between authoritative and permissive parenting styles and child BMI, there was an inverse correlation between authoritarian parenting style and child BMI, suggesting that increased authoritarian parenting style was associated with lower child BMI. In addition, authoritarian parenting style was significantly associated with child BMI. However, contrary to the current literature, the present study found that authoritarian parenting style was inversely related to child BMI, in which higher authoritarian parenting style was predictive of lower BMI. Thus far, three longitudinal studies have investigated the role of parenting style on child BMI across different ages of childhood and adolescence. These studies have consistently found that authoritarian parenting style is predictive of higher BMI, compared to authoritative and permissive parenting styles (Rhee et al., 2006;

Fuemmeler et al, 2012; Berge et al., 2010). The mechanisms underlying the relation between parenting style and child BMI is that the low sensitivity and low parental warmth exhibited in authoritarian parenting style may serve as a risk factor, causing the child to emotionally eat to compensate for such comfort (Fuemmeler et al., 2012). Thus, the present study presents contradictory findings to the current literature on parenting style and child BMI.

One possible explanation for divergent findings can be found in the present study's sample of low income, ethnic minority children. Unlike past research which generally includes a nationally representative or Caucasian majority sample of children, the present study has a dominantly African American and Hispanic sample of children. This provokes an interesting discussion of the relation between child ethnicity and parenting style. Although Baumrind (1991) laid out a solid foundation of the relation between parenting style and child outcomes, in which authoritarian parenting style generally engenders poor child outcomes, the current literature provides inconsistent results on how authoritarian parenting style affects child outcomes among ethnic minority children. This is particularly true for African American children where it has been found that authoritarian parenting may produce better child outcomes compared to authoritative and permissive parenting styles. For example, Deater-Deckard, Dodge, Bates, and Pettit (1996) examined the interrelations between ethnicity, parenting style, and child externalizing behavior across a sample of nationally representative children in low income kindergarten, first, second, and third grade. Interestingly, Deater-Deckard et al. (1996) found that parents' physical

disciplinary strategies predicted higher externalizing behavior among Caucasians, but not in African Americans. In fact, authoritarian parenting style was related to lower aggression and externalizing behavior among African Americans. These results have been found longitudinally, as well (Lansford, Deater-Deckard, Dodge, Bates, and Pettit, 2004).

The mechanism involved for explaining such findings, including the present study, may be that authoritarian parenting style, as defined by high parental control and low sensitivity, differs from the authoritarian parenting style that ethnic minority, in particular African American youth, experience. Past research has shown that while African American parents embrace a “no-nonsense” parenting style which includes high levels of parental control and harshness, but also high levels of parental affection (Tamis-LeMonda, Briggs, McClowry, & Snow, 2008). This unique parenting style that is defined by high levels of parental control and harshness, coupled with high levels of parental affection, is often exhibited by ethnic minority parents and may serve as a protective factor for low income ethnic minority children. Due to their low socioeconomic status, ethnic minority children may face adverse conditions, such as high levels of crime and substance abuse, and having higher levels of parental control, coupled with parental affection, may protect the implications of living in adverse conditions (Tamis-Lemonda et al., 2008; Lansford et al., 2004; Deater-Deckard et al., 1996). The current study provided evidence of this parenting style through extremely strong, direct correlation seen between authoritarian and authoritative parenting style. This finding, combined by the longitudinal, inverse

correlation between authoritative parenting style and child BMI, proposes an interplay between authoritative parenting style and authoritarian parenting style in decreasing child BMI two years later. While low income, ethnic minority children may face adverse health outcomes, such as less availability to vegetables and fruits and high sedentary behavior (Dawson et al. 2014), high levels of parental control contributed from authoritarian parenting style, coupled with high levels of parental affection consistent with the authoritative parenting style, may serve as a protective factor in that ethnic minority children may be “affectionately forced” to locate and select healthy eating choices and participate in less sedentary behaviors.

### **Temperament and BMI**

The present study failed to support direct relations between the multidimensional framework of child temperament (emotionality, impulsivity, activity, and sociability) and child BMI. Unlike past research that has used a multidimensional approach to child temperament in analyzing the relation between child temperament and BMI, no dimensions of child temperament in the present study were predictive of child BMI. This is contrary to the existing literature as previous studies have shown that when using a multidimensional framework of child temperament to predict child BMI, there are usually at least one or two dimensions that significantly predict child BMI (Agras et al., 2004; Faith & Hittner, 2010; Haycraft et al., 2011; Pulkki-Raback et al., 2005). However, despite the lack of significant findings, the present study’s model is unique in the literature as it is one of the first models to specifically include



emotionality, activity, impulsivity, and activity all as dimensions of child temperament in predicting child BMI. Previous studies have used similar dimensions of child temperament to predict child BMI (Agras et al., 2004; Faith & Hittner, 2010; Pulkki-Raback et al., 2005), but the current study is one of the first to include emotionality, sociability, impulsivity, and activity all as dimensions to predict BMI. This is a key component of the present study as it contributes to the literature by using a dimensional approach to capture child temperament versus a categorical approach. Using a dimensional approach allows researchers to witness the separate effects of each dimension of child temperament on child BMI. However, findings from the present study revealed significant correlations among the different dimensions of child temperament. Specifically, it was found that Time 1 impulsivity was directly correlated with Time 1 emotionality. In addition, Time 1 sociability was directly correlated with Time 1 emotionality. These direct and significant correlations among the different dimensions of child temperament reveal that the various dimensions of child temperament overlap and are intertwined with each other. Thus, these findings show that the dimensional approach of child temperament may not be the best approach in predicting child BMI since the dimensions may have interacting effects with each other, which is restricted by the dimensional approach. A categorical approach may serve as a better model of child temperament since it allows for the combined effects of each dimension of child temperament in predicting child BMI. In summary, no significant findings between the multidimensional approach of child temperament and child BMI were found.

However, significant correlations were found among the different dimensions of child temperament, suggesting that the categorical approach may be a more appropriate model of child temperament in predicting child BMI. Further research should continue to investigate child BMI using both the present multidimensional model and categorical model of child temperament to better understand the effects of child temperament on child BMI, as well as evaluating the strengths and weaknesses of both models.

### **Child Temperament, Parenting Style, and BMI**

The third hypothesis that there would be interaction effects between each of the four dimensions of child temperament and each of the three dimensions of parenting styles in predicting child BMI was not supported. This third hypothesis served as an exploratory component of the present study as there is extremely limited research on interacting effects between child temperament and parenting styles in predicting child BMI. Only one cross sectional and one longitudinal study has been conducted revealing that children with difficult child temperament and insensitive mothers have higher BMI (Wu et al., 2011; Zeller et al. 2008). Although the present study failed to produce similar and significant findings, this is one of the first studies that has used a dimensional approach of child temperament and parenting styles in examining joint effects. Findings suggest that when examining the interacting effects between child temperament and parenting styles in relation to child BMI it may be better to use a categorical approach versus a dimension approach because the multidimensional model restricts multiple, interacting effects among the various dimensions of child temperament

and parenting style. This is supported by the significant correlations seen between various dimensions of child temperament and parenting style in the present study. Specifically, it was found that authoritarian parenting style and impulsivity/activity were directly correlated with each other, suggesting that increased authoritarian parenting style is associated with increased impulsivity and activity. At the same time, findings revealed that authoritative parenting style was inversely correlated with emotionality, suggesting that increased authoritative parenting is associated with lower emotionality and higher sociability. These findings show that different aspects of child temperament may respond to different aspects of parenting style. A multidimensional model of child temperament and parenting style may show specific interactions of the two in predicting child BMI, but a categorical approach may be better since it will allow for the additive effects of multiple interactions among the different dimensions of child temperament and parenting style.

Though there were no significant findings and findings may show stronger evidence for a categorical approach instead of the present's study multidimensional approach the present study provided new contributions to the literature. For example, the current study presents a sample of children between 2-6 years old, which is an original contribution to the literature as Wu et al. (2011) encompassed a sample of infants that were 6 months old and Zeller et al. (2008) comprised children between the ages of 8-16 years old. In addition, the current study contributes to the very limited, existing literature on non-clinical samples as Zeller et al. (2008) was based on a clinical sample of obese children. Therefore,

although the third hypothesis was not supported in the present study and provides further evidence for a categorical approach in analyzing the interacting effects of child temperament and parenting style in predicting child BMI, its contributions include providing novel aspects in methodology to the current literature.

### **Implications**

The present study's primary finding that authoritarian parenting style is significantly related to child BMI has several clinical implications. Clinical implications of the current study suggest that educators, physicians, and nutritionists, should be ethnically and culturally sensitive when providing parents information on child-raising, specifically when providing information on the prevention or reduction of child obesity. Previous research has shown that when an obesity prevention program is culturally adapted it has better outcomes, such as improved health behaviors, greater participant satisfaction, and scoring a higher comprehensive rank (Bender, Clark, & Gahagan, 2014; Bender, Nader, Kennedy, & Gahagan, 2013). Clinical implications involve greater consideration of specific dimensions of children's temperament and mothers' parenting style when creating dietary schedules and plans, as well as physical activity regimen. Previous research has shown that an obesity intervention programs that included strategies to increase self-regulation skills in children, such as impulse control and increased social competence, were significantly linked to better child outcomes such as better food choices and decreased television viewing (Riggs, Sakuma, & Pentz, 2007). In addition, past research has shown that obesity prevention programs that included a family functioning component, such as training for parenting skills or

authoritative parenting, had positive effects in increasing child weight loss as well as child health behaviors (Ulrich et al., 2010).

Greater research and clinical attention should be paid to the mechanisms in which parenting style, as well as child temperament, serve as a risk or protective factor in reducing or preventing child obesity. Research implications of the current study include providing an introduction on using a dimensional framework to analyze the various dimensions of child temperament and parenting styles and their joint effects on preventing or reducing child obesity.

### **Strengths, Limitations, and Future Directions**

The present study has several strengths. First, the study was longitudinal in nature, based on two time points that were two years apart. Using a longitudinal study allowed us to examine change in BMI over time, as opposed to a cross sectional study which only allow for assessing change in BMI at one time point. Future research should continue utilizing more time points, as it would be interesting to further investigate BMI changes well into adolescence. In addition, the present study included a large sample size with ethnic minority children across three major urban cities in geographically different locations. Having a large sample size with ethnically diverse children in three major urban cities allows for greater generalizability of findings. Future research should replicate the present study in other major urban cities, as well as in rural areas, and with other types of ethnically diverse children.

The current investigation also has limitations. First, parenting style was assessed using a self-report measure completed by the parental unit. This

approach in methodology does not allow for objective measurement as the parent may have been biased in their responses to appear socially desirable. Future studies should include more consistent and objective measures of parenting style. Past research has shown that when longitudinally assessing parenting style in relation to child outcomes, among maternal self-report measures, interviews with mothers, and observational measures, observational measures revealed greatest predictive validity whereas self-report revealed the weakest (Zaslow et al., 2006). Possible explanation for this finding is that self-report measures are biased because of mothers' social desirability, whereas observational measures involve trained researchers to score maternal behavior consistently and objectively, allowing for greater reliability (Zaslow et al., 2006). In addition, the scale used in the present study to assess both 'authoritarian parenting style' and 'sociability' each only consisted of two items, which does not allow for high reliability. Future research should use a scale for 'authoritarian parenting style' and 'sociability' which includes numerous items to increase reliability. When developing reliable measures in conducting psychological research, past research has suggested that quality scales should consist of at least four to five items to adequately assess the domain of interest (Thurstone, 1947; Hinkin, Tracey, & Enz, 1997). Moreover, this study is limited in its inclusion of almost only mothers' parenting styles. Future research should include examination of both father and mother parenting style in relation to child BMI, especially since past research has shown significant differences in parenting style based on parent gender (Starrels, 1994). Lastly, another limitation of the present study is the dataset's use of combining

impulsivity and activity as one variable, in which a higher score for this combined variable indicates higher levels of both impulsivity and activity. This serves as a limitation since impulsivity and activity have different effects on child BMI. As noted in the past literature, increased impulsivity is related to higher BMI, whereas increased activity is related to lower BMI. Since higher levels of these two dimensions have opposite effects on child BMI, future studies should analyze them separately in predicting child BMI.

### **Summary**

In sum, this study extended the prior and limited research on the role of child temperament and parenting style, as well as the interacting effects between the two, in longitudinally predicting child BMI. Findings from the present study revealed no significant relations between child temperament, specifically the dimensions of emotionality, impulsivity, activity and sociability, and child BMI. Although authoritative and permissive parenting style did not significantly predict child BMI, authoritarian parenting style did significantly predict child BMI in an inverse direction, which may be due to differences in ethnic minority children's authoritarian parenting style. No interaction effects between each of the dimensions of child temperament and parenting style predicted child BMI. Future research should continue to investigate the interrelations between child temperament, parenting style, and child BMI and the underlying mechanisms, addressing the current investigation's limitations and expanding on the current framework.

## References

- Agras, W. S., Hammer, L. D., McNicholas, F., & Kraemer, H. C. (2004). Risk factors for childhood overweight: A prospective study from birth to 9.5 years. *The Journal of Pediatrics, 145*(1), 20-25.
- Anderson, S. E., Bandini, L. G., Dietz, W. H., & Must, A. (2004). Relationship between temperament, nonresting energy expenditure, body composition, and physical activity in girls. *International Journal of Obesity and Related Metabolic Disorders, 28*, 300-306.
- Anderson, S. E., Bandini, L. G., & Must, A. (2005). Child temperament does not predict adolescent body composition in girls. *International Journal of Obesity, 29*, 47-53.
- Aunola, K., Stattin, H., & Nurmi, J. E. (2000). Parenting styles and adolescents' achievement strategies. *Journal of Adolescence, 23*(2), 205-222.
- Baumrind, D. (1991). The influence of parenting style on adolescent competence and substance use. *The Journal of Early Adolescence, 11*, 56-95.
- Berge, J. M., Wall, M., Loth, K., & Neumark-Sztainer, D. (2010). Parenting style as a predictor of adolescent weight and weight related behaviors. *Journal of Adolescent Health, 46*(4), 331-338.
- Braungart-Rieker, J. M., Moore, E., Planalp, E. M, & Lefever, J. B. (2014). Psychosocial pathways to childhood obesity: A pilot study involving a high risk preschool sample. *Eating Behaviors, 15*(4), 528-532.
- Braet, C., Claus, L., Verbeken, S., & Van Vlierberghe, L. (2007). Impulsivity in overweight children. *European Child and Psychiatry, 16*(8), 473-483.



- Buss, A. & Plomin, R. (1984). *Temperament: Early Developing Personality Traits*. Hillsdale, NJ: Erlbaum.
- Centers for Disease Control and Prevention. (2015). Childhood Obesity Facts. Retrieved from <http://www.cdc.gov/healthyschools/obesity/facts.htm>
- Dawson-McClure, S., Brotman, L. M., Theise, R., Palamar, J. J., Kamboukos, D., Barajas, R. G., & Calzada, E. J. (2014). Early childhood obesity prevention in low-income, urban communities. *Journal of Prevention and Intervention in the Community, 42*(2), 152-166.
- Deater-Deckard, K., Dodge, K. A., Bates, J. E., & Pettit, G. S. (1996). Physical discipline among African American and European American mothers: Links to children's externalizing behaviors. *Developmental Psychology, 32*(6), 1065–1072
- Dornbusch, S. M., Ritter, P. L., Leiderman, P. H., Roberts, D. F., & Fraleigh, M. J. (1987). The relation of parenting style to adolescent school performance. *Child Development, 58*(5), 1244-1257.
- Faith, M. S. & Hittner, J. B. (2010). Infant temperament and eating style predict change in standardized weight status and obesity risk at 6 years of age. *International Journal of Obesity, 34*, 1515-1523.
- Fontaine, K. R., Redden, D. T., Wang, C., Westfall, C. O., & Allison, D. B. (2003). Years of life lost due to obesity. *Journal of the American Medical Association, 289*(2), 187-189.
- Francis, L. A., Ventura, A. K., Marini, M., & Birch, L. L. (2007). Parent

overweight predicts daughters' increase in BMI and disinhibited overeating from 5 to 13 years. *Obesity*, *15*(6), 1544-1553.

Freedman, D. S., Zugno, M., Srinivasan, S. R., Berpenson, G. S., & Dietz, W. H. (2007). Cardiovascular risk factors and excess adiposity among overweight children and adolescents: The Bogalusa Heart Study. *Journal of Pediatrics*, *150*(1), 12–17.

Fuemmeler, B., Yang, C., Costanzo, P., Hoyle, R., Siegler, I., & Williams, R. (2012). Parenting styles and body mass index trajectories from adolescence to adulthood. *Health Psychology*, *31*(4), 441-449.

Goldsmith, H. H., Buss, A. H., Plomin, R., Rothbart, M. K., Thomas, A., Chess, S., Hinde, R. A., & McCall, R. B. (1987). Roundtable: What is temperament? Four approaches. *Child Development*, *58*(2), 505-529.

Graziano, P., Calkins, S.D., & Keane, S.P. (2010). Toddler self-regulation skills predict risk for pediatric obesity. *International Journal of Obesity*, *34*, 633-641.

Harrist, A. W., Hubbs-Tait, L., Topham, G. L., Shriver, L. H., & Page, M. C. (2013). Emotion regulation is related to children's emotional and external eating. *Journal of Developmental and Behavioral Pediatrics*, *34*(8), 557-565.

Haycraft, E., Farrow, C., Meyer, C., Powell, F., & Blisset, J. (2011). Relationships between temperament and eating behaviors in young children. *Appetite*, *56*, 689-692.

Isasi, C., Ostrovsky, N., & Wills, T. (2013). The association

of emotion regulation with lifestyle behaviors in inner-city adolescents.

*Eating Behaviors, 14*(4), 518-521.

Israel, A. C., & Ivanova, M. Y. (2002). Global and dimensional self-esteem in preadolescent and early adolescent children who are overweight: Age and gender differences. *International Journal of Eating Disorders, 31*(4), 424-429.

Jackson, S. L., & Cunningham, S. A. (2015). Social competence and obesity in elementary school. *American Journal of Public Health, 105*(1), 153-158.

Lamborn, S. D., Mounts, N. S., Steinberg, L., & Dornbusch, S. M. (1991). Patterns of competence and adjustment among adolescents from authoritative, authoritarian, indulgent, and neglectful families. *Child Development, 62*(5), 1049-1065.

Lansford, J. E., Deater-Deckard, K., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2004). Ethnic differences in the link between physical discipline and later adolescent externalizing behaviors. *Journal of Child Psychology and Psychiatry, 45*(4), 801-812.

Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. In P. Mussen and E.M. Hetherington, editors, *Handbook of Child Psychology, volume IV: Socialization, personality, and social development*. New York: Wiley.

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *Journal of the American Medical Association, 311*(8), 806-814.

- Parsons, T. J., Power, C., & Manor, O. (2005). Physical activity, television viewing and body mass index: A cross-sectional analysis from childhood to adulthood in the 1958 British cohort. *International Journal of Obesity*, 29, 1212-1221.
- Pulkki-Raback, L., Elovainio, M., Kivimaki, M., Raitakari, O., & Keltikangas-Jarvinen, L. (2005). Temperament in childhood predicts body mass in adulthood: The cardiovascular risk in Young Finns Study. *Health Psychology*, 24, 307-315.
- Rhee, K. E., Lumeng, J. C., Appugliese, D. P., Kaciroti, N., & Bradley, R. H. (2006). Parenting styles and overweight status in first grade. *Pediatrics*, 117(6), 2047-2054.
- Starrels, M. E. (1994). Gender differences in parent-child relations. *Journal of Family Issues*, 15(1), 148-165.
- Steinberg, L., Dornbusch, S., & Brown, B. (1992). Ethnic differences in adolescent achievement: An ecological perspective. *American Psychologist*, 47, 723-729.
- Tamis-LeMonda, C. S., Briggs, R. D., & McClowry, S. G., & Snow, D. (2008). Challenges to the study of African American parenting: Conceptualization, sampling, research approaches, measurement, and design. *Parenting: Science & Practice*, 8, 319-358.
- Winston, P., Angel, R., Burton, L., Chase-Lansdale, L., Cherlin, A., Moffitt, R., & Wilson, William. (1999). *Welfare, Children, and Families: A Three City Study. Overview and Design*. Baltimore: Johns Hopkins University.

Wu, T., Dixon, W. E., Dalton, W. T., Tudiver, F., & Liu, X. (2011). Joint effects of child temperament and maternal sensitivity on the development of childhood obesity. *Maternal and Child Health Journal*, 32(10), 1474-1480.