THE RELATION OF MATERNAL FEEDING PRACTICES AND FOOD SOCIALIZATION BEHAVIORS TO WEIGHT STATUS IN LOW INCOME 3- AND 4-YEAR OLD CHILDREN

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THE RELATION OF MATERNAL FEEDING

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3- AND 4-YEAR OLD CHILDREN

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CHAPTER I

INTRODUCTION

Summary

Twenty five percent of American children aged two to five years are diagnosed as overweight or at risk for overweight annually (Flegal, Ogden, Wei, Kuczmarski, & Johnson, 2001; Ogden, Carroll, Curtin, McDowell, Tabak, & Flegel, 2006), and this number has been increasing rapidly over the last two decades. In children, the term overweight refers to a child with a Body Mass Index (BMI) greater than the 95th percentile. Children regarded as at risk for overweight have a BMI greater than the 85th percentile but less than the 95th percentile (Center for Disease Control, 2006). A diagnosis of either overweight or at risk for overweight can be accompanied by serious co-morbidities including impaired glucose tolerance and elevated blood pressure, in addition to profound social and psychosocial consequences which often persist into adolescence (Goran & Sothern eds., 2006; Reilly, 2005). In addition, those who are diagnosed as overweight or at risk for overweight in childhood are twice as likely to develop obesity, and associated co-morbidities in adulthood (Serdula, Ivery, Coates, Freedman, Williamson, & Byers, 1993).

The development of obesity in childhood is multi-factorial; both environmental and genetic factors have been associated with increased BMI in children. Environmental

factors such as energy intake and energy output are crucial in development of overweight status. Energy intake exceeding energy expenditure for an extended period leads to an increased deposition of adipose tissue. In adults, energy intake is associated with personal responsibility regarding food choices (Birch & Fisher, 1995; Birch, 2006); however, in young children food intake choices are almost solely dictated by the family or caregiver environment. Food providers determine food quality and quantity, and alterations in either by factors related to general parenting and/or food socialization behaviors can lead to poor dietary intake and childhood overweight. The behaviors associated with food intake displayed by parents provide children with a framework for food behaviors that persist into adulthood. Adults responsible for child feeding often perpetuate food practices dictated by their individual food experiences, culture, and tradition. Birch, Fisher, and Davison (2003) suggest that current food parenting behaviors were derived from a period of food scarcity, and the continuation of these behaviors in a society with abundant low-nutrient, high-calorie foods contributes to an increased number of overweight and at risk for overweight children. Food practices such as eating in the absence of hunger, using food as a reward, and providing palatable foods while disregarding nutrient quality may be associated with increased body mass (Birch, 2006).

At birth, parents completely control a child's eating behavior. As children grow, they become more involved in food related choices as an act of claiming individual autonomy. It is at this point that the parent-child relationship regarding food intake becomes crucial to the development of healthy eating practices (Birch, 1998). Birch and Fisher (1995) suggest three specific types of parent-child relationships in regards to eating behavior which were found to some degree in all sampled food providers. These

behaviors were labeled responsive, laissez-faire, and highly controlling. Responsive feeding practices by food providers involved acknowledging a child's need for food based on behavior and requests, and then responding appropriately. Laissez-faire food providers believed that a child is able to dictate his/her own food choices, and hence a provider would allow the child to self-regulate food behavior. Highly controlling food providers considered a child incapable of accurately making food related decisions concerning quality of food and portion size and thereby restricted dietary intake independent of the child. Birch and Fisher further discussed the associations between the food provider role and Baumrind's (1971) classification of general parenting styles. Laissez-faire child feeding is similar to permissive parenting, while highly controlling child feeding is similar to authoritarian parenting styles. Research suggests that both authoritarian and permissive parenting impede the ability of a child to develop autonomous self control (Birch & Fisher, 1995). Responsive feeding practice, as defined by adaptive behavior in response to child development of self-control, is most similar to Baumrind's authoritative parenting style which promotes the development of self-control in children, and could be associated with development of healthy food intake behaviors in children.

In addition to environmental factors such as parenting practices and food socialization techniques, low socioeconomic status is associated with an increased prevalence of childhood obesity (Troiano & Flegal, 1998). Therefore, the purpose of this study is to investigate the parenting practices and food socialization behaviors of parents of low-income preschool children to determine the effects of those practices on the weight status of the child. Parenting styles identified as permissive or authoritarian are

hypothesized to be associated with overweight or at risk for overweight in these low income three- to five-year-old children.

In order to test the aforementioned hypothesis, subjects, questionnaires and data were collected using an Agriculture Experimentation Grant obtained by Laura Hubbs-Tait, Ph.D. The procedure received approval by the Institutional Review Board at Oklahoma State University. The subjects were recruited at the beginning of the 2006-2007 school year from Head Start Centers located in North Central Oklahoma. In the fall of 2006, anthropometric measurements were taken from students whose parents provided informed consent. In addition, the modified Parenting Behavior Questionnaire (PBQ-HS), validated by Coolahan, McWayne, Fantuzzo, and Grim (2002), a modified Child Feeding Questionnaire (CFQ) validated by Birch, Fisher, Grimm, Markey, Sawyer, & Johnson (2001), and a modified Cullen questionnaire (Cullen, Baranowski, Rittenberry, Cosart, Owens, Hebert & de Moor, 2000) were used to ascertain parenting practices and food socialization techniques as self-reported by the child's mother.

Research Questions:

1. Does parenting style, as obtained from the Parent Behavior Questionnaire modified for Head Start (PBQ-HS) participants, relate to weight status, as calculated by Body Mass Index, in three- to five-year-old children participating in the Head Start Program?
2. Which parenting practices and food socialization behaviors, obtained from the PBQ-HS, Cullen questionnaire and modified Child Feeding Questionnaire (CFQ), show greater association with continuous BMI z-scores of low-income preschool children?

3. Which combination of parenting practices and food socialization behaviors predict child weight?

Research Hypotheses:

Null Hypothesis 1: Derived parental subscales for Active-Responsive, Passive-Permissive and/or Active-Restrictive, as obtained from the PBQ-HS will have no linear correlation with reported child BMI z-scores or other anthropometric assessments.
Statistical Analysis: Correlation of BMI and subscale scores from the PBQ-HS.

Null Hypothesis 2: Individual parenting behaviors from the adapted Cullen questionnaire and the CFQ will not be linearly correlated with child BMI z-scores. In addition, subscales from the Cullen questionnaire and CFQ will not correlate linearly with child BMI z-scores or other anthropometric assessments.
Statistical Analysis: Correlation using BMI and modeling/monitoring behavior questions obtained from the adapted Cullen et al. (2000) questionnaire and CFQ (Birch et al., 2001). Examples of questions taken from the modified Cullen questionnaire and used for this analysis will include questions similar to the following 'I eat vegetables when I am with my child,' or 'I eat low-fat snack foods when I am with my child.'

Research Question 3: The aforementioned analyses will provide the framework for the development of a model regarding child weight and parenting behavior, in addition to theoretical constructs derived from the literature review. We hypothesize that appropriate modeling/monitoring behaviors will negatively predict BMI when controlled for maternal

education and socioeconomic status. Active-Restrictive parenting styles will positively predict BMI status when controlled for maternal education and socioeconomic status.

Statistical Analysis: Hierarchical regression analysis.

CHAPTER II

REVIEW OF LITERATURE

Development of Obesity

The prevalence of child obesity has risen in the past three decades (Troiano & Flegel, 1998), and this increase cannot be solely attributed to genetic predisposition. While approximately 75% of variance in fat mass is related to genetic factors, only thirty to fifty percent of variance in individual BMI can be attributed to genetic influence (Faith, Rha, Neale & Allison, 1999). Allison and colleagues (1996) evaluated the effect of environment and genetics on separated twins reared apart, and reported that genetic influence can only account for approximately fifty percent of the variance in obesity, and the remaining variance must be attributed to environmental effects.

Research suggests that parents who are obese are more likely to have children who are also obese (Garn, 1976; Faith, Keller, Johnson, Petrobelli, Matz, Must, et al., 2004). This familial predisposition, however, cannot solely be attributed to genetic predisposition, but it can also be dictated by parents through feeding situations in the home environment (Birch, 1998). Thus, parents transmit the genetic aspects of obesity, they also exacerbate this through control of environmental cofactors implicit in the development of obesity.

Parent-Child Food Socialization

Energy intake in excess of energy output is the physiological determinant of obesity, and both energy intake and output are environmental factors that are influenced by practices within the context of the parent-child relationship. Parents are primarily responsible for satisfying the nutritional needs of children, and therefore have the largest impact on the feeding environment (Birch, 1995). Parents alter infant and early child food preferences and teach a child to eat based on internal or external food consumption cues (Birch, Zimmerman & Hind, 1980; Birch, Johnson, & Fisher, 1995). During this period of child development, parents are increasingly important in the development of eating habits. Parents exert control over meal nutrient composition, meal size, and the social context in which food is offered. Each of these environmental cues dictated by parents, if inadequately implemented can inhibit the ability of a child to self-monitor dietary intake, and potentially lead to increased adiposity and elevated weight.

Food Socialization Behaviors: Diet Composition

In infancy, parents control child consumption through timing, quality and amount of food made available to the infant. A child can, to some extent, control when and what they prefer to eat through behavior, and often that behavior is in response to genetically predisposed preference. Children are born with innate food neophobia so as to prevent ingestion of potentially harmful food products (Birch, 1998), and as a child begins to accept solid foods parents become more responsible for dictating child intake. Early in development, children are genetically prone to accept sweet and salty tastes, and to reject bitter and sour tastes (Birch, 1998). As children acclimate to a variety of new foods, they are more willing to consume other novel foods, and this genetic fondness and/or aversion

is changed based on foods offered. Soon the foods provided by parents begin to fundamentally shape the food preferences of the child (Birch, Johnson & Fisher, 1995). As a child ages, their preferences become less about genetic predisposition and more about foods made available. If a child is repeatedly presented a diet high in fat content, a child could be placed at risk for development of obesity through increased preference for such foods. Gazzaniga and Burns (1993) positively correlated total dietary fat, saturated, monounsaturated and polyunsaturated fat with elevated body fat and obesity in children aged nine to eleven years. Further, the increase in adiposity was independent of total energy consumption and physical activity, suggesting diet composition, as provided by parents and food providers, is a major component of weight status. If a child is repeatedly presented meals with micronutrient-dense fruits and vegetables, they remain less likely to develop preferences for high fat foods. The displacement of high fat meals with more nutrient-dense fruit and vegetables has been shown to lower the overall consumption of fat in the diet (Subar, Ziegler, Patterson, Ursin & Graubard, 1994). In addition, repeatedly introducing children to meals composed primarily of fruits and vegetables has been associated with lower weight status (Field, Gillman, Rosner, Rockett & Colditz, 2003). Resnicow and colleagues (1997) concluded that among a variety of social-cognitive factors associated with consumption of fruits and vegetables, preference alone is indicative of increased consumption. Similarly, preference for fruits and vegetables has been not only linked with familiarity and availability as presented by parents (Cooke & Wardle, 2005), but also parental consumption (Fisher, Mitchell, Smickilas-Wright & Birch, 2002).

Food Socialization Behaviors: Social Context

The social context in which the food is presented by a parent also aids in development of preference as well as rejection of food. Parents provide a model for children in developing food preferences and attitudes towards dietary intake. Harper and Sanders (1975) observed children in relation to modeling of parental food consumption. If a parent was consuming a food and offered the food to a child between one to four years of age, then the child was more likely to consume the food. Also, foods presented in the same context by a non-parent were less likely to exhibit the same response, indicating the importance of parental modeling as means of food acceptance. Children also learn to develop food preference depending upon the social context in which food is presented to them. When a child is presented a food by a parent in positive context, preference for that food is increased (Birch, Zimmerman & Hind, 1980), and similarly, when a food is offered in negative context, there is a decreased preference for that food (Birch, Deysher & Kennedy, 1984). If a child has increased exposure to high-fat foods through availability offered by the parent, as well as increased positive social correlation with those foods, then a child would have more opportunities to develop preference for high fat foods and associated increases in BMI. Fisher and Birch (1995) reported increased preference for fat with higher dietary intakes, and subsequently higher adiposity in children.

Food Socialization Behaviors: Meal Energy Content

Food made available to each child is important in molding food preferences for nutrient dense foods, but if a fluctuation in meal-time energy composition does occur a child can generally compensate. Studies have shown that a child has the innate ability to

compensate for fluctuations in energy density during single meal situations as well as longer 24-hour periods (Birch & Deysher, 1985; Birch, Johnson, Andersen, Peters and Schulte, 1991; Johnson, McPhee & Birch, 1991). However, as a child ages, they are less likely to regulate intake based on internal cues of hunger, satiety and fullness, and shift their focus to external cues (Johnson & Taylor-Holloway, 2006). Children as young as two years old can respond to caloric density cues within a meal and determine adequate portion sizes based on internal cues of satiety and fullness (Birch & Deysher, 1985, 1986; Cecil, Palmer, Wrieden, Murrie, Bolton-Smith, Watt, et al., 2005). At approximately three years of age, a child is no longer dependant solely on hunger as a motivator for consumption, but instead becomes increasingly aware of external cues as meal determinants (Klesges, Klem, Epkins & Klesges, 1991). Children whose consumption behavior is focused primarily on internal cues, such as feelings of hunger, satiety and fullness are more likely to be able to self-regulate dietary intake based on energy density of food. A child focused on internal cues can determine adequate meal size and regulate energy intake accordingly. A child that is primarily focused on external cues as a meal determinant is less likely to develop a healthy ability to regulate diet based on energy density and food selection. During times of energy excess, that child will be less likely to control consumption and inadvertently consume additional unnecessary calories. If persistent energy excess is consumed with no physical compensation, then increased adiposity and elevated weight will result (Johnson & Birch, 1994).

Food Socialization Behaviors: Control

Parental control of a diet is usually comprised of restrictive and pressure to eat behaviors. Parents try to restrict certain behaviors seen as unnecessary or unhealthy for

their child, or pressure to eat behaviors they feel will aid in adequate food related ontogeny. The degree to which a parent expresses pressure and restriction is highly variable, and in an attempt to quantify these behaviors, Johnson and Birch (1994) developed the Child Feeding Questionnaire (CFQ). It incorporated parents' attitudes, beliefs, and use of control in the child feeding context modified from Costanzo and Woody's (1985) parent interviews. With further research (Birch, Fisher, Grimm, Markey, Sawyer, & Johnson, 2001), the Child Feeding Questionnaire (CFQ) evolved to include aspects of parental concerns about the child's weight, or perceived risks concerning weight status, and factors measuring parental control which may alter the parenting practice in respect to feeding. Eventually ideas of parental responsibility in child feeding tasks were incorporated to elicit more information regarding control over dietary intake (Birch et al., 2001). Control of the feeding environment by parents and food providers is thought to have significant impact on development of child eating behaviors, and it became necessary to determine the extent to which that control or permissiveness affects weight status in children.

Johnson and Birch (1994) utilized the initial CFQ to determine the effects of parental control of the child versus self-regulation on development of child eating behaviors. Children were presented with two controlled meals differing in caloric density and their ability to self-regulate dietary consumption was assessed. Parental control was assessed utilizing the CFQ. Results showed that parents who were more controlling in regard to feeding were more likely to have a child who was unable to adequately self-regulate diet based on caloric density. Also, children with an inability to adequately alter their intake in response to changing energy density exhibited increased body fat stores

based upon the anthropometric measurements. Johnson and Birch's results seemed to support the hypothesis that increasing control of intake may interfere with child ability to regulate intake, and eventually lead to weight gain. Fisher and colleagues (2000) considered that parental control on weight status may begin in infancy. Fisher observed fifty-five white infants and mothers at twelve or thirteen months and the effect of the maternal control, through duration of breastfeeding on subsequent weight status six months following. Women who breastfed until the twelfth month were less likely to exhibit control in child intake following breastfeeding, regardless of child weight at twelve months. In addition, subsequent child energy intake at eighteen months was attributable to the amount of control exhibited by the mother. Their research suggests that maternal control practices begin to dictate child eating behaviors as early as one year and can persist throughout the second year of development.

Hood et al. (2000) utilized data from the Framingham Children's Study, a longitudinal study focusing on children's dietary and physical activity habits. Ninety-two children aged three to five years were enrolled in 1987 and were anthropometrically assessed regularly over a six year period to determine BMI at different stages of growth. At the initial visit, parents were asked to complete the Three Factor Eating Questionnaire (TFEQ), which assesses cognitive restraint in regards to feeding practices. High dietary restraint increased the progression of adiposity in children, but only when restraint was associated with dietary disinhibtion in parental control. Parents who actively restrict child intake and simultaneously show no self-restraint in the presence of 'trigger' foods, can increase the likelihood of elevated child weight and adiposity. Several other studies of varying design and sample have shown similar results (Costanzo and Woody, 1985;

Birch & Fisher, 2000; Lissau & Sorenson, 1994; Spruijt-Metz, Lindquist, Birch, Fisher & Goran, 2002).

Observational studies also provide important insight into the effects of parental control in child feeding situations. Forty-five African American children (b=18, g=27) from an urban preschool were videotaped during lunch at home or in the preschool setting. Researchers analyzed the interactions based on the number and quality of prompts in regards to dietary intake. Positive maternal encouragement was successful in prompting a child not to eat, whereas negative encouragement was less likely to prompt a child not to eat (Iannotti, O'Brien & Spillman,, 1994). Parents utilizing more positive, less restrictive forms of control were more successful in gaining desired child outcome. Drucker and colleagues (1999) videotaped 77 parent/child meal-time interactions within the lab, and coded the interactions based on parenting style, eating cues, and child rate of eating. It was found that the quantity of verbal and physical encouragements to eat, verbal and physical discouragements to eat, and total eating prompts all resulted in a significant increase in energy intake. In addition, an increased rate of feeding prompts, both positive and negative, were significantly associated with increased energy intake within the taped interaction. These results suggest that maternal feeding cues, when more numerous and regardless of positive or negative connotation, result in alterations in energy intake by the child and thereby change the natural development of the child's relation to food.

Parenting Styles

Parenting *styles* consist of parentally-held beliefs that dictate behavior and interactions with a child across a variety of domains. This differs distinctly from the food

socialization based parenting *practices* addressed previously. Practices are specific strategies which parents use to socialize their child according to the beliefs, or parenting style which they express. Parenting *style* can be conceptualized as the major context in which parents employ parenting *practices* in order to socialize a child. Four archetypal parenting styles were introduced by Baumrind (1971) and modified by Maccoby and Martin (1983) to include permissive, neglectful (uninvolved), authoritarian, and authoritative parenting styles. The four proposed parenting styles are based on the extent to which a parent exhibits two dimensions; (1) demands or expectations for self-control from a child and (2) sensitivity and emotional involvement with the child (Maccoby and Martin, 1983). Parents deemed authoritative express high expectations of a child, as well as high sensitivity. Permissive parents have low expectations of child self-control and exhibit high sensitivity and emotional involvement, which suggest that children of permissive parents often lack discipline and become self-indulgent. Authoritarian parents have high demands for self-control from a child, but do not display sensitivity in interaction, and neglectful (uninvolved) parents express low concern and sensitivity for the child (Maccoby and Martin, 1983). Permissive, neglectful (uninvolved), and authoritarian parenting styles are thought to impede adequate development of child self-control. These parenting styles inhibit the ability of a child to develop individual autonomy and can impede development.

Costanzo and Woody (1985) suggested that the extent to which a parent expresses a certain parenting style differs in regards to the domain in which child interaction is presented. Parenting styles have been analyzed in regards to several domains, but of particular importance to this discussion is that of the child-feeding relationship. In

regards to food-related parenting style, Hughes and colleagues (2005) classified caregivers into four similar parental constructs labeled authoritative, authoritarian, indulgent or uninvolved depending on the degree to which a parent used demanding or responsive feeding behaviors with children. These overarching ideologies dictate parenting practices regarding feeding and impact child consumption.

Parenting Styles: Authoritative

Authoritative parenting is often characterized by increased expectations of the child regarding parentally established boundaries while employing strategies based on child response. Authoritative parents moderate control in order to encourage child independence and adequate development of child autonomy. Actions commonly associated with this type of parenting include increased child acceptance, inductive discipline, consistent approaches to parenting and punishment that is not considered punitive (Maccoby & Martin, 1983). In general, these practices are consistently shown to produce positive developmental outcomes across a variety of disciplines. With regard to child feeding, parents who exhibit greater authoritative parenting practices are more apt to adequately control child intake, and subsequently give a child more autonomy in decisions regarding food intake. These parents are more likely to allow a child to develop self-control and healthy food intake practices. Patrick and colleagues (2005) found that authoritative feeding style, as ascertained by the Caregiver's Feeding Style Questionnaire (CFSQ), was positively associated with increased availability of fruits and vegetables. In this sample of predominantly African-American and Hispanic caregivers, authoritative parenting was also shown to increase attempts made by parents to encourage child consumption of dairy, fruit and vegetables. Further, the study showed that

authoritative parenting was positively associated with increased child consumption of dairy, fruit and vegetables as compared with other parenting styles. This cross-sectional study controlled for gender, ethnicity, education level and BMI as reported by the parents. However, associations between specific parenting style, child eating and weight status were not ascertained. In a longitudinal study, Rhee and colleagues (2006) ascertained weight in children aged 4-5 years, while simultaneously assessing parenting style. The study, utilizing a national sample of 872 children and parents, showed evidence that children with authoritative parents were less likely to be overweight in a follow-up anthropometric assessment in first grade. The decreased likelihood of overweight status in the children of authoritative parents was consistent even when controlling for initial weight status. The literature suggests that authoritative parenting stimulates positive multi-factorial results by not only increasing availability of high nutrient dense foods to a child, but also increasing the prompts by which they encourage the eating of that food (Patrick, Nicklas, Hughes & Morales, 2005). In addition, by change in child eating behaviors or direct influence on weight, authoritative parenting style over time is likely to encourage adaptive behaviors and decrease the risk of unhealthy weight gain.

Parenting Styles: Authoritarian

Similar to authoritative parenting style, the authoritarian parenting style is characterized by high expectations of the child. Most often authoritarian parents have high expectations of child conformity and obedience to established rules (Baumrind, 1971). These parents differ in that the reasons for such rules are not always expressed and failure to comply with rules results in punitive punishment. Children of such parents

usually do not develop adequate self-autonomy and are unable to make decisions without the context of parental regulations, often resulting in lack of self-competence. Children may not always comply with parentally established regulations and can outwardly rebel against rules and suggestions made by parents (Birch & Fisher, 1995; Hughes et al., 2005). These children of authoritarian parents are likely to develop autonomy to some degree outside of the parent-child relationship, but are increasingly likely to partake in behaviors deemed deviant by the authoritarian parent. In regards to food socialization, this lack of self-competence can manifest itself in the inability of a child to adequately respond to situations regarding feeding (Drucker et al., 1999; Duke, Bryson, Hammer & Agras, 2004). Patrick and colleagues (2005) found authoritarian parenting style was negatively associated with availability of fruits and vegetables, in addition to decreased consumption of vegetables. In the longitudinal study by Rhee et al. (2006), authoritarian parents were more likely to have children who were overweight at follow-up anthropometric assessments as compared with children of authoritative parents. Two cross-sectional studies also elicit positive associations between authoritarian parenting and increased child weight (Hughes et al. 2005, Moens, Braet & Soetens, 2007).

Parenting Styles: Permissive and Neglectful

Permissive parenting and neglectful parenting are defined by their low expectations of the child. Permissive parents generally are sensitive to child needs and respond to the needs of the child as the child dictates. Neglectful parents show similarly low expectations of the child, but it is accompanied by low sensitivity to the child needs. The parent usually does not give guidelines or expectations and provides little beyond basic needs. Neglectful and permissive parenting styles often result in children who are

unable to control their own impulses through improper development of child autonomy (Baumrind, 1971; Costanzo & Woody, 1985; Birch & Fisher, 1995). Neglectful and permissive parenting often results in similar child incompetencies in adequate food ontogeny, as seen in children of authoritarian parents (Hughes et al., 2005). Few studies adequately assess the relationship between permissive and neglectful parenting styles and child eating behaviors and weight status. Preliminary studies suggest the consequences of these parenting styles are similar to effects of authoritarian parenting on child weight. In a study by Rhee and colleagues (2006), 4- and 5-year old children of permissive and neglectful parents were more likely to be overweight in assessments completed in the first grade, similar to results found with authoritative parents. Hughes and colleagues (2005) suggest that permissive and neglectful parenting may have a more extreme effect on child weight status. In a study of 231 predominantly African-American and Hispanic children, it was shown that those children with parents identified as indulgent, or permissive, were more likely to have higher BMI z-scores as compared with children of authoritarian parents.

Limitations in associating parenting style with child weight status

Aforementioned research suggests that there is a relation between parenting style and child weight; however, several other studies have also shown no relation between parenting style and child weight (Brann & Skinner, 2005; Chen & Kennedy, 2005). Currently, a majority of the research relating parenting styles and weight status in children is cross-sectional, and with conflicting results, it is difficult to understand the exact mechanism by which parenting style affects child weight, let alone establish causality. Ventura and colleagues (2008) reviewed current literature and suggest that the

lack of direct evidence correlating parenting style and child weight is because it is moderated by another factor—child eating habits. Parenting style can only affect child weight status depending on how a child responds to those cues and adapts their eating behavior. A child may adapt food behaviors individually according to his/her parent's style. At this point research shows some associations between parenting styles and child intake or eating behavior, but all studies do not show similar results. Also, there is a lack of causal evidence, associating specific behaviors with future weight gain. Patrick and colleagues (2005) did look at parenting styles and show that authoritative parents were likely to increase fruit and vegetable consumption; however, this cross-sectional research did not correlate findings with child BMI. Child consumption patterns heavily influence weight status, and analysis of how parenting styles change eating behavior in children can provide necessary information regarding the mechanism of the association, or lack thereof.

As previously mentioned, parenting style is an overall context inferred from parenting behaviors, emotions and attitudes when interacting with a child, and can be specific to certain domains, i.e. feeding situations (Costanzo & Woody, 1985). However, parenting styles and their subsequent behaviors are not static, but adapt to perceived threats and concerns regarding supposed deviations from normal ontogeny. Overall parenting style may remain similar, but the extent to which the behaviors are expressed may be altered. Costanzo and Woody (1985) saw alterations in the extent to which parents controlled or showed concern when presented with deviations in child weight. This change in parental behavior suggests a bidirectional relationship between parenting style and child weight. The cross-sectional reports showing some association may be

alluding to the bi-directionality of the relationship. Kasemsup and Reicks (2006) showed a direct correlation among parental perceptions of child overweight and child weight itself. Their cross-sectional study conducted in eighty low-income 3- to 5-year old children suggests that parents who perceived weight status as higher, did in fact have children with elevated BMI, and also exhibited more restrictive feeding practices with their child. Similar results have been reported in other studies (Francis, Hofer & Birch, 2001; Johannsen, Johannsen & Specker, 2006)

Additional External Confounders

Research in parenting styles and behaviors indicates a relationship among these constructs and child weight status. However, there are several other external environmental cues which can influence parenting style, behavior and food availability to a child.

Maternal Influence

Mothers remain the primary food provider in the household, and research often focuses solely on their influence. Children are considered high risk for eventual obesity when a mother is overweight, as maternal BMI is often associated with child's weight while paternal BMI is not (Johannsen et al., 2006). A majority of current maternal research focuses on restriction and control in feeding, and its subsequent effects on intake and weight status. Birch and colleagues (2003) found that mothers who exhibited greater restrictive parenting practices had daughters who were more likely to eat in the absence of hunger, and those daughters that were more likely to eat in the absence of hunger were more likely to have greater weight for length. Also, in this cross-sectional study of 3- to 6-year old girls, higher levels of adiposity, as measured by child skinfold, were positively

correlated with increased maternal restriction. Similarly, mothers who display these restrictive behaviors over time were more likely to have daughters with increased eating in the absence of hunger and greater changes in BMI between 5 to 9 years of age (Francis & Birch, 2005). In addition to restriction and control behaviors of mothers, demographic factors such as low maternal education level have also been significantly correlated with elevated child weight status (Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000; Thomas, Strauss & Henriques, 1991).

Child Gender

Much of the maternal impact on child weight has been seen in studies involving mothers and daughters. Research suggests that mothers perceive their child's weight quite differently based on gender, and concern for child weight differs accordingly (Maynard, Galuska, Blanck & Serdula, 2003). Mothers of daughters who are overweight, are generally more concerned and express more restrictive parenting practices (Fisher & Birch, 1999; Francis & Birch, 2005); however mothers of boys have shown different results. Mothers in general are more likely to classify overweight daughters as being overweight, and less likely to classify overweight sons as being overweight (Maynard et al., 2003). In general, mothers with boys who have higher BMI used pressure to eat less often as compared with mothers of boys with average, healthy BMI scores (Brann & Skinner, 2005). Hughes and colleagues (2006) also showed gender differences in parenting and weight status. Their research showed that among the 231 participants, parental behaviors that were parent- and child-centered, and contingency management strategies all positively correlated with higher BMIs in boys. Moreover, the similarities in parenting styles were not expressed with girls, and did not significantly correlate with

weight status. While gender differences are a concern when relating to parenting style, most research continues to aggregate children and neglect differences in parental behavior based on gender.

Father's Influence

Most current research relates parenting practices, particularly of mothers, to child eating behaviors and weight status. Fewer studies focus on the role of fathers in the household, but there is some evidence to suggest that fathers may make a significant contribution even though they are not the primary food provider. Brann and Skinner (2005) suggest paternal attitudes are also associated with child weight. Fathers of boys with higher BMI exerted less pressure and monitoring of dietary intake as compared with fathers of boys with average BMIs. Johannsen and colleagues (2006) concluded that girls with higher percentage body fat, as estimated by Dual energy X-ray absorptiometry (DXA), had fathers who were more controlling. In addition, these same girls had fathers who showed greater concern about future health implications.

Increased parental education has been linked to several positive health benefits for children. Elevated parental education level has been directly linked with increased child height, and this increase is attributed to better maternal health during pregnancy and availability of health resources (Thomas et al., 1991). Thomas (1994) later discovered that paternal education level is a better indicator of height for male progeny. Similarly, parental education level is often associated with elevated socioeconomic status, and increased access to health resources. Associations between parental education level and weight status have been mixed. In a cross-sectional analysis of the Early Childhood Longitudinal Study (ECLS), among 7,599 participant pairs, increased paternal education

level was significantly correlated with increased child BMI, independent of income levels (Baker, 2008 unpublished manuscript). Another study, in Ho Chi Minh City, Vietnam has also shown increased parental education levels being associated with children at risk for overweight or overweight (Dieu, Dibley, Sibbritt & Hanh, 2007).

Parental Ethnicity

Birch and Fisher (1995) suggested that contemporary parenting practices and styles are derived from a period of food scarcity, and have roots in individual food experiences. Often the context for prior food experiences are dictated by the culture of the parent. Differences in culture may relate to difference among prevalence of obesity between ethnic groups. NHANES survey data elicit this discrepancy between ethnic groups regarding percentages of children overweight and at risk for overweight. Non-Hispanic Black and Hispanic children were more likely to be overweight or at risk for overweight as compared with their non-Hispanic White counterparts. In addition, among children aged 2 to 19 years, Hispanic children were more likely to be at risk for overweight or overweight as compared with all other ethnic groups (Hedley, Ogden, Johnson, Carroll, Curtin, & Flegal, 2004). Some differences in feeding behaviors have been described among various ethnic groups. In a study by Hughes and colleagues (2005), assessing or describing parental feeding styles, Non-Hispanic Black parents were more likely to display uninvolved behaviors, while Hispanic parents were more likely to be indulgent, and these cultural difference were found independent of child weight (Hughes 2005). In a follow-up study, Hughes and colleagues' (2006) research indicates that highly controlling, parent-centered strategies are positively associated with increased BMI in Hispanic children. While child centered strategies, as well as contingency

management based, parent centered strategies were all positively correlated with higher BMIs in African Americans. Chen and Kennedy (2004) indicated contrasting results in a Chinese-American sample. Chinese-American parents who were less authoritarian were more likely to have increased child consumption of sugar and total energy. Also, children of these less authoritarian, more democratic, parents had higher BMI scores. It is important to note, outside of national survey studies, a majority of the research studying ethnic differences study predominantly low-socioeconomic participants.

Socioeconomic Influence

In a review of 144 studies, Sobal and Stunkard (1989) showed consistent evidence that among women socioeconomic status (SES) is inversely linked with weight. However, results from that review also suggest that among men and children, evidence is not as strong. Recent research in U.S. children by Wang and Zhang (2006) only showed significant inverse correlations between SES and weight in white girls, while Non-Hispanic Black girls of higher SES were more likely to be overweight. Wang and Zhang also analyzed the national sample over two decades and concluded that the general strength of the relation is weakening. There are several complex issues regarding correlations among weight and SES. Food availability is not always ideal, and food insecurity can be a concern for lower SES groups. In a study of 108 low SES boys and girls, Matheson and colleagues (2006) discovered discrepancies among low SES groups, food security and child weight status. Among food-insecure households, food availability was associated with lower BMIs and total child energy intake. In food-secure households, increased food availability was associated with higher fruit intake and percent of total calories from fat; and no significant associations were made between

availability and BMI. It is difficult to adequately discern the impact of socioeconomic influence on weight, because its effects are often inseparable from other confounding variables such as ethnicity and parental education.

CHAPTER III

METHODOLOGY

Sample

Participants were recruited at Head Start Centers in five rural communities in Oklahoma. All centers were administered by United Community Action Program Head Start (United CAP). Informed consent was obtained from parents or legal guardians of each participant according to approved protocol, and a total of 208 children aged three to five years were enrolled in the study. Prior to conducting the anthropometric assessment, the research team obtained child assent through a previously approved child-specific protocol. Parents, legal guardians or food providers with a child participating in the study were asked to complete questionnaires. Of those participants, 165 parent-child pairs were included based on completed anthropometric measurements and complete parent questionnaire data. In addition, participants were selected based on maternal completion of the questionnaire (n=131). All protocols and procedures were approved by the Oklahoma State University Institutional Review Board for Human Subjects.

Procedure

Informed consent was obtained from the parents in October 2006, and questionnaires regarding demographics, parenting practices and food socialization behaviors were completed at that time. One trained research assistant assessed child anthropometry, so as to ensure reliability of measurement with the aid of fellow research

assistants. All anthropometric measurements and questionnaires were completed and collected by December 2006.

Anthropometric Assessment

Child height (cm) was obtained using a portable measuring board (accuracy ± .2cm; Shorr Productions, Olney MD), and weight (kg) was obtained using a digital scale (Tanita Electronic Scale, BWB-800 accuracy ±.2 lb, Arlington Heights, IL) that automatically averaged multiple measurements. Weight and height were assessed in light clothing. Triceps skin-fold measurements were obtained on each participant using calibrated skin fold calipers (Holtain Calipers, Chamberlain, United Kingdom; ±.2mm), and mid-arm circumference was assessed using a standard measuring tape. All measurements were taken over a period of two weeks by the same researcher trained in child and adult anthropometry who had reliability of assessments in excess of .80. Height measurements were taken twice, and measurements within 0.15 cm were repeated. Repeated height measurements with discrepancies greater than 0.15 cm were taken a third time and averaged if the third was within 0.15 cm of one of the prior measurements to attain the final measurement. The heights and weights were then used to calculate individual BMI, BMI percentile rankings and BMI z-scores using the Epi-Info Software program (release 4.3.0, 2006, CDC Atlanta GA). Triceps skin-fold z-scores were derived using the Epi-Info software and the acquired measurements. The Center for Disease Control 2000 standards were used. Participants were identified as at risk for overweight (greater than or equal to the 85th percentile but less than the 95th percentile) or overweight

(greater than the 95th percentile) following CDC standards (CDC, 2006). For statistical purposes, children were grouped into three categories being healthy (< 85th percentile), at risk for overweight (≥85th percentile, < 95th percentile) and overweight (≥95th percentile) for analyses of child weight status.

Behavioral Assessment

Parents of all participants were given a 65 item questionnaire to assess parenting style and food socialization behaviors. Items regarding perceived parental responsibility, concern about child's weight, restrictive eating practices and parental pressure to eat were taken from the Child Feeding Questionnaire (Birch, Fisher, Grimm-Thomas, Markey Sawyer, & Johnson, 2001). Questions regarding parental expectancy, food behavior consequences, parent rationale, preparation practices and food related discouragement were assessed using questions from the Cullen, Baranowski, Rittenberry, Cosart, Owens, Hebert, and de Moor questionnaire (2000). Parental food modeling practices were assessed using questions adapted from a second Cullen questionnaire (Cullen, Baranowski, Rittenberry, Cosart, Owens, Hebert, & de Moor, 2001). Questions from the Parenting Behavior Questionnaire-Head Start (Coolahan, McWayne, Fantuzzo, & Grim, 2002) were used to assess parenting styles defined as Active-Restrictive, Passive-Permissive and Active-Responsive. Sample questions, original Cronbach's alphas and derived Cronbach's alphas can be found in table 3. In addition, a complete questionnaire is included in the Appendix.

Statistical Methods

The anthropometric measurements and parenting questionnaires were entered into a general database using Microsoft Office Excel® 2000. The anthropometric and demographic data necessary for BMI interpretation were extracted from the database, and by using the Center for Disease Control's Epi-Info® program, along with the CDC's 2000 guidelines for BMI calculation, we obtained the BMI z-score for each child who completed assessment.

Prior to analysis, all missing questionnaire variables were imputed using the mean, so as to include responses of all participants (n=131). On the CFQ consisting of eight questions and 1048 data points, eleven missing values were imputed (1.0%), with no more than three missing data points from one question. For the Cullen questionnaire of thirty-four questions with 4454 responses, thirty-four missing values were imputed (0.77%) with no more than four missing values for an individual question. There were twenty-two questions taken from the PBQ-HS with 2882 responses possible. Of those possible, sixteen values were imputed (0.56%), with no more than three responses being imputed for one individual question. Additive subscales were used to derive scores for each parenting style and grouped food socialization behaviors.

BMI z-scores were correlated with demographic variables. For non-continuous variables, students t-tests and analyses of variance were conducted. Correlations were used to evaluate the association between parenting style, as obtained from the PBQ-HS additive subscales and the child BMI z-score. Similarly correlations were calculated between food socialization behavior subscales and BMI z-scores. Hierarchical regression

analyses were used to assess how the combination of food socialization behaviors and parenting practices predicted child weight using BMI z-scores while controlling for maternal education, paternal education, income and child health demographic variables. All analyses were conducted using the Statistical Package for the Social Sciences software (release 14.0, 2003, SPSS Inc., Chicago, IL). An *a priori* significance level was set at $p < 0.05$.

CHAPTER IV

FINDINGS

Of the mothers assessed, 59.5% (n=78) were white, and 40.1% (n=53) had received some college education or had graduated from college (table 1). In addition, most mothers (table 2) were married (50.0%, n=65), and participated in households with a combined income of $500 to $1499 US dollars per month (42.4%, n=53). Children participating in the study (table 2) had a mean age of 51.0 months, and a mean BMI of 16.5. Of the children, 19.1% (n=25) were considered at risk for overweight ($\geq 85^{th}$ percentile and $<95^{th}$ percentile), and 13.7% (n=18) were considered overweight ($\geq 95^{th}$ percentile) (table 2).

Demographic variables from maternal responses were correlated with child BMI z-scores in order to identify demographic responses that were linearly associated with increasing child weight status (table 4). Maternal education level was not significantly correlated with child BMI z-scores; however, paternal education level was significantly correlated with child BMI z-scores ($r = .263$, $p < .01$). Household income was significantly correlated with paternal education level ($r = .299$, $p < .01$), but was not significantly related to child BMI z-score. Report by parents of children as being 'more healthy' when compared with peer counterparts was related to increased maternal and paternal education levels ($r = .312$, $p < .01$, $r = .188$, $p < .05$ respectively), as well as

elevated household income levels (r = .238, $p < .01$). Children who reported being 'more healthy' also exhibited increased BMI z-scores (r = .198, $p < .05$). BMI z-scores did not differ depending on maternal ethnicity (F = 1.056, $p > .05$, table 4b). There was a significant difference in maternal concern about child weight depending on child gender (F = 2.423, $p < .05$, table 4c). In a post-hoc Tukey's test, white mothers differed significantly in concern for weight of child as compared with Hispanic counterparts. White mothers were more likely to be concerned about their child's weight ($\bar{\mu}_d = .989$, $p = .014$). In addition white mothers were more likely to display discouraging food socialization behaviors to their child (F = 2.423, $p < .05$), when compared with Hispanic mothers ($\bar{\mu}_d = 1.77$, $p = .04$; White maternal concern $\bar{\mu} = 4.68$, Hispanic maternal concern $\bar{\mu} = 3.91$).

Additive subscales derived from the PBQ-HS were correlated with grouped food socialization variables from the other questionnaires (table 5). Parents who reported more active-responsive parenting practices were also more likely to show increased parental inclusion of fruits, vegetables, lean meats and low fat milk in meals or snacks prepared for the child (r = .246, $p < .01$). Parents with higher active-responsive behavior also, on average, reported more positive food modeling practices through the inclusion of fruit and vegetables in parental meals eaten with the child (r = .207, $p < .05$). In regards to verbal food socialization techniques, these parents tended to use positive reinforcement to encourage child consumption of a certain food through the use of phrases similar to "a child should eat this food because it is good for him/her," and "a child should eat this food because it will make him/her grow," (r = .156, $p < .10$).

Mothers with increased subscale scores deemed active-restrictive were more likely to use negative reinforcement in dictating child food consumption. Active-restrictive mothers were more likely to take away privileges, force a child to eat or give them dessert if they would consume a certain food ($r = .248$, $p < .01$). In regards to verbal food socialization cues, active restrictive mothers also tended to dictate child consumption through discouragement. These mothers would more likely use phrases, such as; "a child should not eat these foods because they are not healthy," "this food will make you fat," or "this food will make you sick," in order to dissuade child consumption of a certain food ($r = .242$, $p < .01$). In addition, active-restrictive mothers were also more likely to be concerned about their child's weight ($r = .241$, $p < .01$).

Mothers exhibiting higher passive-permissive style behaviors were less likely to feel responsible for child feeding ($r = -.207$, $p < .05$). As passive-permissive scores increased, mothers were less likely to promote positive food consumption through modeling of healthy food consumption and were less likely to prepare fruits, vegetables, lean meats and low-fat milk in meals or snacks. ($r = -.239$, $p < .01$). In addition, these mothers were less likely to provide adequate modeling for consumption of these foods, due to decreased consumption by parents of fruits and vegetables in meals eaten with the children ($r = -.226$, $p < .01$).

Correlations between parenting style subscales and BMI z-scores, height and weight did not show significant linear correlations. The pattern of relations differed only slightly between BMIz scores and grouping children by overweight status. However, food socialization behaviors such as maternal discouragement did show some direct correlation to child BMI z-scores and anthropometric measurements. Mothers who

reported using more verbally negative cues to dissuade food consumption by the child were more likely to have children with increased BMI z-scores ($r = .175$, $p < .05$), and increased arm circumference ($r = .189$, $p < .05$) and/or have children diagnosed as at risk for overweight or overweight ($r = .270$, $p < .01$). Mothers who are more concerned about their child's weight tend to be mothers with children who have an increased BMI z-score ($r = .360$, $p < .01$), increased arm circumference ($r = .333$, $p < .01$), increased height ($r = .189$, $p < .05$) and/or are more likely be considered at risk for overweight or overweight ($r = .305$. $p < .01$).

Research suggests that maternal feeding practices and food socialization behaviors may be specific to child gender. Using student's standardized t-tests, we found no significant difference between the BMI z-scores of females and males (table 7). Similarly, no differences were found in overall child health between female and male children as reported by parents. Also parents did not display differences in parenting style associated with gender of their child. Food socialization behaviors, such as parental modeling and food preparation practices, did not differ based on child gender; however, food socialization behaviors such as restriction and weight concern did differ depending on child gender. Mothers of male children were less likely to be concerned about child weight as compared with mothers of female counterparts ($t = -2.865$, $p = .005$). Also mothers of male children were more likely to restrict behavior in regards to food intake ($t = 1.817$, $p = .072$); however, this difference only approaches statistical significance.

Separate gender specific correlations were conducted between parenting practices food socialization behaviors and BMI z-scores, arm circumference and weight groups (table 8a males, table 8b females). For mothers of male participants, maternal responses

to concern about weight were significantly correlated with child BMI z-scores, arm circumference and weight group (r = .403, $p < .001$, r = .436, $p < .001$, r = .459, $p < .001$, respectively). Other parenting practices and food socialization behaviors did not show association with BMI z-scores. Mothers with male children did show more discouraging behavior to child consumption when the male child was considered at risk for overweight or overweight (r = .294, $p < .05$).

Mothers of female children showed similar increase in concern for child weight when BMI z-score was increased (r = .375, $p < .01$). Mothers of female children assumed more parental responsibility for feeding as child BMI z-score increased, (r = .324, $p < .05$), differing from male associated counterparts. Also mothers of female children displayed more positive verbal reinforcement associated with increased expectancies as a female child's BMI z-score increased (r = .270, $p < .05$). It is important to note that as a female child was considered at risk for overweight or overweight, mothers would be more likely to use discouragement as a means to dissuade from eating particular foods (r = .240, $p < .10$, r = .242, $p < .10$, respectively); these associations are exploratory and are merely approaching statistical significance.

Significant correlations between paternal education level, maternal concern for child weight, child energy status and child BMI z-scores were shown from analyses. In order to ascertain the effect of parenting style and food socialization behaviors on child BMI z-scores we controlled for these correlations in hierarchical regression (table 9). According to the regression models, parenting style and food socialization behaviors did not significantly predict variation in child BMI z-scores apart from paternal education level and maternal concern. However, in a model with just paternal education level,

maternal concern for child weight and child energy status, approximately 20% of the variance was accounted for with a high level of significance. When regression analyses were conducted separately for male and female children, significant differences resulted. For male children, paternal education level remained significant when evaluating the multi-variate interactions involving parenting style and food socialization behaviors (table 9a and 9b), while paternal education level did not significantly differ between the sexes. For males energy status in comparison to peers also significantly contributed to variation in BMI z-scores when parenting style and food socialization behaviors were analyzed collectively. This association was not apparent in regression analyses for female children. For females, perceived maternal responsibility is a significant variable in ascertaining variance in BMI z-scores, while in males maternal responsibility did not significantly contribute to variance in BMI z-scores. It is important to note, there were no differences between mean scores between boys and girls, except regarding maternal concern (table 7). For females and males, maternal concern for weight attributed to variance in BMI z-scores only when parenting style and demographics were combined, but when food socialization behaviors were added to the model, maternal concern no longer significantly contributed; however, maternal concern remained significant in the model when both boys and girls were included.

CHAPTER V

CONCLUSION

Summary

Of the 208 participants enrolled in this study, 131 mother-child dyads were selected based on completion of the questionnaires and child participation in the anthropometric assessment. Approximately 30% of child participants were identified as at risk for overweight, and overweight. This is consistent with current research in lower-income populations. In addition, this sample was taken from Head Start Centers and shows consistencies with previous research regarding income status, as a majority of the families reported earning between $500 to $1500 US dollars per month. Within this population of predominantly non-Hispanic white and Hispanic participants, there was a rather large percentage of individuals from Native American backgrounds (6.9%) compared with other studies. Also, approximately 40% of mothers and 31% of fathers had some post-secondary education or had graduated from college. There were no direct associations between any demographic contributor and child weight status.Our initial research question sought to detail the relationship between parenting style, as obtained from the PBQ-HS, and child weight status, in the form of age- and gender-adjusted BMI z-score. Within this sample there were no significant associations between active-responsive, active-restrictive, or passive-permissive parenting style and child BMI z-score. These results are similar to other cross-sectional studies (Brann & Skinner, 2005;

Chen & Kennedy, 2005). These studies did not utilize the PBQ-HS for determining parenting styles, but instead used the Parenting Practices Questionnaire, CFQ or Child Rearing Practice Report. There are currently no published studies assessing the correlation between the PBQ-HS and child weight status. The PBQ-HS is validated in low-income, predominantly urban African-American samples (Coolahan, McWayne, Fantuzzo and Grim, 2002). The scales were meant to identify general trends in parenting styles over a variety of domains. Constanzo and Woody (1985) suggest that parenting in regards to child feeding situations may be domain specific. Thus, parenting in child feeding may differ depending on perceived threats to normal child socialization. Ventura and Birch (2008) suggest that there is not a direct correlation between parenting style and child weight, but instead it is actualized by the way a parent responds to certain parenting situations, such as parenting practices. In addition, this pathway is mediated by child response to these cues, and in turn subsequent weight is affected. For this study child eating practices were not ascertained, so no mediation effects of dietary intake could be ascertained.

The second hypothesis concerns the specific parenting practices used by a parent to adequately socialize a child in feeding situations. The null hypothesis assumed that no parenting practice affects child weight status. When correlations were run, some associations were found. From the CFQ, we combined all practices, and then combined individual items into smaller categories labeled perceived parental responsibility, parental concern regarding weight, parental restriction and pressure to eat. Among all CFQ subscales, only parental concern about child weight directly correlated with weight status. This direct linear correlation suggests that as a child's BMI z-score increases, then

parental concern regarding child weight increases. Since the design of this study is cross-sectional, we cannot assign causality to the relationship. Previous research suggests that parents become more concerned when a child is overweight, but evidence is contradictory. However, research has shown that increasing parental concern about a child weight can influence other parenting practices. Costanzo and Woody (1985) suggest that in the case of overweight children, parental concern can increase and food providers can react by increasing maladaptive parenting practices such as restriction. The research suggests increased maternal concern for child weight is associated with increased child weight, and furthermore increased concern can be associated with more instances of active-restrictive parenting. However, active-restrictive parenting itself is not directly related to child weight status, suggesting some factors outside the scope of this study may influence the relation between these variables. No other associations could be drawn between other CFQ parenting practices and child weight status.

Additional subscales from the questionnaire were used to assess the effect of other aspects of parenting behavior and their effect on child weight. Upon analysis, there were no significant correlations between parental expectancies, consequences and child weight status. However, there was a significant positive correlation between parental discouragement and child weight status. The research suggests that, in general, parents of children with elevated BMI z-scores tend to display more discouraging parenting practices regarding child intake. These parents are more likely to dissuade a child from eating a food based on negative food cues. These parents prohibit intake by using prompts such as, “this food will make you sick,” or “this food will make him/her fat.” These results are similar to those published by Drucker et al. (1999). Drucker and

colleagues found that maternal control is often expressed by either positive reinforcement or negative discouraging practices. In the observational study, parents who used discouraging practices were more likely to have children with increased energy intakes in feeding scenarios. This study was short term, but if allowed to persist one might assume that increases above normal intake would lead to elevated weight status. Due to cross-sectional design, however, our research cannot assume causality, but instead only assert that parental discouragement is in some way related to elevated child weight status.

The final questionnaire used to examine parenting practices was developed by Cullen and colleagues (2). In addition to specific questions directly taken from the questionnaire, similar questions not directly addressed in the aforementioned study were adapted for use in this study. Cronbach's alphas for the grouped questions, including questions for this study, were similar, but lower, to ones reported at validation (table 3 of this study; validation Cullen 2). This second questionnaire assessed parental fruit, vegetable and dairy preparation practices, as well as parental fruit, vegetable and dairy modeling practices. No correlation was established between increased parental fruit, vegetable and dairy preparation techniques, or their frequency of inclusion during meals. Also, no significant association was established between increased fruit, vegetable and dairy inclusion in daily diet. However both measures are self-reported and depend on the degree to which a child responds to these preparation and modeling techniques. These results are inconsistent with previous research which suggests that parental preparation and modeling practices have some effect on child eating and eventual weight status. One reason for no direct correlation could be due to the lack of child eating variables ascertained in this study. The previous research predominantly focuses on the use of

these cues on child eating outcomes (Harper & Sanders, 1975), and assumed these cues led to eventual deviations in weight status. However, with cross-sectional design we can say that these practices do not influence weight at this age, but with prolonged positive parental modeling and preparation techniques weight status could be affected. Further longitudinal studies; however, would be necessary to draw such a conclusion.

Our research, also suggests differences in maternal concern regarding child weight based on gender, but parenting style in relation to male and female children is not significantly different. However, the means by which the parenting influences and attributes to child weight status does differ based on child gender. Research has suggested some differences based on child gender, but further specific analysis is needed to quantify distinct differences.

Methodological Limitations

The study of parenting styles, parenting practices, food socialization behaviors and child weight has been in progress for over thirty years; however, there is still an inconsistent use of terminology and methodology across a majority of the studies used. Parenting styles and parenting practices, although similar, are distinctly different constructs yet are often used interchangeably in the literature. In addition, within the construct of parenting styles several different terms are used interchangeably. Parenting styles regarding food intake are often attained from the use of standardized measures such as the General Parental Control Scale (Baumrind, 1971) or the Caregivers' Feeding Style Questionnaire (Hughes, 2005). Several other tools are used, in regards to parenting style in food intake with different labels assigned to parenting style. In addition to

different classifications, these other tools also increase the difficulty of comparing results across studies.

Another problem in associating parenting styles with child weight is the measure of child weight itself. Weight status is often associated with Body Mass Index (BMI) of the child, but can also include other measures of child obesity. BMI itself is prone to methodological concerns. It can be highly variable depending on child stature. Research suggests that BMI in children may not always be associated with adiposity, (Dietz & Bellizzi, 1999). Not all studies utilize BMI as an indicator of child weight status, making comparisons among studies difficult. Studies use other accepted measures of child body composition as a measure for obesity. These tools range from skin fold analysis and Bioelectrical Impedance Analysis (BIA) to Dual X-ray Absorptiometry (DXA) which is considered the gold standard. The precision and validity can vary considerably based on the assessment used.

Based on this research, there is no significant correlation between parenting styles, as obtained from the PBQ-HS, and BMI z-scores. Limitations of this study did not fully account for the domain specificity of feeding style. Some tools developed specifically for this purpose include the General Parental Control Scale (Baumrind, 1971) and the Caregivers' Feeding Style Questionnaire (Hughes et al., 2006). These tools account for domain specificity and could more adequately ascertain associations if present. Also, current research suggests that parental effects on child weight are mediated by child eating practices. To fully account for this mediator, research should have accounted for child eating practices and intake, especially due to the cross-sectional nature of this study.

Implications for Future Research and Practice

Increasing obesity among children is a growing public health concern and this study adds to the current body of research analyzing the effect of parenting styles on elevated child weight status. Overall, a majority of the research in this area suggests significant evidence for an association between parenting styles and child weight. Our exploratory study suggests some of these significant associations, and also indicates some areas necessary for future research and development of intervention programs. Future research should focus on causal outcomes of prolonged exposure to specific parenting styles. A predominant limitation of this study was the cross-sectional nature of its design. Therefore, employing longitudinal studies would only strengthen the ability to discern causal effects. At this point, only one study (Rhee et al., 2006) shows a longitudinal design, and the results of that study do suggest a strong association between parenting style and eventual weight status in these low-income young children. However, this study failed to include validated questionnaire measures, and ascertained parenting style by means of coded observation in play sessions.

This lack of similarity suggests another implication for future research. A multitude of terms and tools used to ascertain parenting style may prove counterproductive in future research. Validation of tools for parenting styles and development of a gold-standard in parenting style assessment regarding feeding situations is necessary to discern future associations. In addition the classification of parenting styles and practices is also complicated by variation in terminology used. By using standardized terminology, evidence from multiple studies could be easily analyzed and compared.

Several ideas implicit in this research suggest the need to further examine some aspects of parenting and how it effects child weight. One relation noted in the current research is the significant positive correlation between paternal education level and child BMI z-score. Traditionally, parental education level was thought to have an inverse correlation with child weight, and often it is controlled accordingly. However, some current research suggests this is not always present (Dieu et al., 2007). This finding conflicts with other published research, and may only be present in low-income populations. However, this may be a contemporary issue and there is enough supporting evidence to suggest this is not a spurious conclusion. The means by which paternal education level relates to child weight status, apart from household income, needs further analysis and study in order to determine the mechanism of action.

Future intervention programs may need to ascertain parenting styles and encourage use of parenting behaviors that are associated authoritative parenting practices. Also, these intervention strategies need to examine child eating techniques and encourage the proper adoption of child self-control in feeding situations. Due to lack of evidence regarding parenting style and the exclusion of child consumption within this study, specific intervention strategies regarding these practices cannot be determined. Further research is necessary before adequate strategies can be developed.

REFERENCES

Addessi, E., Galloway, A. T., Visalberghi, E., & Birch, L. L. (2005). Specific Social Influences on the Acceptance of Novel Foods in 2-5-year-old Children. *Appetite, 45*(3), 264-271.

Allison, D. B., Kaprio, J., Korkeila, M., Koskenvuo, M., Neale, M. C., & Hayakawa, K. (1996). The heritability of body mass index among an international sample of monozygotic twins reared apart. *International Journal of Obesity, 20*(6), 501-506.

Anderson, C. B., Hughes, S. O., Fisher, J. O., & Nicklas, T. A. (2005). Cross-cultural Equivalence of Feeding Beliefs and Practices: the Psychometric Properties of the Child Feeding Questionnaire among Blacks and Hispanics. *Prev Med, 41*(2), 521-531.

Anliker, J. A., Laus, M. J., Samonds, K. W., & Beal, V. A. (1992). Mothers Reports of Their 3-year-old Children's Control Over Foods and Involvement in Food-Related Activities. *Journal of Nutrition Education, 24*(6), 285-291.

Arredondo, E. M., Elder, J. P., Ayala, G. X., Campbell, N., Baquero, B., & Duerksen, S. (2006). Is Parenting Style Related to Children's Healthy Eating and Physical Activity in Latino families? *Health Education Research, 21*(6), 862-871.

Baker, E.R. (2008). The Effect of Parenting Practices, Food Socialization Behaviors and Type of Food Provider on Body Mass Index in a National Sample of Fifth Grade Children. Unpublished manuscript. Oklahoma State University, Stillwater, OK.

Baughcum, A.E., Chamberlin, L.A., Deeks, C.M., Powers, S.W., & Whitaker, R.C. (2000). Parental perceptions of overweight preschool children. *Pediatrics, 106,* 1380-1386.

Baumrind, D. (1971). Current Patterns of Parental Authority. *Developmental Psychology, 4*(1), 1-103.

Benton, D. (2004). Role of Parents in the Determination of the Food Preferences of Children and the Development of Obesity. *International Journal of Obesity, 28*(7), 858-869.

Birch, L. L. (1998). Development of Food Acceptance Patterns in the First Years of Life. *Proceedings of the Nutrition Society, 57*(4), 617-624.

Birch, L. L. (2006). Child Feeding Practices and the Etiology of Obesity. *Obesity*, *14*(3), 343-344.

Birch, L. L., & Deysher, M. (1985). Conditioned and Unconditioned Caloric Compensation - Evidence for Self-Regulation of Food-Intake in Young-Children. *Learning and Motivation, 16*(3), 341-355.

Birch, L.L. & Deysher, M. (1986). Caloric compensation and sensory specific satiety: evidence for self regulation of food intake by young children. *Appetite,* (4), 323-331.

Birch, L. L., Deysher, M., & Kennedy, C. (1984). The Effect of Macronutrient Load on Satiety and Allesthesia in Young-Children. *Federation Proceedings, 43*(4), 1058-1058.

Birch, L. L., & Fisher, J. A. (1995). Appetite and Eating Behavior in Children. *Pediatric Clinics of North America, 42*(4), 931-953.

Birch, L. L., & Fisher, J.A. (1998). Development of Eating Behaviors among Children and Adolescents. *Pediatrics, 101*(3), 539-549.

Birch, L. L., & Fisher, J. O. (2000). Mothers' Child-Feeding Practices Influence Daughters' Eating and Weight. *American Journal of Clinical Nutrition, 71*(5), 1054-1061.

Birch, L. L., Fisher, J. O., & Davison, K. K. (2003). Learning to Overeat: Maternal Use of Restrictive Feeding Practices Promotes Girls' Eating in the Absence of Hunger. *American Journal of Clinical Nutrition, 78*(2), 215-220.

Birch, L. L., Fisher, J. O., Grimm-Thomas, K., Markey, C. N., Sawyer, R., & Johnson, S. L. (2001). Confirmatory Factor Analysis of the Child Feeding Questionnaire: a Measure of Parental Attitudes, Beliefs and Practices about Child Feeding and Obesity Proneness. *Appetite, 36*(3), 201-210.

Birch, L.L, Johnson, S.L., Andresen, G., Peters, J.C. & Schulte, M.C. (1991). The variability of young children's energy intake. *New England Journal of Medicine. 324*(4), 232-235.

Birch, L. L., Johnson, S. L., & Fisher, J. A. (1995). Children's Eating - the Development of Food-Acceptance Patterns. *Young Children, 50*(2), 71-78.

Birch, L. L., McPhee, L., Shoba, B. C., Steinberg, L., & Krehbiel, R. (1987). 'Cleand Up Your Plate' - Effects of Child Feeding Practices on the Conditioning of Meal Size. *Learning and Motivation, 18*(3), 301-317.

Birch, L. L., Zimmerman, S. I., & Hind, H. (1980). The Influence of Social-Affective Context on the Formation of Children's Preferences. *Child Development, 51*(3), 856-861.

Boutelle, K. N., Fulkerson, J. A., Neumark-Sztainer, D., Story, M., & French, S. A. (2007). Fast Food for Family Meals: Relationships with Parent and Adolescent Food Intake, Home Food Availability and Weight Status. *Public Health Nutrition, 10*(1), 16-23.

Brann, L. S., & Skinner, J. D. (2005). More Controlling Child-Feeding Practices Are Found Among Parents of Boys with an Average Body Mass Index Compared with Parents of Boys with a High Body Mass Index. *Journal of the American Dietetic Association, 105*(9), 1411-1416.

Brewis, A. (2003). Biocultural Aspects of Obesity in Young Mexican Schoolchildren. *American Journal of Human Biology, 15*(3), 446-460.

Cecil, J. E., Palmer, C. N. A., Wrieden, W., Murrie, I., Bolton-Smith, C., Watt, P., et al. (2005). Energy intakes of children after preloads: adjustment, not compensation. *American Journal of Clinical Nutrition, 82*(2), 302-308.

Center for Disease Control. (2006). Overweight and Obesity: Defining Overweight and Obesity [Electronic Version]. Retrieved February 13, 2007 from http://www.cdc.gov/nccdphp/dnpa/obesity/defining.htm.

Chamberlin, L. A., Sherman, S. N., Jain, A., Powers, S. W., & Whitaker, R. C. (2002). The challenge of preventing and treating obesity in low-income, preschool children - Perceptions of WIC health care professionals. *Archives of Pediatrics & Adolescent Medicine, 156*(7), 662-668.

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

Chen, J.L. & Kennedy, C. (2005). Factors associated with obesity in Chinese-American children. *Pediatric Nursing, 31,* 110-115.

Cooke, L. J., & Wardle, J. (2005). Age and gender differences in children's food preferences. *British Journal of Nutrition, 93*(5), 741-746.

Coolahan, K., McWayne, C., Fantuzzo, J., & Grim, S. (2002). Validation of a Multidimensional Assessment of Parenting Styles for Low-income African-American Families with Preschool Children. *Early Childhood Research Quarterly, 17,* 356-373.

Costanzo, P. R., & Woody, E. Z. (1985). Domain Specific Parenting Styles and Their Impact on the Child's Development of Particular Devience: the Example of Obesity Proneness. *Journal of Social and Clinical Psychology, 3*, 425-445.

Cullen, K.W., Baranowski, T., Rittenberry, L., Cosart, C., Owens, E., Hebert, D., & de Moor, C. (2000) Socioenvironmental Influences on Children's Fruit, Juice and Vegetable Consumption as Reported by Parents: Reliability and Validity of Measures. *Public Health Nutrition, 3*(3), 345-356.

Dieu, H.T.T., Dibley M.J., Sibbritt D. & Hanh T.T.M. (2007). Prevalence of overweight and obesity in preschool children and associated socio-demographic factors in Ho Chi Minh City, Vietnam. *International Journal of Pediatric Obesity, 2* (1) 40-50.

Drucker, R. R., Hammer, L. D., Agras, W. S., & Bryson, S. (1999). Can Mothers Influence Their Child's Eating Behavior? *Journal of Developmental and Behavioral Pediatrics, 20*(2), 88-92.

Duke, R. E., Bryson, S., Hammer, L. D., & Agras, W. S. (2004). The relationship between parental factors at infancy and parent-reported control over children's eating at age 7. *Appetite, 43*(3), 247-252.

Faith, M. S., Keller, K. L., Johnson, S. L., Pietrobelli, A., Matz, P. E., Must, S., et al. (2004). Familial Aggregation of Energy Intake in Children. *American Journal of Clinical Nutrition, 79*(5), 844-850.

Faith, M. S., Rha, S. S., Neale, M. C., & Allison, D. B. (1999). Evidence for genetic influences on human energy intake: Results from a twin study using measured observations. *Behavior Genetics, 29*(3), 145-154.

Field, A. E., Gillman, M. W., Rosner, B., Rockett, H. R., & Colditz, G. A. (2003). Association between fruit and vegetable intake and change in body mass index among a large sample of children and adolescents in the United States. *International Journal of Obesity, 27*(7), 821-826.

Fisher, J. O., & Birch, L. L. (1995). Fat Preferences and Fat Consumption of 3-Year-Old to 5-Year-Old Children are Related to Parental Adiposity. *Journal of the American Dietetic Association, 95(*7), 759-764.

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

Fisher, J. O., Birch, L. L., Smiciklas-Wright, H., & Picciano, M. F. (2000). Breast-feeding through the first year predicts maternal control in feeding and subsequent toddler energy intakes. *Journal of the American Dietetic Association, 100*(6), 641-646.

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

Flegal, K. M., Ogden, C. L., Wei, R., Kuczmarski, R. L., & Johnson, C. L. (2001). Prevalence of overweight in US children: comparison of US growth charts from the Centers for Disease Control and Prevention with other reference values for body mass index. *American Journal of Clinical Nutrition, 73*(6), 1086-1093.

Francis, L.A., & Birch, L.L. (2005). Maternal weight status modulates the effects of restriction on daughters' eating and weight. *International Journal of Obesity, 29,* 942-949.

Francis, L.A., Hofer, S.M. & Birch, L.L. (2001). Predictors of maternal child-feeding style: maternal and child characteristics. *Appetite, 37,* 231-243.

Gable, S., & Lutz, S. (2000). Household, Parent, and Child Contributions to Childhood Obesity. *Family Relations, 49*(3), 293-300.

Garn, S. M., Clark, D. C., Lowe, C. U., Forbes, G., Garn, S., Owen, G. M., et al. (1976). Trends in Fatness and the Origins of Obesity. *Pediatrics, 57*(4), 443-456.

Gazzaniga, J. M., & Burns, T. L. (1993). Relationship Between Diet Composition and Body Fatness, with Adjustment for Resting Enegry-Expenditure and Physical Activity, in Pre-Adolescent Children. *American Journal of Clinical Nutrition, 58*(1), 21-28.

Goran, M.I. & Sothern M.S. eds. *Handbook of Pediatric Obesity; Etiology, Pathophysiology, and Prevention.* (2005). Boca Raton, Florida: CRC Press, Taylor & Francis Group.

Harper, L. V., & Sanders, K. M. (1975). Effect of Adults Eating on Young Childrens Acceptance of Unfamiliar Foods. *Journal of Experimental Child Psychology, 20*(2), 206-214.

Hedley, A.A, Ogden, C.L., Johnson, C.L., Carroll, M.D., Curtin, L.R. & Flegal, K.M. (2004) Prevalence of Overweight and Obesity Among US Children, Adolescents, and Adults, 1999-2002. *Journal of the American Medical Association, 291,* 2847-2850.

Hoerr, S., Utech, A. E., & Ruth, E. (2005). Child Control of Food Choices in Head Start Families. *Journal of Nutrition Education and Behavior, 37*(4), 185-190.

Hood, M. Y., Moore, L. L., Sundarajan-Ramamurti, A., Singer, M., Cupples, L. A., & Ellison, R. C. (2000). Parental Eating Attitudes and the Development of Obesity in Children. The Framingham Children's Study. International Journal of Obesity and Related Metabolic Disorders : *Journal of the International Association for the Study of Obesity, 24*(10), 1319-1325.

Hu, W. T., Foley, T., Wilcox, R., Morgenstern, B. Z., & Juhn, Y. J. (2004). Prevalence and risk factors of overweight and obesity among head start enrollees in southeastern Minnesota between 1998 and 2001. *Pediatric Research, 55*(4), 222A-222A.

Hu, W. T., Foley, T. A., Wilcox, R. A., Kozera, R. M., Morgenstern, B. Z., & Juhn, Y. J. (2007). Childhood obesity among Head Start enrollees in southeastern Minnesota: Prevalence and risk factors. *Ethnicity & Disease, 17*(1), 23-28.

Hughes, S. O., Anderson, C. B., Power, T. G., Micheli, N., Jaramillo, S., & Nicklas, T. A. (2006). Measuring feeding in low-income African-American and Hispanic parents. *Appetite, 46*(2), 215-223.

Hughes, S.O., Power, T.G., Orlet Fisher, J., Mueller, S. Nicklas, T.A. (2005) Revisiting a Neglected Construct: Parenting Styles in a Child-Feeding Context. *Appetite, 44*, 83-92.

Iannotti, R. J., Obrien, R. W., & Spillman, D. M. (1994). Parental and Peer Influences on Food Consumption of Preschool African-American Children. *Perceptual and Motor Skills, 79*(2), 747-752.

Johannsen, D. L., Johannsen, N. M., & Specker, B. L. (2006). Influence of Parents' Eating Behaviors and Child Feeding Practices on Children's Weight Status. *Obesity, 14*(3), 431-439.

Johnson, S. L., & Birch, L. L. (1994). Parents and Children's Adiposity and Eating Style. *Pediatrics, 94*(5), 653-661.

Johnson, S.L., McPhee, L. & Birch L.L. (1991) Conditioned preferences: young children prefer flavors associated with high dietary fat. *Physiological Behavior. 50*(6), 1245-1251.

Johnson, S.L. & Taylor-Holloway, L.A. (2006). Non-Hispanic white and Hispanic elementary school children's self-regulation of energy intake. *American Journal of Clinical Nutrition. 83* (6), 1276-1282.

Klesges, R. C., Klem, M. L., Epkins, C. C., & Klesges, L. M. (1991). A Longitudinal Evaluation of Dietary Restraint and Its Relationship to Changes in Body-Weight. *Addictive Behaviors, 16*(5), 363-368.

Kral, T. V. E., & Faith, M. S. (2007). Child Eating Patterns and Weight Regulation: a Developmental Behaviour Genetics Framework. *Acta Paediatrica, 96*, 29-34.

Lissau, I., & Sorensen, T. I. A. (1994). Parental Neglect during Childhood and Increased Risk of Obesity in Young Adulthood. *Lancet, 343*(8893), 324-327.

Maccoby, E., & Martin, J. (1983). Socialization in the Context of the Family: Parent-Child Interaction. In E. Hetherington (Ed.), *Handbook of Child Psychology: Socialization, Personality and Social Development* (pp. 1-101). New York, NY: Wiley.

Matheson, D.M., Robinson, T.N., Varady, A. & Killen, J.D. (2006). Do Mexican-American mothers' food-related parenting practices influence their children's weight and dietary intake? *Journal of the American Dietetic Association, 106,* 1861-1865.

Maynard, L.M., Galuska, D.A., Blanck, H.M & Serdula, M.K. (2003) Maternal Perceptions of Weight Status of Children. *Pediatrics, 111*(5), 1226-1231.

Moens, E., Braet, C. & Soetens, B. (2007). Observation of family functioning at mealtime: A comparison between families of children with and without overweight. *Journal of Pediatric Psychology, 32,* 52-63.

Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of Overweight and Obesity in the United States, 1999-2004. *Journal of the American Medical Association, 295*(13), 1549-1555.

Patrick, H., Nicklas, T. A., Hughes, S. O., & Morales, M. (2005). The benefits of authoritative feeding style: caregiver feeding styles and children's food consumption patterns. *Appetite, 44*(2), 243-249.

Reilly, J. J. (2005). Descriptive epidemiology and health consequences of childhood obesity. *Best Practice & Research Clinical Endocrinology & Metabolism, 19*(3), 327-341.

Resnicow, K., DavisHearn, M., Smith, M., Baranowski, T., Lin, L. S., Baranowski, J., et al. (1997). Social-cognitive predictors of fruit and vegetable intake in children. *Health Psychology, 16*(3), 272-276.

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.

Ritchie, L. D., Ivey, S. L., Woodward-Lopez, G., & Crawford, P. B. (2003). Alarming trends in pediatric overweight in the United States. *Sozial-Und Praventivmedizin, 48*(3), 168-177.

Robinson, T. N., Kiernan, M., Matheson, D. M., & Haydel, K. F. (2001). Is parental control over children's eating associated with childhood obesity? Results from a population-based sample of third graders. *Obesity Research, 9*(5), 306-312.

Serdula, M. K., Ivery, D., Coates, R. J., Freedman, D. S., Williamson, D. F., & Byers, T. (1993). Do Obese Children Become Obese Adults? A Review of the Literature. *Preventive Medicine, 22*(2), 167-177.

Sobal, J. & Stunkard, A.J. (1989). Socioeconomic status and obesity: A review of the literature. *Psychological Bulletin [American Psychological Association], 105*(2), 260-275.

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

Subar, A. F., Ziegler, R. G., Patterson, B. H., Ursin, G., & Graubard, B. (1994). U.S. Dietary Patterns Associated with Fat Intake - The 1987National Health-Interview Survey. *American Journal of Public Health, 84*(3), 359-366.

Thomas, D. (1994) Like Father, like Son; Like Mother, like Daughter: Parental Resources and Child Height. *The Journal of Human Resources, 29*(4) 950-988.

Thomas, D., Strauss, J. & Henriques, M.H. (1991). How Does Mother's Education Affect Child Height? *The Journal of Human Resources, (26)*,2 , 183-211.

Troiano, R. P., & Flegal, K. M. (1998). Overweight children and adolescents: Description, epidemiology, and demographics. *Pediatrics, 101*(3), 497-504.

Ventura, A.K. & Birch, L.L. (2008). Does parenting affect children's eating and weight status? *International Journal of Behavioral Nutrition and Physical Activity, 5*(15) 1-15.

Wang, Y. & Zhang, Q. (2006) Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overweight and family income between 1971 and 2002. *American Journal of Clinical Nutrition, 84* (4), 707-716.

Wang, Y., Tussing, L., Odoms-Young, A., Braunschweig, C., Flay, B., Hedeker, D., et al. (2006). Obesity Prevention in Low Socioeconomic Status Urban African-American Adolescents: Study Design and Preliminary Findings of the HEALTH-KIDS Study. *European Journal of Clinical Nutrition, 60*(1), 92-103.

Wiecha, J. L., & Casey, V. A. (1994). High Prevalence of Overweight and Short Stature among Head Start Children in Massachusetts. *Public Health Reports, 109*(6), 767-773.

TABLES

TABLE 1. Parental Self-Reported Demographics

Variable	(Median), %	n
Maternal Ethnicity	(white)	131
White	59.5%	78
Native American	6.9%	9
Hispanic	16.8%	22
African American	9.9%	13
Multi-ethnic	4.6%	6
Other	2.3%	3
Paternal Ethnicity	(white)	126
White	50.8%	64
Native American	7.1%	9
Hispanic	15.9%	20
African American	19.8%	25
Multi-ethnic	1.6%	2
Other	4.8%	6
Maternal Education	(some college)	131
Less than 12th grade	19.4%	25
High School Diploma	19.4%	25
Some Vo-Tech	10.1%	13
Some College	24.8%	32
Vo-Tech Graduate	10.1%	13
College Graduate	16.3%	21
Paternal Education	(High School Grad)	110
Less than 12th grade	30.9%	34
High School Diploma	29.1%	32
Some Vo-Tech	6.4%	7
Some College	25.5%	28
Vo-Tech Graduate	2.7%	3
College Graduate	5.5%	6

TABLE 1. Parental Self-Reported Demographics (cont.)

Variable	(Median), %	n
Household Income (per month)	($1000-$1499)	125
$0-$499	16.0%	20
$500-$1499	42.4%	53
$1500-$2499	26.4%	33
$2500-$3499	9.6%	12
$3500-$3999	2.4%	3
$4000+	3.2%	4
Years of Financial Aid	(4 years)	131
5+ years of aid	26.0%	34
4 years	22.1%	29
3 years	16.8%	22
2 years	9.2%	12
1 year	6.1%	8
Less than one year	8.4%	11
No financial aid	11.5%	15
Marital Status	(single, non-married)	130
Married	50.0%	65
Single, Never Married	33.9%	44
Single, Divorced	6.9%	9
Other	9.2%	12

n = 131

TABLE 2. Child Demographics

Variable	Mean (%)	± SD	n
Child Age in Months	51.0	6.205	131
Body Mass Index	16.5	1.8	131
Weight (kg)	18.6	3.5	131
Height (cm)	105.8	5.9	131
Body Mass Index z- score Add boys and girls	0.62	1.03	131
Weight Status, (BMI)			
Healthy (<85th %)	67.2%		88
At-risk-for Overweight (≥85th %, <95th %)	19.1%		25
Overweight (≥95th %)	13.7%		18
Arm-Circumference (in)	7.1	0.7	128
Triceps Skin Fold (cm)	11.7	3.6	122
Less Healthy than Peers			131
Less Healthy	3.1%		4
Neither	19.8%		26
Similar to Peers	77.1%		101
Frequently Catches Disease			131
Catches Disease	28.3%		37
Neither	34.4%		45
Does not Catch Disease	37.4%		49
Child Has Limited Energy			131
Has limited Energy	3.8%		5
Neither	6.1%		8
Has similar Energy	90.1%		118
Has been/is Seriously Ill			
Has been Ill	29.0%		38
Never seriously ill	71.0%		93

N=131

TABLE 3. Means, Internal Consistencies, and Sample Sizes for questionnaire Subscales.

Questionnaire-Subscale, *'Example from Questionnaire'*	Scale Mean (SD)	Cronbach's α (Original Cronbach's α)	n (for α)
CFQ – Complete *'When your child is at home, how often are you responsible for feeding them?'*	26.9 (4.11)	0.43 (0.70-0.88)	8 (131)
CFQ – Perceived Responsibility *'How often are you responsible for deciding what your child's portion sizes are?'*	13.80 (1.73)	0.82 (0.88)	2 (131)
CFQ – Concern about Weight *'How concerned are you about your child becoming overweight?'*	1.81 (1.26)	n/a (0.75)	1 (131)
CFQ – Restriction *'I offer my child her favorite foods in exchange for good behavior?'*	5.78 (2.13)	0.32 (0.73)	2 (131)
CFQ – Pressure to Eat *'My child should always eat all of the food on her plate.'*	5.52 (2.17)	0.43 (0.70)	2 (131)
Cullen – Expectancies *'I tell my child to eat this food, because it is good for him/her.'*	15.6 (3.39)	0.88 (0.79)	5 (131)
Cullen – Consequences *'How often do you tell your child you will take them somewhere if they eat a food?'*	7.90 (2.04)	0.66 (0.79)	5 (131)
Cullen – Parent Rationale *'I check food labels for ingredients before purchasing a product for the first time.'*	4.39 (1.79)	0.88 (0.68)	2 (131)
Cullen[2] – Parent FJV Preparation *'How often do you include vegetables in your child's meals or snacks?'*	15.16 (2.27)	0.60 (0.73)	5 (131)
Cullen[2] – Parent FJV/LFF Modeling *'I eat vegetables when I am with my child.'*	18.35 (3.82)	0.82 (0.89)	6 (131)
Cullen – Discouragement *'How often do you tell your child a food is not healthy?'*	13.13 (3.44)	0.76 (0.77)	7 (131)

TABLE 3. Means, Internal Consistencies, and Sample Sizes for questionnaire Subscales, (continued)

Questionnaire-Subscale, *'Example from Questionnaire'*	Scale Mean (SD)	Cronbach's α (Original Cronbach's α)	n (for α)
PBQ-HS – Active-Responsive '*I show sympathy when my child is hurt.'*	32.58 (3.58)	0.77 (0.77)	9 (131)
PBQ-HS – Active-Restrictive *'I spank when my child is disobedient.'*	6.87 (1.92)	0.59 (0.77)	4 (131)
PBQ-HS – Passive-Permissive *'I find it difficult to discipline my child.'*	12.22 (3.36)	0.76 (0.77)	7 (131)

TABLE 4a. Correlations between Demographic Variables and BMI z-scores

	BMIz	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Maternal Education Level	.024							
(2) Paternal Education Level	.263**	.424**						
(3) Household Income	-.032	.141	.299**					
(4) Years of Financial Aid	-.037	-.172	-.056	-.014				
(5) Child is More Healthy	.198*	.312**	.188*	.238**	-.066			
(6) Child is More Likely to Catch Disease	-.103	.095	.229*	.256**	-.052	.149		
(7) Child Has Limited Energy	-.096	.278**	.092	.103	-.057	.392**	.099	
(8) Child has been seriously ill	.044	.012	.043	-.006	.055	-.250**	.023	-.401**

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

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

TABLE 4b. ANOVAs for demographic variables, parental responses to general child health and maternal ethnicity, (F-test).

Questionnaire-Subscale	Maternal Ethnicity
BMI z-score	1.056
Mid-Upper Arm Circumference	2.043+
My Child is less healthy.	.713
My child has limited Energy.	4.403***
My child has been seriously ill.	1.284
My child is more likely to catch a disease.	1.276
CFQ – Complete	1.151
CFQ – Perceived Responsibility	.677
CFQ – Concern about Weight	2.423*
CFQ – Restriction	.623
CFQ – Pressure to Eat	.542
Cullen – Expectancies	.620
Cullen – Consequences	1.486
Cullen – Parent Rationale	.831
Cullen[2] – Parent FJV Preparation	.825
Cullen[2] – Parent FJV/LFF Modeling	1.146
Cullen – Discouragement	2.119
PBQ-HS – Active-Responsive	.890
PBQ-HS – Active-Restrictive	1.257
PBQ-HS – Passive-Permissive	.573

+*p-value* significant 0.10

**p-value* significant 0.05

***p-value* significant 0.01

****p-value* significant 0.001

Table 4c. Post-hoc Tukey's results for significant ANOVAs (see table 4b) for demographic variables, parental responses to general child health and maternal ethnicity.

Dependent Variable	N	Mean	SD
Children with Limited Energy			
Native American	8	4.62[ab]	.74
African-American	13	4.92[a]	.28
Hispanic	22	3.91[b]	1.34
White	78	4.68[a]	.63
Multi-ethnic	6	4.83[ab]	.41
Other	3	4.00[ab]	1.00
Total	130	4.56	.84
Maternal Concern			
Native American	9	2.00[ab]	1.73
African-American	13	2.08[ab]	1.44
Hispanic	22	2.55[a]	1.64
White	78	1.56[b]	.99
Multi-ethnic	6	1.67[ab]	1.21
Other	3	1.67[ab]	.58
Total	131	1.81	1.26

[a] Same superscript letters denote groups with significantly similar means at the $p = 0.05$ level; those not showing similar letters have statistically different means at the $p = 0.05$ level.

N=131

TABLE 5. Correlations between Subscales and Parenting Styles

Questionnaire-Subscale	Active-Responsive	Active-Restrictive	Passive-Permissive
CFQ – Complete	-.068	.160	-.061
CFQ – Perceived Responsibility	-.009	-.071	-.207*
CFQ – Concern about Weight	-.002	.241**	.030
CFQ – Restriction	-.042	.096	.096
CFQ – Pressure to Eat	-.078	.125	-.069
Cullen – Expectancies	.156+	.168+	-.017
Cullen – Consequences	-.032	.248**	.144+
Cullen – Parent Rationale	.028	-.131	-.116
Cullen[2] – Parent FJV Preparation	.246**	-.151	-.239**
Cullen[2] – Parent FJV/LFF Modeling	.207*	-.080	-.226**
Cullen – Discouragement	-.050	.242**	-.112

+*p-value* significant 0.10

**p-value* significant 0.05

***p-value* significant 0.01

*****p-value* significant 0.001

TABLE 6. Correlations between Subscales and BMIz, Weight Group and Height.

Questionnaire-Subscale	BMIz	Height	Weight Group
CFQ – Complete	.048	-.019	-.038
CFQ – Perceived Responsibility	.043	-.022	-.044
CFQ – Concern about Weight	.360***	.189*	.305***
CFQ – Restriction	-.098	-.090	-.156+
CFQ – Pressure to Eat	-.057	-.040	-.062
Cullen – Expectancies	.039	-.087	.109
Cullen – Consequences	-.086	-.179*	-.115
Cullen – Parent Rationale	.082	-.111	.079
Cullen[2] – Parent FJV Preparation	-.004	-.129	-.092
Cullen[2] – Parent FJV/LFF Modeling	-.038	-.148+	-.006
Cullen – Discouragement	.175*	.078	.270**
PBQ-HS – Active-Responsive	.054	-.005	-.085
PBQ-HS – Active-Restrictive	.045	-.082	.071
PBQ-HS – Passive-Permissive	-.093	.014	-.046

+*p-value* significant 0.10

**p-value* significant 0.05

***p-value* significant 0.01

****p-value* significant 0.001

TABLE 7. Sex Differences. T-test for Equality of Means

Subscale, Item, or Weight Distinction	M/F	Mean	T statistic	*p-value*
CFQ – Complete	M	26.9	-.485	0.629
	F	26.8		
CFQ – Perceived Responsibility	M	13.7	-0.648	.518
	F	13.9		
CFQ – Concern about Weight	M	1.5	-2.865	.005
	F	2.2		
CFQ – Restriction	M	6.1	1.817	.072
	F	5.4		
CFQ – Pressure to Eat	M	5.6	.452	.652
	F	5.4		
Cullen – Expectancies	M	15.8	.674	.502
	F	15.4		
Cullen – Consequences	M	8.1	1.077	.386
	F	7.7		
Cullen – Parent Rationale	M	4.2	-1.184	.239
	F	4.6		
Cullen[2] – Parent FJV Preparation	M	15.0	-1.109	.269
	F	15.4		
Cullen[2] – Parent FJV/LFF Modeling	M	18.0	-1.081	.282
	F	18.7		
Cullen – Discouragement	M	13.5	1.515	.132
	F	12.6		
PBQ-HS – Active-Responsive	M	32.9	1.152	.251
	F	32.2		
PBQ-HS – Active-Restrictive	M	6.9	.022	.982
	F	6.9		

TABLE 7. Sex Differences. T-test for Equality of Means (continued)

Subscale, Item, or Weight Distinction	M/F	Mean (SD)	T statistic	*p-value*
PBQ-HS – Passive-Permissive	M	12.4	.739	.461
	F	12.0		
Child is More Healthy	M	4.2	-.485	.629
	F	4.3		
Child More likely to Catch Disease	M	3.2	.058	.954
	F	3.2		
Child Has limited Energy	M	4.6	.964	.337
	F	4.5		
Child has been seriously ill	M	1.8	.997	.321
	F	1.7		
BMI	M	16.6	.567	.572
	F	16.4		
BMIz	M	0.6	-.657	.512
	F	0.7		
Weight groups	M	1.5	.114	.909
	F	1.5		

Male, N=72,

Female, N=59

TABLE 8a. Correlations between Subscales and BMIz, Weight Group and Height. Selection, Sex Males.

Questionnaire-Subscale	BMIz	Height	Weight Group
CFQ – Complete	-.038	-.155	-.109
CFQ – Perceived Responsibility	-.080	-.148	-.125
CFQ – Concern about Weight	.403***	.186	.459***
CFQ – Restriction	-.080	-.160	-.157
CFQ – Pressure to Eat	-.111	-.099	-.161
Cullen – Expectancies	-.116	-.039	-.039
Cullen – Consequences	-.146	-.269*	-.184
Cullen – Parent Rationale	-.011	-.148	-.017
Cullen[2] – Parent FJV Preparation	.034	-.168	-.023
Cullen[2] – Parent FJV/LFF Modeling	.023	-.143	.026
Cullen – Discouragement	.176	.053	.294**
PBQ-HS – Active-Responsive	.123	-.029	-.055
PBQ-HS – Active-Restrictive	.012	-.156	.106
PBQ-HS – Passive-Permissive	-.154	.057	-.122

Male, N=72,

Female, N=59

+*p-value* significant 0.10

**p-value* significant 0.05

***p-value* significant 0.01

****p-value* significant 0.001

TABLE 8b. Correlations between Subscales and BMIz, Weight Group, and Height. Selection, Sex Females.

Questionnaire-Subscale	BMIz	Height	Weight Group
CFQ – Complete	.211	.165	.052
CFQ – Perceived Responsibility	.324*	.207	.088
CFQ – Concern about Weight	.375**	.250+	.213
CFQ – Restriction	-.116	-.030	-.164
CFQ – Pressure to Eat	.044	.032	.061
Cullen – Expectancies	.270*	.207	.253+
Cullen – Consequences	.065	-.049	-.012
Cullen – Parent Rationale	.231+	-.05	.192
Cullen[2] – Parent FJV Preparation	-.088	-.068	-.175
Cullen[2] – Parent FJV/LFF Modeling	-.174	-.147	-.047
Cullen – Discouragement	.210	.095	.240+
PBQ-HS – Active-Responsive	-.060	.013	-.128
PBQ-HS – Active-Restrictive	.113	.008	.031
PBQ-HS – Passive-Permissive	.025	-.054	.049

Male, N=72,

Female, N=59

+*p-value* significant 0.10

**p-value* significant 0.05

***p-value* significant 0.01

****p-value* significant 0.001

Table 9. Hierarchical Regression Results including Demographics, Parenting Style and Food Socialization. Outcome = BMI z-scores.

	Regression Model 1 *Demographic (Controls)*		**Regression Model 2** *Parenting Styles*		**Regression Model 3** *Food Socialization*	
Variable	Stndized β	*P*-value	Stndized β	*P*-value	Stndized β	*P*-value
Block 1						
Paternal Education Level	.292	.001	.289	.002	.270	.007
Maternal Concern for Weight	.347	.000	.350	.000	.363	.001
Child with Limited Energy	-.044	.630	-.071	.468	-.067	.506
Block 2						
Active-Responsive	-	-	.037	.685	.043	.661
Active-Restrictive	-	-	-.064	.500	-.065	.524
Passive-Permissive	-	-	-.066	.460	-.081	.407
ΔR^2	-	-	*.010*	-	-	-
Block 3						
Perceived Responsibility	-	-	-	-	-.018	.854
Expectations	-	-	-	-	.087	.381
Consequences	-	-	-	-	-.131	.194
Parental Rationale	-	-	-	-	.021	.837
FJV Preparation Practices	-	-	-	-	-.006	.964
Parental FJV modeling	-	-	-	-	-.142	.246
Parental Discouragement	-	-	-	-	.000	.995
ΔR^2	-	-	-	-	*.035*	-
R^2	.199***	-	.208***	-	.243**	-

Note: N=131. Standardized regression coefficients.

* $p < 0.05$, two-tailed test.

** $p < 0.01$, two-tailed test.

*** $p < 0.001$, two-tailed test.

Table 9a. Hierarchical Regression Results. Outcome = BMI z-scores. Sex = Males.

	Regression Model 1		**Regression Model 2**		**Regression Model 3**	
	Demographic (Controls)		*Parenting Styles*		*Food Socialization*	
Variable	Stndized β	*P*-value	Stndized β	*P*-value	Stndized β	*P*-value
Block 1						
Paternal Education Level	.322	.008	.325	.009	.294	.038
Maternal Concern for Weight	.310	.024	.265	.060	.210	.169
Child with Limited Energy	-.170	.209	-.273	.077	-.341	.049
Block 2						
Active-Responsive	-	-	.036	.770	.090	.568
Active-Restrictive	-	-	-.133	.308	-.173	.227
Passive-Permissive	-	-	-.171	.168	-.221	.104
ΔR^2	-	-	*.037*	-	-	-
Block 3						
Perceived Responsibility	-	-	-	-	-.164	.253
Expectations	-	-	-	-	-.169	.302
Consequences	-	-	-	-	.004	.981
Parental Rationale	-	-	-	-	-.046	.744
FJV Preparation Practices	-	-	-	-	.047	.800
Parental FJV modeling	-	-	-	-	-.069	.707
Parental Discouragement	-	-	-	-	.046	.778
ΔR^2	-	-	-	-	*.055*	-
R^2	.282***	-	.319**	-	.373*	-

Note: N=72. Standardized regression coefficients.

* $p < 0.05$, two-tailed test.

** $p < 0.01$, two-tailed test.

*** $p < 0.001$, two-tailed test.

Table 9b. Hierarchical Regression Results. Outcome = BMI z-scores. Sex = Females.

	Regression Model 1 *Demographic (Controls)*		**Regression Model 2** *Parenting Styles*		**Regression Model 3** *Food Socialization*	
Variable	Stndized β	*P*-value	Stndized β	*P*-value	Stndized β	*P*-value
Block 1						
Paternal Education Level	.208	.133	.189	.205	.218	.172
Maternal Concern for Weight	.385	.006	.377	.012	.141	.451
Child with Limited Energy	.115	.406	.142	.362	.036	.819
Block 2						
Active-Responsive	-	-	-.007	.958	-.045	.752
Active-Restrictive	-	-	.040	.794	.054	.728
Passive-Permissive	-	-	-.064	.665	.048	.755
ΔR^2	-	-	*.005*	-	-	-
Block 3						
Perceived Responsibility	-	-	-	-	.322	.045
Expectations	-	-	-	-	.245	.106
Consequences	-	-	-	-	.000	.997
Parental Rationale	-	-	-	-	.175	.272
FJV Preparation Practices	-	-	-	-	.087	.625
Parental FJV modeling	-	-	-	-	-.215	.232
Parental Discouragement	-	-	-	-	.063	.678
ΔR^2	-	-	-	-	*.205*	-
R^2	.184*	-	.188	-	.393	-

Note: N=59. Standardized regression coefficients.

* $p < 0.05$, two-tailed test.

** $p < 0.01$, two-tailed test.

*** $p < 0.001$, two-tailed test.

Table 10. Hierarchical Regression Results. Outcome = BMI z-scores.

	Regression Model 1 *Demographic (Controls)*		**Regression Model 2** *Parenting Styles*		**Regression Model 3** *Food Socialization*	
Variable	Stndized β	*P*-value	Stndized β	*P*-value	Stndized β	*P*-value
Block 1						
Paternal Education Level	.267	.001	.263	.004	.253	.012
Maternal Concern for Weight	.354	.000	.360	.000	.375	.000
Child is More Healthy	.118	.182	.109	.232	.085	.370
Block 2						
Active-Responsive	-	-	.010	.916	.016	.869
Active-Restrictive	-	-	-.029	.753	-.036	.716
Passive-Permissive	-	-	-.064	.473	-.081	.404
ΔR^2	-	-	*.005*	.886	-	-
Block 3						
Perceived Responsibility	-	-	-	-	-.017	.865
Expectations	-	-	-	-	.092	.353
Consequences	-	-	-	-	-.120	.237
Parental Rationale	-	-	-	-	.021	.839
FJV Preparation Practices	-	-	-	-	-.010	.935
Parental FJV modeling	-	-	-	-	-.132	.280
Parental Discouragement	-	-	-	-	-.017	.865
ΔR^2	-	-	-	-	*.030*	.792
R^2	.210***	.000	.215***	.000	.246**	.008

Note: N=131. Standardized regression coefficients.

* $p < 0.05$, two-tailed test.

** $p < 0.01$, two-tailed test.

*** $p < 0.001$, two-tailed test.

Table 10a. Hierarchical Regression Results. Outcome = BMI z-scores. Sex = Males.

	Regression Model 1 *Demographic (Controls)*		**Regression Model 2** *Parenting Styles*		**Regression Model 3** *Food Socialization*	
Variable	Stndized β	*P*-value	Stndized β	*P*-value	Stndized β	*P*-value
Block 1						
Paternal Education Level	.319	.008	.327	.009	.293	.040
Maternal Concern for Weight	.383	.002	.388	.002	.381	.004
Child is More Healthy	.096	.414	.091	.472	.036	.803
Block 2						
Active-Responsive	-	-	-.002	.990	.044	.785
Active-Restrictive	-	-	-.072	.563	-.094	.501
Passive-Permissive	-	-	-.101	.406	-.146	.278
ΔR^2	-	-	*.014*	.804	-	-
Block 3						
Perceived Responsibility	-	-	-	-	-.118	.418
Expectations	-	-	-	-	-.070	.666
Consequences	-	-	-	-	-.045	.767
Parental Rationale	-	-	-	-	-.010	.941
FJV Preparation Practices	-	-	-	-	.048	.805
Parental FJV modeling	-	-	-	-	-.143	.431
Parental Discouragement	-	-	-	-	-.005	.973
ΔR^2	-	-	-	-	*.038*	.922
R^2	.262**	.001	.276**	.008	.314*	.126

Note: N=72. Standardized regression coefficients.

* $p < 0.05$, two-tailed test.

** $p < 0.01$, two-tailed test.

*** $p < 0.001$, two-tailed test.

Table 10b. Hierarchical Regression Results. Outcome = BMI z-scores. Sex = Females.

	Regression Model 1 *Demographic (Controls)*		**Regression Model 2** *Parenting Styles*		**Regression Model 3** *Food Socialization*	
Variable	Stndized β	*P*-value	Stndized β	*P*-value	Stndized β	*P*-value
Block 1						
Paternal Education Level	.118	.438	.097	.547	.154	.356
Maternal Concern for Weight	.373	.007	.357	.017	.104	.582
Child is More Healthy	.204	.177	.239	.153	.092	.582
Block 2						
Active-Responsive	-	-	-.022	.874	-.014	.632
Active-Restrictive	-	-	.069	.648	.018	.731
Passive-Permissive	-	-	-.061	.666	.052	.729
ΔR^2	-	-	*.007*	*.939*	-	-
Block 3						
Perceived Responsibility	-	-	-	-	.337	.041
Expectations	-	-	-	-	.253	.094
Consequences	-	-	-	-	.058	.749
Parental Rationale	-	-	-	-	.121	.447
FJV Preparation Practices	-	-	-	-	.116	.513
Parental FJV modeling	-	-	-	-	-.224	.205
Parental Discouragement	-	-	-	-	.103	.494
ΔR^2	-	-	-	-	*.199*	*.128*
R^2	.191*	.018	.199	.118	.398	.066

Note: N=59. Standardized regression coefficients.

* $p < 0.05$, two-tailed test.

** $p < 0.01$, two-tailed test.

*** $p < 0.001$, two-tailed test.

APPENDIX

APPENDIX A

PARENT AND CHILD EATING QUESTIONNAIRE

1. When your child is at home, how often are you responsible for feeding them? ___never ___seldom ___half of the time ___most of the time ___always
2. How often are you responsible for deciding what your child's portion sizes are? ___never ___seldom ___half of the time ___most of the time ___always
3. How often are you responsible for deciding if your child has eaten the right kind of foods? ___never ___seldom ___half of the time ___most of the time ___always
4. How concerned are you about your child becoming overweight? __unconcerned __a little concerned __concerned __fairly concerned __very concerned
5. I offer my child her favorite foods in exchange for good behavior. ___disagree ___slightly disagree ___neutral ___slightly agree ___agree
6. If I did not control my child's eating, they would eat too many junk foods. ___disagree ___slightly disagree ___neutral ___slightly agree ___agree
7. My child should always eat all of the food on her plate. ___disagree ___slightly disagree ___neutral ___slightly agree ___agree
8. If my child says "I'm not hungry," I try to get them to eat anyway. ___disagree ___slightly disagree ___neutral ___slightly agree ___agree

HOW OFTEN DO YOU DO THE FOLLOWING TO ENCOURAGE YOUR CHILD TO EAT CERTAIN FOODS?

9. I tell my child to eat this food, because it is good for him/her. _____never _____sometimes _____often _____always
10. I tell my child to eat this food, because it will make him/her strong. _____never _____sometimes _____often _____always
11. I tell my child to eat this food, because it tastes good. _____never _____sometimes _____often _____always
12. I tell my child to eat this food, because it will make him/her grow. _____never _____sometimes _____often _____always
13. I let my child see me eat this food. _____never _____sometimes _____often _____always
14. How often do you tell your child you will take them somewhere if they eat a food? _____never _____sometimes _____often _____always
15. How often do you take away a privilege from your child (for example: watching TV, going outside) if a food is not eaten? _____never _____sometimes _____often _____always
16. How often do you make something else for them to eat? _____never _____sometimes _____often _____always
17. How often do you tell your child if they eat a food you will give them dessert? _____never _____sometimes _____often _____always
18. How often do you force your child to eat a food? _____never _____sometimes _____often _____always

WHEN YOU ARE SHOPPING OR COOKING HOW LIKELY ARE YOU TO DO EACH OF THE FOLLOWING:

19. I check food labels for ingredients before purchasing a product for the first time. _____never _____sometimes _____often _____always
20. I read the nutrition information provided on food packages before purchasing a product for the first time. _____never _____sometimes _____often _____always

21. I make out a list before doing the shopping. _____never _____sometimes _____often _____always

WHEN YOU ARE SHOPPING OR COOKING HOW LIKELY ARE YOU TO DO EACH OF THE FOLLOWING:

22. I compare prices on several food products when I go food shopping. _____never _____sometimes _____often _____always
23. How often do you include vegetables in your child's meals or snacks? _____never _____sometimes _____often _____always
24. How often do you include fruits in your child's meals or snacks? _____never _____sometimes _____often _____always
25. How often do you include lean meat in your child's meals or snacks? _____never _____sometimes _____often _____always
26. How often do you include low fat milk and dairy foods in your child's meals or snacks? _____never _____sometimes _____often _____always
27. How often do you include whole grain breads or cereals in your child's meals or snacks? _____never _____sometimes _____often _____always
28. How often do you include fried foods in your child's meals or snacks? _____never _____sometimes _____often _____always
29. Before you handle foods how often do you wash your hands? _____never _____sometimes _____often _____always
30. How often do you tell your child to wash their hands before they eat? _____never _____sometimes _____often _____always

EACH OF THE FOLLOWING APPLIES TO EATING IN YOUR FAMILY:

31. I eat vegetables when I am with my child. _____never _____sometimes _____often _____always
32. I eat fruit when I am with my child. _____never _____sometimes _____often _____always
33. I eat lean meat when I am with my child. _____never _____sometimes _____often _____always
34. I eat low-fat snack foods when I am with my child. _____never _____sometimes _____often _____always
35. I drink milk when I am with my child. _____never _____sometimes _____often _____always
36. I eat whole grain breads or cereals when I am with my child. _____never _____sometimes _____often _____always

TO DISCOURAGE YOUR CHILD FROM EATING A PARTICULAR FOOD, HOW OFTEN DO YOU DO THE FOLLOWING?

37. How often do you tell your child a food is not healthy? _____never _____sometimes _____often _____always
38. How often do you tell your child a food will make them sick? _____never _____sometimes _____often _____always
39. How often do you say "don't eat it"? _____never _____sometimes _____often _____always
40. How often do you give your child a small portion? _____never _____sometimes _____often _____always
41. How often do you tell your child a food will make him/her fat? _____never _____sometimes _____often _____always
42. How often do you just don't buy a food? _____never _____sometimes _____often _____always
43. How often do you just don't give a food to your child? _____never _____sometimes _____often _____always

APPENDIX B

Home Practices Questionnaire

11. I find it difficult to discipline my child.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
12. I give praise when my child is good.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
13. I spank when my child is disobedient.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
14. I have a hard time saying "no" to my child.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
15. I show sympathy when my child is hurt.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
16. My family says I spoil my child .	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
17. When my child doesn't do what I ask, I let it go or do it myself.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
18. I tell my child I'll punish them but don't do it.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
19. I respond to my child's feelings or needs	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
20. I tell my child reasons to obey rules.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
21. I tell my child I'm proud when they try to be good	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
22. I encourage my child to think about the consequences of their behavior.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
23. When my child misbehaves, I say things I regret.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
24. I express affection to my child by hugging, kissing, and holding them.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
25. If my child resists going to bed, I let them stay up.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
26. I apologize to my child when I make a mistake involving them.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always
27. When my child and I disagree, I tell my child to keep quiet.	_____Almost Never	_____Sometimes	_____Often	_____Almost Always

28. When my child acts up, I get visibly upset. _____Almost Never _____Sometimes _____Often _____Almost Always

29. When I want child to stop doing something, I ask many times. _____Almost Never _____Sometimes _____Often _____Almost Always

30. I scold or criticize my child, when they don't do what they are told. _____Almost Never _____Sometimes _____Often _____Almost Always

31. When my child asks why they must do something, I say, "I said so." _____Almost Never _____Sometimes _____Often _____Almost Always

32. I explain the consequences of my child's behavior to them. _____Almost Never _____Sometimes _____Often _____Almost Always

Oklahoma State University Institutional Review Board

Date:	Thursday, September 07, 2006
IRB Application No	HE0689
Proposal Title:	Parenting Practices for Cognitive, Emotional, and Nutritional health: Effects on Child Nutrient Status, Overweight, and Behavior - "Head Start on Health-II"
Reviewed and Processed as:	Expedited (Spec Pop)

Status Recommended by Reviewer(s): Approved Protocol Expires: 9/6/2007

Principal Investigator(s

Laura Hubbs-Tait
341 HES
Stillwater, OK 74078

Tay Seacord Kennedy
312 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,

Sue C. Jacobs

Sue C. Jacobs, Chair
Institutional Review Board

VITA

Eric R. Baker

Candidate for the Degree of

Master of Science

Thesis: THE RELATION OF MATERNAL FEEDING PRACTICES AND FOOD SOCIALIZATION BEHAVIORS TO WEIGHT STATUS IN LOW INCOME 3- AND 4-YEAR OLD CHILDREN

Major Field: Human Nutrition

Biographical:

Personal Data: Born in Chickasha, Oklahoma, on October 11, 1982, the son of John and Lynny Baker.

Education: Graduated from Minco High School, Minco, Oklahoma in May 2001; received Bachelor of Science degree in Nutritional Sciences from Oklahoma State University in Stillwater, Oklahoma in May 2006. Completed the requirements for the Master of Science in Human Nutrition at Oklahoma State University, Stillwater, Oklahoma in September, 2008.

Experience: Employed as graduate research and teaching assistant, Oklahoma State University Department of Human Nutrition, Stillwater, Oklahoma, 2006 to May 2008. Biomedical Research Fellow, National Heart Lung and Blood Institute, National Institutes of Health, Bethesda, Maryland, Summer 2007.

Name: Eric R. Baker Date of Degree: December, 2008

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: THE RELATION OF MATERNAL FEEDING PRACTICES AND FOOD SOCIALIZATION BEHAVIORS TO WEIGHT STATUS IN LOW INCOME 3- AND 4-YEAR OLD CHILDREN

Pages in Study: 84 Candidate for the Degree of Master of Science

Major Field: Human Nutrition

Scope and Method of Study: The purpose of the study was to examine the effect of maternal parenting style and food socialization behaviors on child weight status in low-rural Oklahoma children. Participants in the study were 131 children aged three, four, and five years enrolled in one of four rural or micropolitan Oklahoma Head Start Centers. Mothers of the participants completed a demographic questionnaire and other questionnaires examining parenting practices. Anthropometric measurements, including height, weight, and triceps skin fold, were measured in fall 2006.

Findings and Conclusions: Approximately 30% of children in this sample were at risk for overweight, or overweight based on Center for Disease Control standards. Analyses suggest neither parenting style nor food socialization behaviors significantly contributed to the variance among child weight in all children. However, significant differences were evident depending on child gender. Paternal education greatly impacted child weight status, and in particular male children. Concern for weight and perceived responsibility were more important in assessing variance in BMI z-scores of female children.

ADVISER'S APPROVAL: Dr. Tay S. Kennedy