MATERNAL CHARACTERISTICS RELATED TO INFANT GROWTH

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CHAPTER I

INTRODUCTION

The purpose of this thesis is to explore the links among maternal characteristics, maternal feeding patterns of infants, and infant growth. The maternal characteristics considered are parenting styles and attitudes, parenting stress, and maternal affect. Maternal patterns of feeding infants refer to the amount of formula fed to infants at 6 and 9 months. Infant growth is defined as the rate of infant weight gain. The expectation is that certain maternal characteristics, such as lower positive affect and lower empathy, will lead to unhealthy infant weight gain.

As a comparison to negative parenting behaviors some positive parenting behaviors will be discussed first. Marc Bornstein (2002) explains four tasks for parents of infants: nurturant caregiving, material caregiving, social caregiving, and didactic caregiving. He describes nurturant caregiving as the parents providing for the basic needs of the infant: food, protection, clothing, and affection. Material caregiving is explained as providing an environment for the infant that is stimulating, organized, and safe for exploration. Social caregiving is the actions parents perform with their infants such as hugging, soothing, talking, and playing. Didactic caregiving introduces the infants to the world outside the parent-infant interactions; this means introducing, teaching and interpreting objects and events outside the parent-infant dyad. Other

important behaviors for parents are being attentive to the infant's needs, learning to regulate the infant's physiological states, and using low-power techniques to help the infant learn what is expected (Brooks, 2004).

Conceptual Framework

These positive parenting behaviors are consistent with responsive parenting. According to Black and Aboud (2011), responsive parenting consists of a prompt response from the caregiver in response to child's behavior, emotionally supportive responses from parents, a parent's dependency on the child's cues for proper reactions, and developmentally appropriate responses from parents. Black and Aboud have suggested that responsive parenting is similar to responsive feeding. The responsive feeding style involves a parent who is aware of the child's cues of satiety and hunger, as well as allowing the child to communicate his or her needs of hunger and satiety and begin to become self-sufficient at feeding (Black & Aboud, 2011). Gillman et al (2001) have suggested that breastfeeding promotes responsive feeding. It is possible that breastfeeding mothers more readily learn to identify infants' satiety cues because breastfed infants will detach when full and it is more difficult to force breast- than bottle feeding. Non-responsive feeding styles include controlling, restricting and uninvolved feeding styles.

Black and Aboud (2011) linked early negative parent infant interactions with later child feeding difficulties and the child's being underweight or overweight. A recommendation from the American Academy of Pediatrics Expert Committee states caregivers should refrain from using restrictive feeding practices (Black &Aboud, 2011). Another implication of controlling and restrictive feeding practices, according to Black

and Aboud, is parents' misinterpreting their child's food refusal, which is a signal for autonomy, as poor appetite. Hurley, Cross, and Hughes (2011) found a positive association between indulgent feeding and infant overweight/obesity. Hurley, Cross and Hughes examined 31 studies and 16 of those studies found significant positive relations between controlling feeding and infant weight gain.

It is expected that a short-term benefit of responsive feeding is allowing children to become competent and responsible at self feeding, as well as learning to recognize their internal satiety and hunger cues. The long-term benefit of responsive feeding is an increased likelihood of children having healthy growth and nutrition (Black & Aboud, 2011). Black and Aboud (2011) postulated that future interventions to support healthy growth and nutrition and inhibit overweight and underweight should include responsive feeding.

Black and Aboud (2011) summarized several benefits of responsive parenting and responsive feeding. Responsive parenting is similar to the authoritative parenting style because it allows children to make decisions within guidelines from supportive and responsive parents. Black and Aboud (2011) point out that non-responsive indulgent, non-reponsive controlling, and non-responsive ignoring feeding styles and practices all may result in infants' failure to learn satiety cues – but for different reasons. In accordance with Black and Aboud's (2011) findings that non-responsive feeding practices lead to overweight or underweight infants, parenting style studies have found similar results for responsive parenting (authoritative) versus non-responsive parenting (authoritarian, permissive, and indulgent) styles. The findings mean that the extreme

parenting (feeding) styles of excessive control or lack of control both lead to weight problems with infants.

Maternal characteristics have an important role in responsive parenting. Maternal symptoms of depression, stress and anxiety are correlated with the unresponsive and uninvolved feeding styles, according to Paulson, Dauber, and Leiferman (2006) and Hurley, Black, Papas and Caufield (2008). Blissett and Farrow (2007) also found that a more controlling feeding style was predicted by greater maternal distress. Mothers who have depressive symptoms and greater distress and anxiety are less likely to use responsive parenting techniques. When mothers are using non-responsive parenting, the mothers are less sensitive to infant's needs and cues. Similarly, Worobey, Lopez, and Hoffman (2009) found that infants gained more weight with mothers who were less sensitive to infants' satiety cues.

In summary, responsive parenting styles and responsive feeding styles promote healthy infant weight gain. Non-responsive parenting and non-responsive feeding styles have been linked with infants' being both underweight and overweight. This thesis aims to identify parenting factors that lead to healthy and unhealthy weight gain. The specific parenting factors being considered include parenting styles, maternal stress, anxiety, depressive symptoms, hostility, and amount of formula fed to infants.

CHAPTER II

REVIEW OF LITERATURE

In this chapter I review the literature on maternal parenting characteristics that are related to infant weight and weight gain and conclude with the hypotheses tested in my thesis research.

Parental Feeding in Infancy and Infant Weight

The connection between infants and parenting is complex and multiple aspects have been studied previously. There are several studies that relate to parenting and infant weight gain. The following section will briefly discuss some of the research that connects parenting behaviors with infant weight gain.

Growth and Weight Gain in Breastfed and Bottle Fed Infants

It is important to understand the normal growth of breastfed infants in order to find time periods during which parenting and amounts of formula might have the greatest impact on infant weight gain Hill and Johnson (2007) found that breastfed infants have similar growth patterns for length and head circumference but have lower weights than formula fed or mixed fed babies. The WHO Multicentre growth reference study group (2006) also determined that breastfed infants weigh less than formula fed infants in the first 6 months of life, but the difference is not enough for different growth standards for breastfed and bottle fed infants.

Hui et al. (1997) found that children's higher BMI z-scores at 7 years were related to more rapid weight gain of breastfed infants in the first 3 months and between 3 and 12 months. Similarly, Taveras et al. (2009) found that extreme weight gain, measured in weight-for-length z-scores, in the first 6 months was associated with childhood obesity at 3 years of age. Extreme weight gain was determined by the highest quartile of infant weight gain. Fifty-four percent of these infants were taking some breast milk at 6 months; no other information was collected on infant feeding. Another study by Chomtho et al. (2008) found that children's weights, when children were between the ages of 4-20, were associated with their weight gains in the first 6 months of infancy. The study did not specify if infants were breastfed or bottle-fed. These studies show the link between infant weight gains in infancy and weights in later childhood.

Several research studies have looked at the effects of breastfeeding on obesity. A study by Butte (2009) did not find that breastfeeding (exclusive or partial) was a protective factor against childhood (ages 4-19 years) obesity. Predominantly breastfed infants were breastfed for 8 months. Variables linked to increased risk for childhood obesity were found to be birth weight and weight gain in the first year of life. Birth weight affects the risk of obesity with lower birth weight linked to a higher rate of obesity. It appears that infants who are born with low birth weight rebound with excessive weight gain and are at higher risk for obesity. The reasons for this include biological changes and differences in parenting practices (Butte, 2009).

In contrast to the report by Butte (2009) a study by Gillman et al. (2001) found that the longer a child was breastfed, the lower the weight-for-height z-scores. Gillman et

al. studied children and adolescents from ages 9 to 14, with 48% of their sample having been breastfed for at least 7 months. Dewey, Peerson, Lonnerdal, Heinig, and Nommsen (1993) studied two groups of infant's ages 1 month to 24 months, one group who had been predominantly breastfed for 12 months and the other group who had not been breastfed for more than 3 months, if ever. They found that the predominantly breastfed group had significantly lower weight-for-length than the predominantly formula fed group beginning at 7 months of age and continuing through 24 months of age. Anzman (2010) found that greater duration of breastfeeding, at least 6 months, was related to lower risk of overweight children.

The majority of studies consistently found that breastfed infants have a lower risk for obesity or being overweight. This protective factor increases with the duration of breastfeeding. Due to the protective factor of breastfeeding, the first hypothesis examines the effects of formula introduced in a sample that was originally predominantly breastfed. Thus, the ***first hypothesis*** is that the formula amount fed to infants at 6 and 9 months will be correlated with infant weight gain: the greater the formula, the greater the infant weight gain.

A study by Butte (2009) found that birth weight affects the risk of obesity with low birth weight having a higher rate of obesity. Butte and Anzman (2010) found that rapid weight gain was also associated with higher rates of obesity in childhood. In previous research rapid weight gain was operationalized as an increase of +0.67 SD in weight-for-length *z* scores over a three-month time span (Demerath et al., 2009; Goodell, Wakefield, & Ferris (2009); Ong, 2006; Ong & Loos, 2006). Demerath et al. (2009) found that 9 year olds who had rapid weight gain in the first two years of life had higher

BMI. This study did not acquire information about infant feeding, such as breastfed or bottle-fed. Stettler and Iotova's (2010) meta-analysis found similar results in studies of infants ranging in age from 3 to 24 months. The common finding was that rapid weight gain, or excessive weight gain in the first 24 months of life increases the risk for obesity in childhood. Ong (2006) found in his systematic review that five variables were linked to increased risk for later obesity: rapid infant weight gain, rapid childhood weight gain, maternal obesity, infant energy intake in formula, and maternal obesity. Goodell, Wakefield, and Ferris (2009) found that infants who had rapid weight gain from birth to 1 year were 9 and 31 times more likely to be obese and extremely obese, respectively, in early childhood. These studies lead to the ***second hypothesis*** that rapid weight gain (more than .67 SD in weight-for length z scores) from 3 to 6 months will be correlated with greater infant weight at 9 months.

Maternal Affect and Infant Weight Gain

There are several aspects of maternal affect that could be influencing infant weight gain such as depressive symptoms, anxiety, hostility and stress. Effects of maternal depression, anxiety, hostility, and stress are detrimental to infant development. Maternal depression is associated with an increased likelihood of mothers using less healthy feeding and sleeping methods with infants (Paulson, Dauber, & Leiferman, 2006; Hurley et al., 2008). Hurley et al. found that maternal symptoms of stress, depression, and anxiety were associated with maternal nonresponsive feeding styles toward infants. Specifically, maternal stress, depressive symptoms, and anxiety were positively associated with forceful and uninvolved feeding styles, while maternal depressive symptoms were positively associated with indulgent feeding style as well. Maternal

anxiety was positively associated with restrictive feeding style also. Thus, maternal depressive symptoms, negative mood, and nonresponsive parenting style may be associated with higher infant weight-for-length. In order to better understand which maternal affect characteristics influence infant weight gain, ***third hypothesis (Part A)*** of the investigation is that greater stress, depressive symptoms, anxiety, and hostility in mothers are related to greater infant gain in weight.

Maternal depression was found to be lower with mothers who were breastfeeding (Mezzacappa & Endicott, 2007). This study included infants who were 12 months or younger and the majority were bottle-fed with a large enough sample of breastfed infants to perform adequate comparisons. Of the breastfeeding mothers, those who had two or more children were less likely to be depressed, than first time mothers (Mezzacappa & Endicott, 2007). Therefore, ***part B of the third hypothesis*** is that birth order will moderate the relation of maternal depressive symptoms to infant weight gain: maternal depressive symptoms will have a greater impact on first-born infants than later-born infants with first-born infants having greater weight gain due to greater maternal depressive symptoms.

Maternal Feeding Styles and Infant Weight Gain

This section reviews disparate findings on the link between feeding styles during infancy and infant weight gain and concludes with the fourth hypothesis. Maldonado-Duran et al. (2008) found that maternal affect did not predict feeding problems of infants who were breastfed, bottle fed, and/or eating solids. Pridham's (1995) findings (which did not specify if infants were breastfed or bottle fed) that nurturance by caregivers at 12 months is significantly less than nurturance at 4 months suggest that as infants become

better at self-feeding, mothers give less thought and attention to infant feeding and the possible challenges related to feeding.

Hurley et al. (2008) studied the direct effect of maternal affect on the feeding style of infants, ages 0-12 months. This study included 64.1% in their sample of mothers who breastfed for any duration, and 25.2% who were currently breastfeeding at time of interview. There are four types of infant feeding styles. The responsive feeding style is the most nurturing and attentive style, while the controlling feeding style is associated with low maternal self-regulation, infant overweight, and feeding fussiness. The responsive feeding style is when caregivers provide guidance and nurturance during feeding while also recognizing satiety cues of infants. The controlling feeding style involves caregivers who pressure children to eat, and restrict certain foods or amounts from children (Hurley et al., 2008). The indulgent feeding style allows the infants to have their way and eat when they choose. An uninvolved feeding style describes mothers who do not pay attention to infant cues, or dietary needs. Maternal symptoms of depression, stress and anxiety are correlated with the unresponsive and uninvolved feeding styles, according to this study. As previously stated, non-responsive feeding style includes controlling, unresponsive, and uninvolved feeding styles.

Feeding beliefs play a part in feeding practices with mothers who pressure infants to finish food believing their infants feel full with more food, sleep better with more food intake, and use food to soothe infants (Thompson et al., 2009). The study by Thompson et al. did not state whether infants were breastfed or bottle-fed. In a longitudinal study of bottle fed infants beginning at age 3 months and ending at age 12 months, Worobey, Lopez and Hoffman (2009) found that the number of feedings and maternal sensitivity to

infant feeding cues of satiety predict infant weight gain from 6 to 12 months, while maternal BMI, infant birth weight and maternal feeding attitudes did not predict infant weight. The study found that infants gained more weight with less sensitive mothers, which are mothers who ignored infant cues of satiety.

In a similar study of non-responsive feeding, mothers' behaviors of restriction and pressure to eat, measured when children were 1 year old, negatively predicted lower weight for children at age 2 years according to Farrow and Blissett (2006). The majority of infants in the study had been breastfed during the first year of infancy. In contrast, non-responsive parenting feeding styles with children 3 to 10 years old showed an increased risk for overweight children according to Gable and Lutz (2000). Feeding styles are thought to be relatively consistent over time, similar to parenting styles; therefore when mothers exhibit these non-responsive feeding styles with infant's ages 3 months to 12 months, 1 to 2 years, and again with children 3 to 10 years, it is assumed they began these practices when infants were born and continue throughout childhood.

The reason for the differences could be that less sensitive mothers are overfeeding their infants when they are full, while mothers who use pressure to eat are trying to get their underweight infants to gain weight. Mothers who restrict eating may be trying to get overweight children to lose weight. Another explanation for lower weight in infants is that mothers take control away by pressuring or restricting eating with their infants. This could lead infants who may be trying to assert autonomy in the feeding domain to refuse food in order to gain autonomy. Black and Aboud (2011) theorize that controlling caregivers of child feeding hinder child's growing competence and autonomy. Another

U.K. study (Farrow & Blissett, 2006) found that high maternal feeding control hindered self-regulation development by infants in breast- and bottle fed infants.

Many studies have shown the negative effects of non-responsive feeding styles. Non-responsive feeding styles begin in infancy, as studied by Worobey, Lopez, and Hoffman (2009) and continue into childhood. These non-responsive feeding practices include pressure to eat, restricting eating, and controlling feeding, which increase the risk for obesity in later childhood. Infants gained more weight with mothers who were less sensitive to satiety cues (Worobey et al., 2009). Thus, the ***fourth hypothesis*** is that the greater the insensitivity of mothers, the greater the infant weight gains. Insensitivity in the current study is operationalized as emotional insensitivity.

Parenting Style and Infant Weight Gain

Parenting styles play an important role in the development of children. Several studies found that permissive parenting style was related to an increased risk in childhood obesity. A study by Chen and Kennedy (2005) found that the democratic (permissive) parenting style was associated with higher BMI in children ages 8 to 10 years old. Topham et al. (2010) found that with depressed mothers, an increase in permissive parenting of 1 point was associated with a 6.74 increase in odds of their children being obese. Rhee et al. (2006) found that authoritative parenting had the lowest risk for child obesity, permissive and neglectful both had increased risks for child obesity with authoritarian parenting style having the greatest risk for obesity. The greatest increase in overweight children from ages 1 to 4 years was found with indulgent (permissive) parenting styles according to Olvera & Power (2009). Thus, the ***fifth hypothesis*** is that

the more permissive the parenting style the greater the weight gain of the infants.

Hypotheses and Research Questions

The first hypothesis was that the formula amount fed to infants at 6 and 9 months would be correlated with infant weight gain: the greater the formula, the greater the infant weight gain from 6 to 9 months and 3 to 9 months.

The second hypothesis was that rapid weight gain from 3 to 6 months would lead to greater infant weight at 9 months. Rapid weight gain was operationalized by a weight increase of $\geq$ 0.67 SD in weight-for-length z-scores. The 9-month infant weight was weight in kilograms.

The third hypothesis was divided into two parts. Part A of the third hypothesis was that more stress, depressive symptoms, hostility, or anxiety was related to greater infant gain in weight from 3 to 6 months, 6 to 9 months, and 3 to 9 months. Part B of the third hypothesis was that maternal depressive symptoms would be related to greater infant weight gain for first-born infants than later-born infants from 3 to 6 months, 6 to 9 months, and 3 to 9 months.

The fourth hypothesis was that the greater the insensitivity of mothers, the greater the infant weight gains from 3 to 6 months, 6 to 9 months, and 3 to 9 months. In the current study of breastfeeding mothers, lower sensitivity would be operationalized as the PANAS with lower scores on the PA subscale, higher scores on the NA scale, the SCL-90-R with high scores on the Interpersonal Sensitivity scale, and separately, the AAPI subscales. All of these subscales measure non-responsive parenting characteristics.

The fifth hypothesis was that the more permissive the parenting style, the greater the weight gain of the infants from 3 to 6 months, 6 to 9 months, and 3 to 9 months.

The first research question asks what effect gender has on amount of formula and links of parenting variables to weight gain. This question is asked because Hui et al. (1997) found that boys were more likely to be overweight or obese at 7 years of age than girls and Ayatollahi (2005) found males to have slightly, but not significantly, greater growth velocity for weight, length, arm, head, and chest circumference than females in the first few months.

The second research question is whether maternal authoritative or authoritarian parenting styles are related to greater infant weight gain. The previously mentioned research gives a strong indication of the link of permissive parenting style to weight gain, but there are less consistent results for authoritative and authoritarian parenting styles – particularly in infancy. This question aims to clarify the effect of authoritative and authoritarian parenting styles on infant weight gain.

CHAPTER III

METHODOLOGY

Participants

The participants included mother-infant dyads (N=111). There were 64 female (57.7%) and 47 male (42.3%) infants in the study. Participants were recruited from the general population in a rural community. The main recruiting occurred on the university campus, the local town, and the rural communities. Recruitment flyers were posted in doctors' offices, restaurants, laundromats, and bulletin boards on university campus, and distributed during specific events pertaining to mothers and infants in surrounding areas. Recruitment also included visiting the breastfeeding class offered through the local hospital. Participants were recruited when mothers were pregnant or before the infant turned three months of age.

The original sample consisted of 132 mother-infant dyads at the 3-month visit. There were five mother-infant dyads who dropped out at the 6-month test visit (with one returning at 9 months but excluded for the missing 6 month data), and an additional eight dyads who dropped out for the 9-month visit. There were eight additional dyads who were excluded due to missing infant anthropometry or feeding data. Additionally, there were several questionnaires that were not given at all time points, due to not being added to the study until after data collection started. These measures are identified below.

These participants were still included therefore sample size is smaller for analyses with those questionnaires.

Procedure

The mother and infant pair visited the laboratory, when the infants were 3, 6, and 9 months of age, for testing that included anthropometric measures such as weight, length, and head circumference of infants, and weight of mothers. Mothers received payment for each visit to the laboratory with the total for attending all visits being $90. The study received approval from the university's Institutional Review Board and followed the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association 2002) and HIPAA regulations for the safety of personal information of participants.

A digital infant scale (Seca, Columbia, MD, accuracy to 0.002 kg) was used to measure infant's weight. The infant was weighed wearing light clothing and a diaper while the infant was lying down on the scale. The weight was recorded in gram units. Infant's length was measured using an infant length, where length was measured from crown to heel of infant. The length measure was taken twice and averaged for analysis. If these measures were more than 5 mm apart, the length was taken again and the two measurements within 5mm were averaged together.

Maternal procedures. Each mother was given the following self-report measures to complete about herself and her parenting beliefs. The measures included the Positive and Negative Affect Scale (PANAS), the Symptom Checklist-90-Revised (SCL-90-R), the Parenting Style and Dimensions Questionnaire (PSDQ), Parenting Stress Index – Short Form (PSI-SF), and Adult Adolescent Parenting Inventory – 2 (AAPI-2). All

measures were administered at the 3-month infant visit, and the PANAS was administered at all three visits. An infant diet questionnaire was administered at the 6 and 9 month visits only.

Measures

Maternal self-report measures. The PANAS is a self-report measure with two 10-item subscales, positive affect (PA) and negative affect (NA). The NA dimension is characterized by distress and lack of enjoyment in interactions, while PA is the lack of those characteristics. The measure was created using Zevon and Tellegen's mood checklist (Crawford & Henry, 2004). The measure is a 5-point Likert scale with 1 being "very slightly or not at all", 2 being "a little", 3 being "moderately", 4 being "quite a bit", and 5 being "very much." The questions refer to positive or negative affect "during the past three months." Items that participants rate from the scale include: interested, distressed, ashamed, upset, strong, inspired, etc. The internal consistency of the PANAS was measured using Cronbach's alpha; the alpha for the PA scale was .89 and the alpha for the NA scale was .85 according to Crawford and Henry (2004). The reliability is high because the results and reliabilities of the PA and NA subscales found in Crawford and Henry were similar to other studies cited in their work; scores for PA ranged from .86 to .90, and for NA ranged from .84 to .87. For the current study the alpha for the PA scale at 3 months was .86 and the alpha for the NA scale at 3 months was .82. The 6-month alpha for the current study for the PA scale was .85 and the alpha for the NA scale was .84. At 9 months the PA alpha was .88 and the NA alpha was .87. The measure has moderate divergent validity because the PA and NA subscales do measure different constructs but the two subscales are also moderately negatively correlated (Crawford & Henry, 2004).

The external validity is also high because the sample used to generate the reliability scores was 1,003 members of the adult general population in the study by Crawford and Henry, which makes this study one of the only ones to use the general population and not a student population. Face validity is high as well because the NA subscale includes items such as distressed, ashamed, hostile, and afraid, which are commonly considered negative affects and the PA subscale includes such items as, interested, excited, attentive, and proud, which are commonly considered positive affects. The measure has been found to predict anxiety and depression distinctly with the NA subscale predicting both, while the PA subscale is only correlated with depression (Jolly, Dyck, Kramer, & Wherry, 1994 as cited in Crawford & Henry, which gives this measure moderate divergent validity).

The SCL-90-R includes 90 items measuring psychological symptoms in a self-report questionnaire. The measure was created by Derogatis from the Hopkins Symptom Checklist (Groth-Marnat, 2003). The measure is a 5-point Likert scale with 0 being "not at all", 1 being "a little bit", 2 being "moderately", 3 being "quite a bit", and 4 being "extremely." The questionnaire requests information about a certain time frame; the time used would be "during the past 7 days." Items that participants rate from the scale include: headaches, feeling critical of others, trembling, feeling lonely or blue, poor appetite, feeling inferior to others, and feelings of guilt. The SCL-90-R has nine subscales with a varying number of items for each scale. The subscales include: Somatization (12 items), Psychoticism (10 items), Paranoid Ideation (6 items), Depression (13 items), Anxiety (10 items), Hostility (6 items) Interpersonal Sensitivity (9 items), Obsessive-Compulsive (10 items), and Phobic Anxiety (7 items) (Pauker &

Payne, 1975). The measure includes three other scores. The Global Severity Index (GSI) is the average rating for all 90 items. The Positive Symptom Total (PST) is the number of symptoms identified by the participant. The Positive Symptom Distress Index (PSDI) is the average rating for the symptoms identified by the participant. The internal consistency of the SCL-90-R was measured using Cronbach's alpha; the alpha for the subscales ranged from .77 to .90 according to Groth-Marnat (2003), and Pauker and Payne (1975). For this study only the Somatization (α=0.79), Depression (α=0.87), Anxiety (α=0.78), Hostility (α=0.75), and Interpersonal Sensitivity (α=0.85) scales were used. Test-retest reliability correlations range from .78 to .90 with a one-week span (Groth-Marnat, 2003; Pauker & Payne, 1975). The SCL-90-R subscales were found to have good convergent validity and good divergent validity according to Groth-Marnat (2003). The external validity is also high because the sample used to generate the reliability scores was a sample of inpatient, outpatient, and non-patient participants. The measure has been found to predict depression (Pauker & Payne, 1975), which indicates that this measure has adequate predictive and convergent validity.

The PSDQ has been extensively used in developmental and nutrition research to measure parenting style (Hubbs-Tait et al., 2008; Wu et al., 2002). The PSDQ is a 32-item measure that measures parenting practices to determine parenting style. The PSDQ has 3 domains: authoritativeness, authoritarianism, and permissiveness. The authoritative domain has 15 items that make up 3 subscales: warmth and involvement, reasoning/induction, and democratic participation. The authoritarian domain has 12 items that make up 3 subscales: verbal hostility, corporal punishment, and non-reasoning/punitive strategies. The permissive domain has 5 items that make up one

subscale: lack of follow through. The measure is a 5-point Likert scale with 1 being "never", and ranging to 5 being "always." Divergent and convergent validity of the Head Start version of the PSDQ were verified by correlations that show the domains are studying what they are meant to study (Coolahan, McWayne, Fantuzzo, & Grim, 2002). The Head Start version differed from the original version because it was directed toward low-income African-American individuals. The questionnaire was reworded to correlate with the mean reading level of the Head Start population. Questions were also dropped or changed if the question was inverted or went against cultural norms. The Active-Responsive parenting style correlated with two videotaped maternal behaviors toward children: Warmth and Limit-Setting ($r = .36$, $p<.01$, and $r = .39$, $p <.01$, respectively). The Passive-Permissive parenting style correlated negatively with Warmth and Limit-Setting ($r = -.27$, $p <.05$, and $r = -.41$, $p <.01$, respectively). The Active-Restrictive parenting style correlated negatively with Warmth and positively with Directiveness ($r = .34$, $p<.01$, and $r = -.40$, $p<.01$, respectively) (Coolahan, McWayne, Fantuzzo, & Grim, 2002). Hubbs-Tait et al.'s (2008) study reported Cronbach's alphas of .82 for authoritative, .78 for authoritarian, and .76 for permissive parenting styles. The current study determined the alphas for the subscales to be .87 for authoritative, .82 for authoritarian, and .45 for permissive.

The PSI short version is a self-report measure with 36 items that is used to measure the stress of parents and their beliefs about their children. The measure is designed to identify at risk children for emotional disturbance based on parents' results. The questions in this measure are answered on a 5-point Likert scale. The subscales are the Parent Distress (PD) subscale, the Parent-Child Dysfunctional Interaction (PCDI)

subscale, and the Difficult Child (DC) subscale; each subscale has 12 items. The external validity is moderate because the sample used to generate the reliability scores was with 800 members of the general population but the majority of the sample was Caucasian (Allison, 1998). The internal consistency of the PSI was measured using Cronbach's alpha, which determined the alpha for PD to be .86, for the PCDI .87, and DC.85, and for the total scale .91 (Allison, 1998). For the current study, the alphas for the subscales were .86 for PD, .87 for PCDI, and .84 for DC. Participants were not excluded if they scored high on the Defensive Responders subscale. The AAPI-2 is a 40-item self-report measure that assesses attitudes of parenting in adult and adolescent parents and pre-parents. The AAPI-2 has two forms, A and B, and each form has 40 items. The forms are supposed to be used as pre and posttests but are not typically used that way (Conners, Whiteside-Mansell, Deere, Ledet, & Edwards, 2006). The AAPI-2 has a total score and five subscales of parenting attitudes: inappropriate expectations of children, parental lack of empathy towards children's needs, strong belief in the use of corporal punishment as a means of discipline, reversing parent-child role responsibilities, and oppressing children's power and independence (Conners, et al., 2006). The measure is a 5-point Likert scale with the choices being "Strongly Disagree", "Disagree", "Neither Agree nor Disagree", "Agree", and "Strongly Agree." The internal consistency of the AAPI-2 was measured using Cronbach's alpha; alpha for the total scale was .85, for lack of empathy alpha was .79, for inappropriate expectations alpha was .64, for value corporal punishment alpha was .79, for role reversal alpha was .59, and oppressing power and independence alpha was .50 in the Conners et al. (2006) study. The AAPI-2 manual states alphas of .92 for value corporal punishment, .88 for lack of empathy, with the lowest alpha being .80 for

oppressing children's power and independence (Conners, et al., 2006). The difference in alphas is important because the cutoff for using a measure as a diagnostic tool is .80, which means that according to the AAPI-2 manual it can be used for diagnostics but according to Conners, et al. (2006) the measure is not reliable enough to be used as a diagnostic tool. However, the current study is a research investigation and alphas of most subscales are sufficiently high for research purposes. Alphas for the current study could not be determined because the specific items for each subscale were not found in published or internet sources. The publishers of the AAPI have not released the information needed to calculate specific alphas. Therefore the alphas reported in this paper are those provided by the AAPI publishers. Conners et al. determined validity by comparing the AAPI with other measures subscales and the total score show good convergent and divergent validity as well. The external validity is also high because the sample used to generate the reliability scores was with 1,400 members of the adult and adolescent general population in 23 states (Conners, et al., 2006).

Infant measures. Infants' weight, length, and head circumference were also measured at the 3, 6, and 9-month visits. In the current study of weight gain over time, unconverted weights (kilograms) are analyzed. Infant parity was determined by the demographic questions on the AAPI, which asked how many children mothers had. If mothers reported 1 child, then the infant was placed in the firstborn category, if mothers reported any number other than 1, the infant was placed in the later born category.

Infant rapid weight gain. The infant rapid weight gain measure was created by subtracting the weight-for-length z-score at the earlier time point from the weight-for-

length z-score at the later time point. This is the only measure that uses z-scores. All other measures in this study used weight in kilograms.

Infant weight per day gain. The infant weight gain per day measure was created by subtracting the earlier time point weight from the later time point weight. The change in weight was then divided by the number of days between the two time points. The formula was [(weight 6 – weight 3) / number of days between visits]. The number of days between visits was calculated using the year-month-day (yrmoda) function in SPSS.

Maternal reports of infant formula. Infant formula amounts were calculated using the infant diet questionnaire (please see Appendix G for specific questions). Mothers reported how often and how much formula per feeding infants were fed. Because very few infants were fed any formula at 6 months, formula amount was calculated for 6 and 9 months only. The formula amount at each time was calculated per day by multiplying the amount per feeding (in ounces) reported by the mother by the number of times per day the infant was fed as reported by the mother.

Data Analysis

Each of the following analyses about weight evaluated infant weight gain from 3 to 6 months, 6 to 9 months, and 3 to 9 months. To control for variations in the length of time between measurements, weight gain from one time of measurement to the next was divided by the total number of intervening days yielding weight gain per day in kilograms.

The first hypothesis was that formula amount fed to infants at 6 and 9 months would be correlated with infant weight gain: the greater the formula per day, the greater the infant weight gain per day between visits. The analysis consisted of a correlation to

look at the continuous variables of infant weight gain and amount of formula. The predictor variable was the amount of formula with infant weight gain being the outcome variable.

The second hypothesis was that rapid weight gain from 3 to 6 months (predictor variable), which was measured by $\geq$ 0.67 SD increase in weight-for-length z-scores, would lead to greater infant weight at 9 months (outcome variable). The analysis consisted of a multiple regression to look at the continuous variables of rapid infant weight gain and infant weight.

Part A of the third hypothesis of the investigation was that an increase of negative mood, operationalized as stress, hostility, depressive symptoms, and anxiety in mothers would be related to an increase in infant weight gain. The analysis consisted of two steps: first, a correlation of the negative mood variables with the weight gain variables and second, multiple regression analyses of any of the negative mood variables that were significantly correlated with infant weight gain. The predictor variable of stress was measured with parent distress (PD), parent-child dysfunctional interaction (PCDI), and difficult child (DC) subscales of the PSI. The other predictor variables were measured by the Depression subscale of the SCL90-R and the Anxiety, Hostility, and Somatization subscales of the SCL90-R. The outcome variable was infant weight gain.

Part B of the third hypothesis was that maternal depressive symptoms would be related to greater infant weight gain for first-born infants than later-born infants. The analysis consisted of a multiple regression, which compared first-born infants with second or later born infants on their weight gain. The predictor variable was maternal depressive symptoms the moderator variable (categorical) was birth order and the

outcome variable was infant weight gain. Hierarchical regression analyses conducted with the two predictors (birth order and depressive symptoms) entered in the first block and the interaction term in the second block.

The fourth hypothesis was that the greater the insensitivity of mothers, the greater the infant weight gain. The analysis consisted of a correlation to look at the continuous variables of insensitivity of mothers and infant weight. Insensitivity of mothers was measured using the PANAS with lower scores on the PA subscale, higher scores on the NA scale, the SCL-90-R with high scores on the Interpersonal Sensitivity scale, and separately, the AAPI subscales.

The fifth hypothesis was that the more permissive the parenting style, the greater the weight gain of the infants. The analysis consisted of a correlation to look at the continuous variables of permissive parenting and infant weight gain. The predictor variable was measured by the permissive subscale of the PSDQ.

The first research question consists of two related questions about the impact of gender on patterns of infant growth. The first part asks what direct effect does gender have on infant weight gain and amount of formula fed? The second part asks whether there is a different link between formula amount and weight gain in boys and girls? The analysis for the first part of this question consisted of an Analysis of Variance (ANOVA) for each of the three measures of infant weight gain per day and the category of infant gender. The independent variable was infant gender. The dependent variables were infant weight gains from 3 to 6 months, 6 to 9 months, and 3 to 9 months. The analysis for formula consisted of an Analysis of Variance (ANOVA) to look at the two measures of formula amount and the category of infant gender. The independent variable was

infant gender. The dependent variables were formula amount at 6 months and formula amount at 9 months. The analysis for the second part of this question consisted of separate correlations conducted for male and female infants between formula amount and weight per day gain.

The second research question was whether maternal authoritative or authoritarian parenting styles are related to greater infant weight gain. The analysis consisted of Correlations between authoritative and authoritarian style and infant weight per day gain.

CHAPTER IV

RESULTS

Overview

Data analyses for each hypothesis and research question were conducted. The results section is organized by the hypotheses discussed in Chapter II. The analyses presented at the end of Chapter III were the analyses used. Table 1 provides the psychometric properties for the measures.

Sample Descriptive Statistics

The sample size for this study was 111 mother-infant dyads (N=111). Mothers' age ranged from 19 to 42 years old (M=28.44). Mothers were 88.3% Caucasian, 6.3% Native American, 2.7% Hispanic, 0.9% Asian, and 0.9% African American. The income of 57% of the sample was over $40,000 a month and 91.2% were married.

Infants were measured when they were approximately 3, 6, and 9 months of age (M_3=3.02 months, M_6=5.95 months, and M_9=8.81 months). Infants' mean weights at the 3, 6, and 9-month visits were 6.17 kg, 7.75 kg, and 8.83 kg, respectively. Infants' mean weight-for-length z-scores for 3, 6, and 9-months were 0.2227, 0.5246, and 0.7665, respectively. The average weight per day gain was 0.0177kg for 3-months, 0.0119kg for 6-months, and 0.0145kg for 9-months. The infants were 57.7% female and 42.3% male. Table 2 displays additional sample information.

Hypothesis I

The first hypothesis was that formula amount fed to infants at 6 and 9 months would be correlated with infant weight per day gain: the greater the formula, the greater the infant weight per day gain. The correlation analyses (one-tailed tests) confirmed that as daily formula (in ounces) at 6 months and 9 months increased, weight per day gain from 6 to 9 months increased, r = .204, p = .016 and r = .246, p = .005, respectively. The amount of daily formula at 6 months was marginally related to infant weight per day gain from 3 to 9 months, r = .137, p = .076. No other correlations were found to be significant. All correlations were one-tailed tests.

Exploratory analyses were also conducted which divided amount of formula into three groups: no formula, greater than 0 ounces up to 18 ounces, and greater than 18 ounces at 6 month and no formula, greater than 0 ounces up to 29 ounces, and greater than 30 ounces at 9 months. The greater than 18 or 30 ounces groups (for 6 and 9 months, respectively) was the top 10% of formula amounts fed for the sample at each time point. In all analyses the dependant variable was weight per day gain from 6 to 9 months. An ANOVA found that the three different 9-months formula groups differed significantly in amount of weight gained per day from 6 to 9 months, $F(2, 108) = 4.644$, p = .01. The ANOVA comparing the 13 infants in the top 10% of formula ($\geq$ 30 ounces) with the 71 infants who received no formula revealed significant differences in weight per day gain from 6 to 9 months, $F(1, 82) = 7.165$, p = .009. The ANOVA comparing the moderate formula (n = 27) and no formula (n = 71) groups approached significance in weight per day gain from 6 to 9 months, $F(1, 96) = 3.568$, p = .062). Comparing the 40 infants who received any formula with the 71 infants who received no formula also

revealed significant differences in weight per day gain from 6 to 9 months (F = 8.022, p = .006). No other effects were found to be significant. Table 3 provides a summary of the findings and means and standard deviations for all comparisons.

Hypothesis II

The second hypothesis was that rapid weight gain from 3 to 6 months (independent variable) would lead to greater infant weight in kilograms at 9 months (dependent variable). The analysis consisted of an ANOVA to look at the two-level independent variable of rapid infant weight gain ($\geq$ .67 SD versus < .67 SD) and the dependent variable of 9-month infant weight. The analyses found that infants classified as experiencing rapid weight gain from 3 to 6 months were significantly different from infants experiencing normal weight gain in 9-month weight in kilograms, F (1, 109) = 6.022, p = .016 (see Table 4 for means and standard deviations).

Exploratory analyses were conducted to compare the effect of rapid weight gain on length and weight-for-length z-scores at 9 months. The ANOVA comparing the length at 9 months for the rapid and normal weight gain groups approached significance F (1, 109) = 3.164, p = .078. The ANOVA comparing weight-for-length z-scores at 9 months for the two groups also approached significance, F (1, 109) = 3.695, p = .057.

Table 4 provides statistics for Hypothesis II and exploratory analyses.

Hypothesis III

Part A of the third hypothesis of the investigation was that greater negative mood, such as hostility, depressive symptoms, and anxiety, in mothers was related to greater infant weight per day gain. The preliminary correlation analyses revealed that only two variables were significantly correlated with weight per day gain from 3 to 6 months:

SCL90-R Somatization and SCL90-R Anxiety. The multiple regressions for SCL90-R Somatization and SCL90-R Anxiety approached significant in predicting infant weight per day gain from 3 to 6 months, R^2 = .057, β = -.003 for anxiety, β = -.001 for Somatization, p = .076. The multiple regression for SCL90-R Somatization was significant in predicting infant weight per day gain from 3 to 9 months, R^2= .049, β = -.002, p = .039. The direction of these relations was opposite to the predicted direction, with high anxiety and high somatization predicting lower infant weight per day gain. Table 5 provides regression statistics.

Part B of the third hypothesis was that maternal depressive symptoms would predict greater infant weight per day gain for first-born infants than later-born infants. The sample contained 45.9% first-born infants and 54.1% later-born infants. The regressions in Table 5 depict the results of the regressions for weight per day gain as a function of birth order and maternal depressive symptoms in the first block. In the second block the interaction between depressive symptoms and birth order was entered. As shown in Table 5, infant weight per day gain from 6 to 9 months was significantly predicted by the interaction between birth order and depressive symptoms, R^2 = .342, β = -.412, p = .003. Infant per day weight gain from 3 to 9 months was significantly predicted by the interaction between birth order and depressive symptoms, R^2 = .320, β = -.323, p = .018.

Hypothesis IV

The fourth hypothesis was that the greater the insensitivity of mothers, the greater the infant weight per day gain. Correlations were conducted with the specific subscales used to define insensitive mother (PANAS PA, PANAS NA, SCL90-R Interpersonal

Sensitivity, and the five AAPI subscales). No correlations were found to be significant in relation to infant weight per day gain from 3 to 6, 6 to 9, or 3 to 9 months. Table 6 shows the correlation between maternal insensitivity subscales and infant weight per day gain.

Hypothesis V

The fifth hypothesis is that the more permissive the parenting style, the greater the weight gain of the infants. Correlations were performed to analyze the relation between permissive parenting style (PSDQ Permissive) and infant weight per day gain from 3-6, 6-9, and 3-9 months. There was no significant relation between permissive parenting style and infant weight per day gain from 3 to 6 months, 6 to 9 months, or 3 to 9 months. Table 7 provides correlation statistics for hypothesis V and research question 2.

Research Question I

The first research question asked what effect does gender have on weight per day gain and differences in the correlations of amounts of formula to weight gain. The ANOVA analysis determined there are significant gender differences in weight per day gain from 3 to 6 months, $F(1,109) = 4.435$, $p = .039$, and from 3 to 9 months, $F(1, 109) = 9.894$, $p = .002$, but only approached significance from 6 to 9 months, $F(1, 109) = 3.719$, $p = .056$. An ANOVA of gender differences in formula amounts at 6 months and 9 months revealed no significant differences.

Correlations for girls found that amount of formula at 6 months was significantly related to weight per day gain from 6 to 9 months, $r = .254$, $p = .043$. The correlations for girls also revealed that formula amount at 6 months approached significance in negative relation to weight per day gain from 3 to 6 months, $r = -.243$, $p = .053$. Finally, for girls, the correlation of formula amount at 9 months to weight gain per day from 6 to

9 months was $r = .185$, $p = .144$. For boys, the correlation for formula amounts for 9 months and weight per day gain for 6 to 9 months approached significance, r = .285, $p = .053$. For boys, the correlation for formula amount at 6 months to weight per day gain from 3 to 6 months was r = .120, $p = .422$. For boys the correlation for formula amount at 6 months to weigh per day gain from 6 to 9 months was r = .120, $p = .421$. This pattern suggests that mothers of girls may feed more formula to girls gaining less weight per day from 3 to 6 months and then girls who are fed more formula continue to gain more weight. The same pattern does not appear to be true for boys.

Research Question II

The second research question was whether maternal authoritative or authoritarian parenting style was related to greater infant weight per day gain. The correlation revealed no significant relations of authoritative or authoritarian parenting style to any of the weight per day gain variables. Exploratory analyses found that permissive parenting style was related to amount of formula fed at 6 and 9 months, r = .262, $p = .008$ and r = .196, $p = .048$. Table 7 provides the results.

CHAPTER V

DISCUSSION

The purpose of this thesis was to explore the links among maternal characteristics, maternal feeding patterns of infants, and infant growth. The maternal characteristics considered are parenting styles and attitudes, parenting stress, and maternal affect. This thesis aimed to identify parenting factors that lead to healthy and unhealthy weight gain. The specific parenting factors considered included maternal parenting styles, stress, anxiety, depressive symptoms, hostility, and amount of formula fed to infants. Hypotheses I, II, and III were either supported or partially supported. Hypotheses IV, and V were not supported by this data set. Further explanations are provided below.

Hypothesis I

Breast-feeding has many positive benefits and lower risk of obesity is just one of those benefits. The first hypothesis was that the formula amount fed to infants at 6 and 9 months would be correlated with infant weight per day gain: the greater the formula, the greater the infant weight per day gain. The correlation analyses confirmed that as daily formula (in ounces) reported by mothers at the 6 and 9-month visit increased, weight gain in kilograms from 6 to 9 months increased. Analyses of variance also found that the group of infants fed any formula had significantly higher weight per day gain than infants who had no formula during the same period.

It is worth noting that the correlation was found in a time frame (6 to 9 months) where parents are introducing more solid foods. This study suggests that formula amounts still have an impact on infants weight gain after the introduction of solid foods and is consistent with other research on the link between formula and infant weight (Dewey et al., 1993). With childhood obesity on the rise, this study provides more support for the protective factor of breastfeeding in preventing overweight children (Anzman, 2010). This study clarifies that as formula amounts increase, weight gain per day also increases, which may then increase risk of obesity in later childhood.

Hypothesis II

The second hypothesis was that rapid weight gain from 3 to 6 months would lead to greater infant weight at 9 months. Rapid weight gain was operationalized as an increase of < 0.67 SD in weight-for-length *z* score. The analyses found that infants classified as experiencing rapid weight gain from 3 to 6 months were significantly different in 9-month weight in kilograms from infants experiencing normal weight gain from 3 to 6 months.

Because only 12 infants in the sample of 111 attained or exceeded a weight-for length *z* score of 2.0 at 9 months, the infants in this sample were normal weight infants. Thus, the current study cannot be interpreted as providing information about regulation of feeding in infancy.

Hypothesis III

Part A of the third hypothesis of the proposed investigation was that more negative mood -- such as stress, depressive symptoms, and anxiety -- in mothers is related to greater infant weight per day gain. The study found that mothers with higher anxiety

and somatization had infants with significantly lower weight per day gain than mothers with lower anxiety and somatization.

The importance of these findings is that as mothers become more anxious and have more problems with their bodies (somatization) due to psychological problems, the less weight their infants gain. A reason for this could be that mothers begin to pay less attention to the infants and more attention to their own problems, which leads to infants gaining weight slower than other normal infants. This change could be reflected in non-responsive feeding behaviors that we did not measure but that have been linked to lower infant weight gain (Black & Aboud, 2011). An alternative explanation is that as infants gain weight more slowly, mothers become anxious and have more psychological distress that appears as body functioning problems (somatization).

In previous research, maternal depression was found to be lower with mothers who were breastfeeding. Of the breastfeeding mothers, those who had two or more children were less likely to be depressed, than first time mothers (Mezzacappa & Endicott, 2007). Therefore, part B of the third hypothesis was that birth order would moderate the relation of maternal depression to infant weight gain: maternal depressive symptoms would have a greater impact on first-born infants than later-born infants with first-born infants having greater weight per day gain. As hypothesized infant weight per day gain from 6 to 9 months and 3 to 9 months was significantly predicted by the interaction between birth order and depression. However, both the direction of the findings and the group to which they pertained were counter to the hypothesis. The findings were significant for later-born infants rather than first-born infants. And the findings pertained to lower weight per day gain rather than greater weight per day gain.

For later-born infants, as maternal depression increased, infant weight per day gain decreased significantly. For first-born infants the relation between maternal depression and infant weight per day gain was not significant.

Hypothesis IV

The fourth hypothesis of this study was that the greater the insensitivity of mothers, the greater the infant weight gains. There were no significant correlations between these variables and infant weight per day gain from 3-6, 6-9, or 3-9 months. Thus, this study did not find support for a link between maternal emotional insensitivity and infant weight per day gain. The reason for the lack of support could be that the entire sample was predominantly breastfeeding at 3 months and a large number of participants were still breastfeeding at 6 and 9 months. According to Black and Aboud (2011), breastfeeding promotes responsive feeding since mothers learn to identify infant's satiety and hunger cues. Thus, this study could have been biased toward including more sensitive mothers due to its emphasis on breastfeeding and the duration of breastfeeding in the sample. This study also did not have a measure for maternal insensitivity to infant cues during feeding therefore the subscales used did not pertain to non-responsive feeding.

Hypothesis V

The fifth hypothesis of the current study was that the more permissive the parenting style, the greater the weight per day gain of the infants. This hypothesis was unsupported because permissive parenting style did not correlate with infant weight per day gain at any age.

The reason for the lack of support for parenting style affecting infant weight per day gain could be that it can be difficult to categorize parent styles with infants. The permissive parenting style is characterized by high warmth with few controls but because there are few control strategies appropriate for infants and most parents could have seen themselves as permissive, leading to restricted range on the variable. The low internal consistency of this measure is congruent with the conclusion that there were measurement problems with this variable.

Research Question I

The first research question asked what effect does gender have on weight per day gain and differences in the correlations of amounts of formula to weight gain. The ANOVA analysis determined there are significant gender differences in weight per day gain from 3 to 6 months, which is consistent with previous findings on gender differences in infant growth (e.g., Ayatollahi, 2005).

The correlation findings suggest that mothers of girls may feed more formula in response to girls who gained less weight per day from 3 to 6 months and then girls who are fed more formula continue to gain more weight. The same pattern did not appear to be true for boys.

Research Question II

The second research question is whether maternal authoritative or authoritarian parenting styles are related to greater infant weight per day gain. The correlation revealed no significant relations of authoritative or authoritarian parenting style to any of the weight per day gain variables. Exploratory analyses found that permissive parenting style was related to amount of formula fed at 6 and 9 months.

This finding appears contrary to research by Rhee et al. (2006) who found authoritative parenting had the lowest risk for child obesity and permissive and neglectful styles both had increased risks for child obesity with authoritarian parenting style having the greatest risk for obesity. However, only 12 infants had a 9 month weight-for-length *z* score greater than or equal to 2. Thus, normal weights characterized this sample. The influence that authoritative and authoritarian parenting styles have on normal infant weight gain still needs clarifying and further research is needed.

Implications

It is interesting that both formula amounts and rapid weight gain were found to be significantly related to infant weight or weight per day gain. As previously mentioned, childhood obesity is on the rise and many people are concerned with the factors leading to obesity. This study found that formula amount and rapid weight gain are related to higher infant weights, which may be relevant to current interventions for childhood obesity. Because only 12 infants in the current sample had weight-for-length *z* scores greater than or equal to 2, discussions of the relation of the current study to childhood obesity are speculative. Furthermore there is a lack of information on the solid food infants in this study were eating. Nonetheless, the knowledge gained from this study suggests that additional research on the relation of infant formula to weight and obesity in childhood is needed.

The study found gender differences with the amount of formula fed to infants and the infant's weight per day gain. The findings suggest that mothers may respond to infant girls who are gaining weight more slowly by feeding them more formula. As previously discussed, more formula is linked to greater infant weight per day gain. If the current

findings are replicated, infant girls might be more at risk for greater weight per day gain due to maternal formula feeding patterns. The findings collectively seem to support the notion that mothers should breast feed longer and consult with their pediatrician about infant growth and amount of formula intake.

Maternal feeding of more formula was correlated with more permissive parenting. While weight per day gain was not associated with permissive parenting, this finding suggests that the link between permissive parenting and weight gain could occur over the long term, as more permissive parents give infants more formula. A greater amount of formula is associated with increased weight per day gain in infants, indicating that more permissive parenting could later be a risk factor for greater infant weight per day gain.

The implications this study has for the mental health field are that parenting groups that focus on parenting infants might want to consider providing information on formula feeding consequences and rapid weight gain risks. Parents have many things to consider when raising their infants but being able to provide parents with specific guidelines could help decrease their anxiety.

An interesting finding of the current study was the negative interaction of maternal characteristics and infant weight per day gain. Mothers who were more anxious and had more somatization had infants with lower weight per day gain. Later-born infants of mothers who had depressive symptoms also had lower weight per day gain. Previous research found greater infant weight gain with mothers of higher negative moods. The reason for the different findings is unknown but should be further investigated by future researchers. This finding is consistent with Black and Aboud's (2011) emphasis that non-responsive parenting affects infant overweight and

underweight. Their position is confirmed by the findings of the current study.

Overall the implications of this thesis research are that parenting behaviors affect infant weight per day gain. Infants who are fed more formula gain more weight per day. Infants of more anxious, somatic, and depressed (for later born infants) mothers have slower infant weight per day gain. If these findings are replicated they could be helpful to doctors and educators when discussing feeding of infants with parents. Replication studies and future research are definitely called for in this important area.

Limitations

A limitation of the current study is the demographics of the sample. The sample was predominantly Caucasian, middle to upper-middle class, and highly educated; therefore results may not be generalizable to other populations. Another limitation of the study was the restriction of birth weight for inclusion. This narrowed the sample to only normal weight babies, which means weight gain differences may not be generalizable to infants with lower or higher birth weight. This study draws conclusions about the risks for obesity but only 12 infants had *z* scores greater than or equal to 2 and only three infants had *z* score exceeding 2.5 (maximum *z* score = 2.94). This is a limitation because the conclusions cannot be drawn about infant obesity or risk for obesity. The normality of this sample limits the generalizability and predictability of the results. A related limitation is that few analyses were conducted infant length but overall the majority of the study was focused on infant weight. This is a limitation because the weight of infants is affected by infant's length.

One major limitation of this study is the lack of knowledge about infants' solid food intake. The time frame studied includes the time parents are introducing solid

foods. The rate of introduction and variability of the foods was not calculated in this thesis; therefore all results should be interpreted with caution because the amount and types of solids that infants eat will directly affect infant weight per day gain. Mothers reported when they introduced solids and the variety of solids but caloric data could not be calculated for those foods due to lack of nutritional information about the foods. Therefore, the impact of solid foods was not analyzed.

Future Research

Future research should include a more diverse sample, specifically over-enrolling families from minority populations. The current study had a majority of Caucasian participants; future research that included a diverse sample might yield different results that would be more generalizable to populations other than Caucasian.

Future research should also look at the relations parenting styles have to both normal infant weight gain and to more problematic rapid infant weight gain. There is a chance that at a certain age one parenting style has a protective quality but at another age the same parenting style could increase risks of obesity. As children grow their needs change, so while in infancy authoritarian parenting does not effect infant weight per day gain (current study), the effect of authoritarian parenting on older children was found to have the greatest risk for obesity (Rhee et al., 2006) at older ages. Other findings on the absence of a link between maternal parenting style and child weight (Blisset & Haycraft, 2008) are more consistent with our findings on parenting of infants, suggesting that more research is needed in order to better understand the relationship of infant weight gain and parenting styles.

Future research should focus on the effects of breastfeeding, formula amounts, and solid food introduction and amounts on infant weight gain. The amount and quality of food affects infant weight. Therefore future research should examine whether the relation of infant weight gain to breastfeeding and solid food introduction is different from formula feeding and solid food introduction, with careful specification of nutrient and energy density of solid foods in both groups.

The last area of future research is ways to improve increasing infants' weight for those who are slowly gaining weight. The problem is that by changing slow growth to rapid growth more risk for later obesity may be created, so research that could identify slower ways of increasing infant weight would be more helpful.

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APPPENDICES

APPENDIX A

Demographic information questionnaire.

Child Information

What is your relationship to the baby? Example: mother, father, stepmother.

_____

Gender of baby _____ Male _____ Female

Birthdate of baby _____
Month Day Year

Birth weight of baby ___ lbs ___oz

Date of expected birth (due date) _____
Month Day Year

Was the baby born by c-section? YES NO

Maternal Information

Birthdate _____
Month Day Year

Your marital status (check one)

___ Married, first time ___ Single, never married

___ Single, separated ___ Single, divorced

___ Single, widowed ___ Remarried

___ Other, please specify: _____

Your own ethnic group (please check) ___ Native American Nation: _____

___ African American
___ Hispanic
___ Asian
___ White
___ Multiethnic Describe: _____
___ _Other

Please place a check mark next to the highest grade you completed in school.

____ 6th grade
____ 7th grade
____ 8th grade
____ 9th grade
____ 10th grade
____ 11th grade
____ 12th grade
____ some vo-tech
____ some college courses
____ vo-tech graduate
____ college graduate

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

____ 6th grade
____ 7th grade
____ 8th grade
____ 9th grade
____ 10th grade
____ 11th grade
____ 12th grade
____ some vo-tech
____ some college courses
____ vo-tech graduate
____ college graduate

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

___ $ 0 - 100
___ $ 100 - 499
___ $ 500 - 999
___ $ 1000 - 1499
___ $ 1500 - 1999
___ $ 2000 - 2499
___ $ 2500 - 2999
___ $ 3000 - 3499
___ $ 3500 - 3999
___ $ 4000 plus

Is your current spouse/partner the father of the baby (check one)

___ yes ___ no

Ethnic group of the biological father of the baby. (please check)

___ Native American Nation: _____

___ African American
___ Hispanic
___ Asian
___ White
___ Multiethnic Describe: _____
___ Other

Do you currently receive state or federal financial assistance? (check as many as apply)

___ WIC
___ TANF
___ School lunch/breakfast
___ Food Stamps
___ Indian Health Services
___ Unemployment benefits
___ Energy assistance
___ Social Security/SSI
___ Medicaid

For how many years have you received such assistance? (check one)

___ five or more years
___ four years
___ three years
___ two years
___ one year
___ less than one year

My child seems to be less healthy than other children I know.

____ strongly agree
____ agree
____ do not agree or disagree
____ disagree
____ strongly disagree

My child has never been seriously ill.

____ agree
____ disagree

APPENDIX B

Parenting Stress Index: Short Form (PSI-SF).

Name_____ Gender___ Date of birth ..... Ethnic group _____ Marital status_____

Child's name_____ Child's gender_____ Child's date of birth _____ Today's date_____

SA = Strongly Agree A = Agree NS = Not Sure D = Disagree SD = Strongly Disagree

1.	I often have the feeling that I cannot handle things very well.	SA	A	NS	D	SD
2.	I find myself giving up more of my life to meet my children's needs than I ever expected.	SA	A	NS	D	SD
3.	I feel trapped by my responsibilities as a parent.	SA	A	NS	D	SD
4.	Since having this child, I have been unable to do new and different things.	SA	A	NS	D	SD
5.	Since having a child, I feel that I am almost never able to do things that I like to do.	SA	A	NS	D	SD
6.	I am unhappy with the last purchase of clothing I made for myself.	SA	A	NS	D	SD
7.	There are quite a few things that bother me about my life.	SA	A	NS	D	SD
8.	Having a child has caused more problems than I expected in my relationship with my spouse (or male/female friend).	SA	A	NS	D	SD
9.	I feel alone and without friends.	SA	A	NS	D	SD
10.	When I go to a party, I usually expect not to enjoy myself.	SA	A	NS	D	SD
11.	I am not as interested in people as I used to be.	SA	A	NS	D	SD
12.	I don't enjoy things as I used to.	SA	A	NS	D	SD
13.	My child rarely does things for me that make me feel good.	SA	A	NS	D	SD
14.	Sometimes I feel my child doesn't like me and doesn't want to be close to me.	SA	A	NS	D	SD
15.	My child smiles at me much less than I expected.	SA	A	NS	D	SD
16.	When I do things for my child, I get the feeling that my efforts are not appreciated very much.	SA	A	NS	D	SD
17.	When playing, my child doesn't often giggle or laugh.	SA	A	NS	D	SD
18.	My child doesn't seem to learn as quickly as most children.	SA	A	NS	D	SD
19.	My child doesn't seem to smile as much as most children.	SA	A	NS	D	SD
20.	My child is not able to do as much as I expected.	SA	A	NS	D	SD
21.	It takes a long time and it is very hard for my child to get used to new things.	SA	A	NS	D	SD

For the next statement, choose your response from the choices "1" to "5" below.

22.	I feel that I am: 1. not very good at being a parent 2. a person who has some trouble being a parent 3. an average parent 4. a better than average parent 5. a very good parent	1	2	3	4	5
23.	I expected to have closer and warmer feelings for my child than I do and this bothers me.	SA	A	NS	D	SD
24.	Sometimes my child does things that bother me just to be mean.	SA	A	NS	D	SD
25.	My child seems to cry or fuss more often than most children.	SA	A	NS	D	SD
26.	My child generally wakes up in a bad mood.	SA	A	NS	D	SD
27.	I feel that my child is very moody and easily upset.	SA	A	NS	D	SD
28.	My child does a few things which bother me a great deal.	SA	A	NS	D	SD
29.	My child reacts very strongly when something happens that my child doesn't like.	SA	A	NS	D	SD
30.	My child gets upset easily over the smallest thing.	SA	A	NS	D	SD
31.	My child's sleeping or eating schedule was much harder to establish than I expected.	SA	A	NS	D	SD

For the next statement, choose your response from the choices "1" to "5" below.

32.	I have found that getting my child to do something or stop doing something is: 1. much harder than I expected 2. somewhat harder than I expected 3. about as hard as I expected 4. somewhat easier than I expected 5. much easier than I expected	1	2	3	4	5

For the next statement, choose your response from the choices "10+" to "1-3."

33.	Think carefully and count the number of things which your child does that bother you. For example: dawdles, refuses to listen, overactive, cries, interrupts, fights, whines, etc.	10+	8-9	6-7	4-5	1-3
34.	There are some things my child does that really bother me a lot.	SA	A	NS	D	SD
35.	My child turned out to be more of a problem than I had expected.	SA	A	NS	D	SD
36.	My child makes more demands on me than most children.	SA	A	NS	D	SD

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APPENDIX C

Adult-Adolescent Parenting Inventory – 2.

AAPI-2 (Form B-posttest) items and scoring information

Participants are asked to rate each item from 1 (Strongly Agree) to 5 (Strongly Disagree)

1. Children who express their opinions usually make things worse.

2. The problem with kids today is that parents give them too much freedom.

3. Children should offer comfort when their parents are sad.

4. Children who learn to recognize feelings in others are more successful in life.

5. Spanking children when they misbehave teaches them how to behave.

6. Children who bit others need to be bitten to teach them what it feels like

7. Children need to be potty trained as soon as they are two years old.

8. Parents who are sensitive to their children's feelings and moods often spoil them.

9. Crying is a sign of weakness in boys.

10. Children should be obedient to authority figures.

11. You cannot teach children respect by spanking them.

12. Children learn violence from their parents.

13. Parents' needs are more important that children's needs.

14. Praising children is a good way to build their self-esteem.

15. Children nowadays have it too easy.

16. Children should be the main source of comfort for their parents.

17. Parents expectations of their children should be high, but appropriate.

18. Children who are spanked usually feel resentful towards their parents.

19. Strong-willed toddlers need to be spanked to get them to behave.

20. Children should be seen and not heard.

21. Parents who encourage their children to talk to them only end up listening to complaints.

22. Give children an inch and they'll take a mile.

23. Parents spoil babies by picking them up when they cry.

24. Children should be considerate of their parent's needs.

25. In father's absence, the son needs to become the man of the house.

26. Consequences are necessary for family rules to have meaning.

27. Children should be taught to obey their parents at all times.

28. Mild spankings can begin between 15 and 18 months of age.

29. If a child is old enough to defy a parent, then he or she is old enough to be spanked.

30. The less children know, the better off they are.

31. Two-year-old children make a terrible mess of everything.

32. If you love your children, you will spank them when they misbehave.

33. Parents should expect more from boys than girls.

34. Older children should be responsible for the care of their younger brothers and sisters.

35. Rewarding children's appropriate behavior is a good form of discipline.

36. Never hit a child.

37. Children who are spanked behave better than children who are not.

38. Children should know when their parents are tired.

39. Good children always obey their parents.

40. Children cry just to get attention.

APPENDIX D

Parenting Styles and Dimensions Questionnaire (PDSQ).

REMEMBER: Rate how often you exhibit this behavior with your child.

I EXHIBIT THIS BEHAVIOR:
1 = Never
2 = Once In Awhile
3 = About Half of the Time
4 = Very Often
5 = Always

1. I am responsive to my child's feelings and needs.
2. I use physical punishment as a way of disciplining my child.
3. I take my child's desires into account before asking the child to do something.
4. When my child asks why he/she has to conform, I state: because I said so, or I am your parent and I want you to.
5. I explain to my child how I feel about the child's good and bad behavior.
6. I spank when my child is disobedient.
7. I encourage my child to talk about his/her troubles.
8. I find it difficult to discipline my child.
9. I encourage my child to freely express himself/herself even when disagreeing with parents.
10. I punishby taking privileges away from my child with little if any explanations.
11. I emphasize the reasons for rules.
12. I give comfort and understanding when my child is upset.
13. I yell or shout when my child misbehaves.
14. I give praise when my child is good.
15. I give into my child when the child causes a commotion about something.
16. I explode in anger towards my child.
17. I threaten my child with punishment more often than actually giving it.
18. I take into account my child's preferences in making plans for the family.

19. I grab my child when being disobedient.
20. I state punishments to my child and do not actually do them.
21. I show respect for my child's opinions by encouraging my child to express them.
22. I allow my child to give input into family rules.
23. I scold and criticize to make my child improve.
24. I spoil my child.
25. I give my child reasons why rules should be obeyed.
26. I use threats as punishment with little or no justification.
27. I have warm and intimate times together with my child.
28. I punish by putting my child off somewhere alone with little if any explanations.
29. I help my child to understand the impact of behavior by encouraging my child to talk about the consequences of his/her own actions.
30. I scold or criticize when my child's behavior doesn't meet my expectations.
31. I explain the consequences of the child's behavior.
32. I slap my child when the child misbehaves.

APPENDIX E

Symptom Checklist-90-Revised (SCL-90-R).

INSTRUCTIONS:

The SCL-90-R test consists of a list of problems people sometimes have. Read each one carefully and circle the number of the response that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE PAST 7 DAYS INCLUDING TODAY. Circle only one number for each problem (0 1 2 3 4). Do not skip any items. If you change your mind, draw an X through your original answer and then circle your new answer (0 1 2 3 4).Read the example before you begin. If you have any questions, please ask them now.

0 = Not at all
1 = A little bit
2 = Moderately
3 = Quite a bit
4 = Extremely

How much were you distressed by:

1. Headaches
2. Nervousness or shakiness inside
3. Repeated unpleasant thoughts that won't leave your mind
4. Faintness or dizziness
5. Loss of sexual interest or pleasure
6. Feeling critical of others
7. The idea that someone else can control your thoughts
8. Feeling others are to blame for most of your troubles
9. Trouble remembering things
10. Worried about sloppiness or carelessness
11. Feeling easily annoyed or irritated
12. Pains in heart or chest
13. Feeling afraid in open spaces or on the streets
14. Feeling low in energy or slowed down
15. Thoughts of ending your life
16. Hearing voices that other people do not hear
17. Trembling
18. Feeling that most people cannot be trusted
19. Poor appetite
20. Crying easily
21. Feeling shy or uneasy with the opposite sex
22. Feelings of being trapped or caught
23. Suddenly scared for no reason
24. Temper outbursts that you could not control

25. Feeling afraid to go out of your house alone
26. Blaming yourself for things
27. Pains in lower back
28. Feeling blocked in getting things done
29. Feeling lonely
30. Feeling blue
31. Worrying too much about things
32. Feeling no interest in things
33. Feeling fearful
34. Your feelings being easily hurt
35. Other people being aware of your private thoughts
36. Feeling others do not understand you or are unsympathetic
37. Feeling that people are unfriendly or dislike you
38. Having to do things very slowly to insure correctness
39. Heart pounding or racing
40. Nausea or upset stomach
41. Feeling inferior to others
42. Soreness of your muscles
43. Feeling that you are watched or talked about by others
44. Trouble falling asleep
45. Having to check and double-check what you do
46. Difficulty making decisions
47. Feeling afraid to travel on buses, subways, or trains
48. Trouble getting your breath
49. Hot or cold spells
50. Having to avoid certain things, places, or activities because they frighten you
51. Your mind going blank
52. Numbness or tingling in parts of your body
53. A lump in your throat
54. Feeling hopeless about the future
55. Trouble concentrating
56. Feeling weak in parts of your body
57. Feeling tense or keyed up
58. Heavy feelings in your arms or legs
59. Thoughts of death or dying
60. Overeating
61. Feeling uneasy when people are watching or talking about you
62. Having thoughts that are not your own
63. Having urges to beat, injure, or harm someone
64. Awakening in the early morning
65. Having to repeat the same actions such as touching, counting, or washing
66. Sleep that is restless or disturbed
67. Having urges to break or smash things
68. Having ideas or beliefs that others do not share
69. Feeling very self-conscious with others
70. Feeling uneasy in crowds, such as shopping or at a movie

71. Feeling everything is an effort
72. Spells of terror or panic
73. Feeling uncomfortable about eating or drinking in public
74. Getting into frequent arguments
75. Feeling nervous when you are left alone
76. Others not giving you proper credit for your achievements
77. Feeling lonely even when you are with people
78. Feeling so restless you couldn't sit still
79. Feelings of worthlessness
80. The feeling that something bad is going to happen to you
81. Shouting or throwing things
82. Feeling afraid you will faint in public
83. Feeling that people will take advantage of you if you let them
84. Having thoughts about sex that bother you a lot
85. The idea that you should be punished for your sins
86. Thoughts and images of a frightening nature
87. The idea that something serious is wrong with your body
88. Never feeling close to another person
89. Feelings of guilt
90. The idea that something is wrong with your mind

APPENDIX F

Positive and Negative Affect Scale (PANAS).

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark
the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past three months. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested
_____ distressed
_____ ashamed
_____ upset
_____ strong
_____ guilty
_____ scared
_____ hostile
_____ enthusiastic
_____ proud
_____ irritable
_____ alert
_____ excited
_____ inspired
_____nervous
_____ determined
_____ attentive
_____ jittery
_____ active
_____ afraid

APPENDIX G

Additional questions posed to the mother regarding infant diet at 6 and 9 months:

Are you exclusively breastfeeding? Yes No

What kind of formula (or milk) do you use? _____
Note to interviewer: make sure to check if the formula is iron fortified or not

How often do you generally give formula? _____

How much formula does *(name)* generally take at a feeding? _____

When did *(name)* start taking solid food like cereal? _____months

What kinds of foods does *(name)* take now?
Note to interviewer: check all that apply

___ baby cereal ___ mashed table food

___ infant fruit ___ cereal: example cheerios/oatmeal (not infant)

___ infant vegetables ___ regular juice/ juicedrinks

___ baby meat ___ cow's milk
___ whole ___ 1 or 2%

___ infant "dinners"

___ infant juice

___ infant deserts

___ other homemade puree/ground baby food

___ other foods: _____

When did you start giving *(name)* pureed meat, infant dinners or other meat products?
_____months of age.
How many times a day does *(name)* eat these foods? _____

Do you give *(name)* any supplements or medications routinely? _____

Note to interviewer: if yes please list all.

Additional question tol be asked of the mother at the 3 month visit.

Where did you hear about this study?

Table 1

Internal Consistency of Measures

Questionnaire - Subscale	Item Mean (SD) [*n* for mean]		Cronbach's α (Original α)		Items (*n* for α)
PANAS - PA - 3mo.	37.64 (6.35)	[10]	.862	(0.89)	10
PANAS - NA - 3mo.	18.63 (5.24)	[10]	.823	(0.85)	10
PANAS - PA - 6mo.	38.54 (5.47)	[10]	.847	(0.89)	10
PANAS - NA - 6mo.	17.72 (5.47)	[10]	.841	(0.85)	10
PANAS - PA - 9mo.	38.64 (5.65)	[10]	.875	(0.89)	10
PANAS - NA - 9mo.	17.86 (5.84)	[10]	.871	(0.85)	10
SCL90-R - SOM	5.05 (4.97)	[12]	.787	--	12
SCL90-R - DEP	7.67 (7.50)	[13]	.874	--	13
SCL90-R - ANX	2.34 (3.44)	[10]	.780	--	10
SCL90-R - HOS	2.67 (3.04)	[7]	.754	--	7
SCL90-R - IS	4.55 (5.13)	[10]	.850	--	10
PSDQ - Authoritative	62.97 (7.45)	[15]	.874	(0.82)	15
PSDQ - Authoritarian	17.67 (4.57)	[12]	.824	(0.78)	12
PSDQ - Permissive	7.98 (2.14)	[4]	.452	(0.76)	4
PSI - PD	25.48 (7.94)	[12]	.861	(0.87)	12
PSI - PCDI	17.14 (5.10)	[12]	.869	(0.80)	12
PSI - DC	22.1 (6.66)	[12]	.845	(0.85)	12
AAPI - Inapp. Expectations	--	--	--	(0.64)	--
AAPI - Lack of Empathy	--	--	--	(0.79)	--

AAPI - Corporal Punishment	--	--	--	--	(0.79)	--
AAPI - Role Reversal	--	--	--	--	(0.59)	--
AAPI - Oppress Power	--	--	--	--	(0.50)	--

Table 2

Sample Demographics

Variable	Mean, Median, %	(SD)	N	Min	Max
Child Age in Months					
3 Months	M = 3.02	(.31913)	111		
6 Months	M = 5.95	(.32472)	111		
9 Months	M = 8.81	(.96554)	111		
Maternal age in years	M = 28.44	(4.411)	110		
Child Gender			111		
Male	42.3%		47		
Female	57.7%		64		
Household Income per month	Median: $40,001-$60,000		111		
$0-$15,000	9.9%		11		
$15,001-$25,000	15.3%		17		
$25,001-$40,000	19.8%		22		
$40,001-$60,000	24.3%		27		
Over $60,000	27.0%		30		
Not Stated	3.6%		4		
Maternal Ethinicity			111		
Caucasian	88.3%		98		

Native American	6.3%	7
African-American	0.9%	1
Hispanic	2.7%	3
Asian	0.9%	1
Not stated	0.9%	1
Maternal Education	Median: College Graduate	111
Less than HS Diploma	0.9%	1
High School Graduate	3.6%	4
Some College	27.0%	30
College Graduate	25.2%	28
Post Graduate or Above	42.3%	47
Not Stated	0.9%	1
Marital Status		111
Married	91.0%	101
Unmarried Partners	6.3%	7
Divorced	1.8%	2
Not Stated	0.9%	1
Maternal number of Children		111
1	45.9%	51
2	36.9%	41
3	10.8%	12

4	3.6%		4		
5	1.8%		2		
Not Stated	0.9%		1		
WIC Status			111		
Yes	23.4%		26		
No	76.6%		85		
Infant Weight in Kg.					
Birth	M = 3.52	(.414)	111		
3 Months	M = 6.17	(.779)	111		
6 Months	M = 7.75	(.977)	111		
9 Months	M = 8.83	(1.05)	111		
Infant Formula in Oz.					
6 Months	M = 4.37	(10.587)	111		
9 Months	M = 6.86	(12.407)	111		
Infant Weight Per Day Gain in kg.					
3 - 6 Months	0.0177	(.00561)	111	.01	.04
6 - 9 Months	0.0119	(.00494)	111	.00	.02
3 - 9 Months	0.0147	(.00388)	111	.00	.02
Infant Weight for Length z-scores					
3 Months	0.2227	(1.10956)	111	-3.11	3.32

6 Months	0.5246	(1.05933)	111	-1.76	3.40
9 Months	0.7665	(.90609)	111	-1.33	2.94
Infant Weight for Age z-scores					
3 Months	0.0715	(.95039)	111	-2.22	2.36
6 Months	0.1844	(.9799)	111	-2.42	2.67
9 Months	0.2932	(.91694)	111	-2.50	2.59

Table 3

Hypothesis I ANOVA

Variables	Mean	SD	N	F	*p*
High Formula 9:			111	4.644*	.012
No Formula	.0109	.00500	71		
0-29 ounces	.0130	.00464	27		
30 + ounces	.0148	.00494	13		
~ DV: weight per day gain 6 to 9 months					
High Formula 9			98	3.568	.062
No Formula	.0109	.00500	71		
0-29 ounces	.0130	.00464	27		
~ DV: weight per day gain 6 to 9 months					
High Formula 9:			84	7.165*	.009
No Formula	.0109	.00500	71		
30 + ounces	.0148	.00366	13		
~ DV: weight per day gain 6 to 9 months					
High Formula 9:			111	8.022*	.006
No Formula	.0109	.00500	71		
Any Formula	.0136	.00438	40		
~ DV: weight per day gain 6 to 9 months					

Note: * $p < .05$, ** $p < .001$

Table 4

Hypothesis II ANOVA

Variables	Mean	SD	N	F	*p*
Rapid Weight Gain 3 to 6 months:			111	6.022*	.016
Normal weight gain	8.6710	1.00773	78		
Rapid weigth gain (+.67 SD)	9.1945	1.07293	33		
~ DV: weight 9 months					
Rapid Weight Gain 3 to 6 months:			111	3.164	.074
Normal weight gain	69.4474	2.80075	78		
Rapid weigth gain (+.67 SD)	70.4833	2.81332	33		
~ DV: length 9 months					
Rapid Weight Gain 3 to 6 months:			111	3.695	.057
Normal weight gain	.6603	.91339	78		
Rapid weigth gain (+.67 SD)	1.0176	.84981	33		
~ DV: weight-for-length z-scores 9 months					

Note: * $p < .05$, ** $p < .001$

Table 5

Hypothesis III Regressions

Outcome	Model Summary			Coefficients			
	ΔR^2	df	*p*	β	B	SE	*p*
Part A:							
Block 1	0.059	85	0.076				
SCL90-R - SOM				-0.096	-0.001	0.002	0.576
SCL90-R - ANX				-0.160	-0.003	0.003	0.350
~ DV: weight gain 3 to 6							
Block 1	0.049	86	.039*				
SCL90-R - SOM				-0.221	-0.002	0.001	.039*
~ DV: weight gain 3 to 9							
Part B:							
Block 1	0.048	85	0.123				
SCL90-R - DEP				0.106	-0.002	0.001	0.069
Firstborn				0.090	0.001	0.001	0.397
Block 2	0.002	84	0.668				
Interaction				-0.059	-0.001	0.002	0.668
~ DV: weight gain 3 to 6							
Block 1	0.016	85	0.51				
SCL90-R - DEP				-0.048	0.000	0.001	0.657
Firstborn				0.113	0.001	0.001	0.296
Block 2	0.101	84	0.003**				
Interaction				-0.412	-0.006	0.002	.003**
~ DV: weight gain 6 to 9							
Block 1	0.041	85	0.173				
SCL90-R - DEP				-0.180	-0.001	0.001	0.094
Firstborn				0.081	0.001	0.001	0.451
Block 2	0.062	84	.018*				
Interaction				-0.323	-0.004	0.001	.018*
~ DV: weight gain 3 to 9							

Note: * $p < .05$, ** $p < .001$

Table 6

Hypothesis IV Correlations

		Weight perday gain3-6	Weight perday gain6-9	Weight perday gain3-9	PANAS Pos 3	PANAS Neg 3	PANAS Pos 6	PANAS Neg 6
Weight perday gain3-6	Pearson	1						
	Sig.							
	N							
Weight perday gain6-9	Pearson	0.018	1					
	Sig.	0.851						
	N	111						
Weight perday gain3-9	Pearson	.690**	.699**	1				
	Sig.	0.000	0.000					
	N	111	111					
PANAS Pos 3	Pearson	0.018	-0.068	-0.030	1			
	Sig.	0.858	0.502	0.763				
	N	101	101	101				
PANAS Neg 3	Pearson	-0.016	-0.038	-0.069	-0.107	1		
	Sig.	0.876	0.706	0.494	0.289			
	N	101	101	101	101			
PANAS Pos 6	Pearson	-0.074	-0.064	-0.102	0.432**	-.287**	1	
	Sig.	0.443	0.509	0.293	0.000	0.004		
	N	109	109	109	99	99		
PANAS Neg 6	Pearson	-0.074	0.069	-0.043	-0.110	0.572**	-.299**	1
	Sig.	0.445	0.473	0.656	0.277	0.000	0.002	
	N	109	109	109	99	99	109	

Note: * $p < .01$, ** $p < .05$, *** $p < .001$

Table 6 (Continued)

Hypothesis IV Correlations

		Weight perday gain3-6	Weight perday gain6-9	Weight perday gain3-9	PANAS Pos 9	PANAS Neg 9	SCL90-R IS	AAPI Expect-ations
Weight perday gain3-6	Pearson	1						
	Sig.							
	N							
Weight perday gain6-9	Pearson	0.018	1					
	Sig.	0.851						
	N	111						
Weight perday gain3-9	Pearson	.690**	.699**	1				
	Sig.	0.000	0.000					
	N	111	111					
PANAS Pos 9	Pearson	-0.015	-0.061	-0.036	1			
	Sig.	0.880	0.525	0.709				
	N	111	111	111				
PANAS Neg 9	Pearson	0.099	0.056	0.098	-.249**	1		
	Sig.	0.299	0.562	0.308	0.009			
	N	111	111	111	111			
SCL90-R IS	Pearson	-0.140	-0.078	-0.069	.012	0.405***	1	
	Sig.	0.192	0.472	0.521	0.911	0.000		
	N	88	88	88	88	88		
AAPI Expect-ations	Pearson	-0.005	0.033	0.022	0.006	-0.107	-0.135	1
	Sig.	0.961	0.735	0.817	0.954	0.266	0.209	
	N	110	110	110	110	110	88	

Note: * p < .01, ** p < .05, *** p < .001

Table 6 (Continued)

Hypothesis IV Correlations

		Weight perday gain3-6	Weight perday gain6-9	Weight perday gain3-9	AAPI Corporal Punish.	AAPI Role Respons.	AAPI Child Power	AAPI Empathy to Child
Weight perday gain3-6	Pearson	1						
	Sig.							
	N							
Weight perday gain6-9	Pearson	0.018	1					
	Sig.	0.851						
	N	111						
Weight perday gain3-9	Pearson	.690**	.699**	1				
	Sig.	0.000	0.000					
	N	111	111					
AAPI Corporal Punish.	Pearson	0.037	-0.006	0.029	1			
	Sig.	0.701	0.953	0.764				
	N	110	110	110				
AAPI Role Respons.	Pearson	-0.115	-0.032	-0.087	0.392***	1		
	Sig.	0.232	0.740	0.368	0.000			
	N	110	110	110	110			
AAPI Child Power	Pearson	-0.103	0.068	0.004	0.341***	0.505***	1	
	Sig.	0.284	0.482	0.966	0.000	0.000		
	N	110	110	110	110	110		
AAPI Empathy to Child	Pearson	-0.069	0.086	0.033	0.412***	0.53***	0.432***	1
	Sig.	0.477	0.370	0.732	0.000	0.000	0.000	
	N	110	110	110	110	110	110	

Note: * p < .01, ** p < .05, *** p < .001

Table 7

Hypothesis V & Research Question II Correlations

		Weight perday gain3-6	Weight perday gain6-9	Weight perday gain3-9	Permis-sive	Author-itarian	Author-itative
Weight perday gain3-6	Pearson Sig. N	1					
Weight perday gain6-9	Pearson Sig. N	0.018 0.851 111	1				
Weight perday gain3-9	Pearson Sig. N	.690** 0.000 111	.699** 0.000 111	1			
Permissive	Pearson Sig. N	0.060 0.551 102	0.123 0.219 102	0.110 0.270 102	1		
Authoritarian	Pearson Sig. N	-0.024 0.814 98	-0.057 0.576 98	-0.051 0.618 98	0.252 0.012 98	1	
Authoritative	Pearson Sig. N	-0.053 0.603 98	0.091 0.375 98	-0.015 0.885 98	0.101 0.321 98	-.257 0.011 98	1

Note: * $p < .05$, ** $p < .001$

Figure 1

Hypothesis III

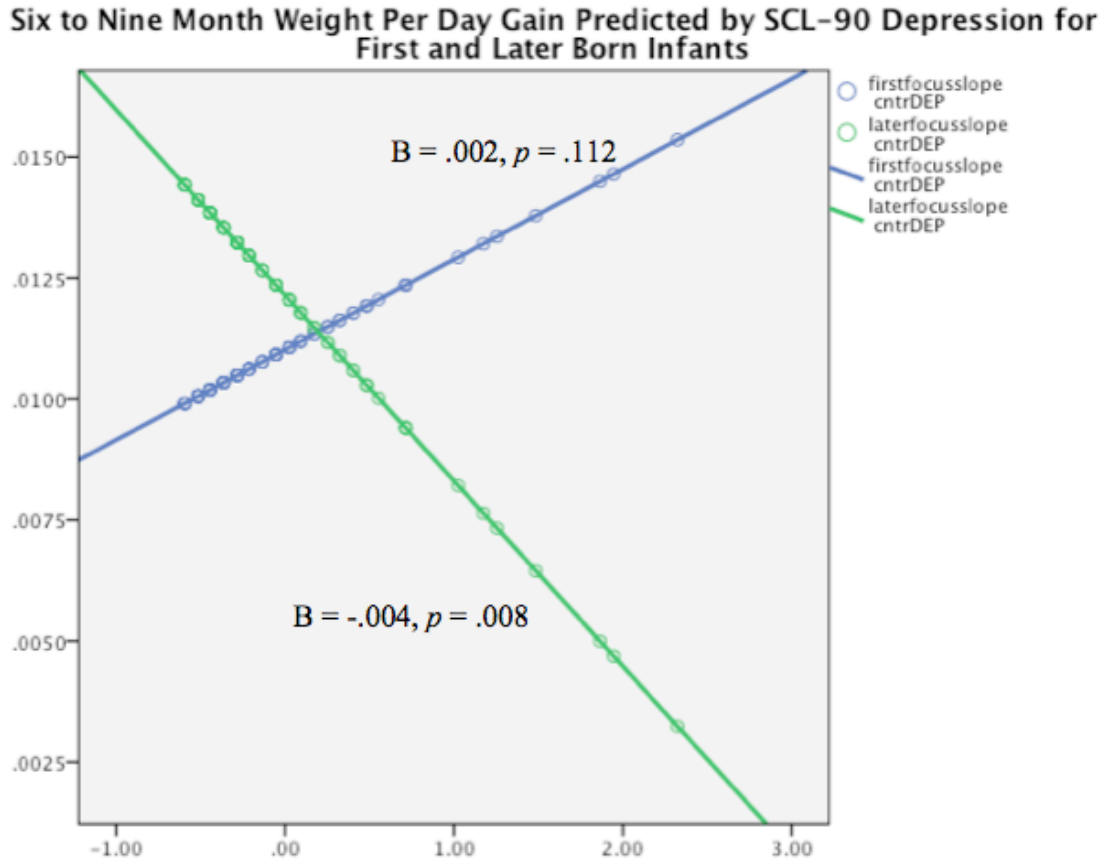
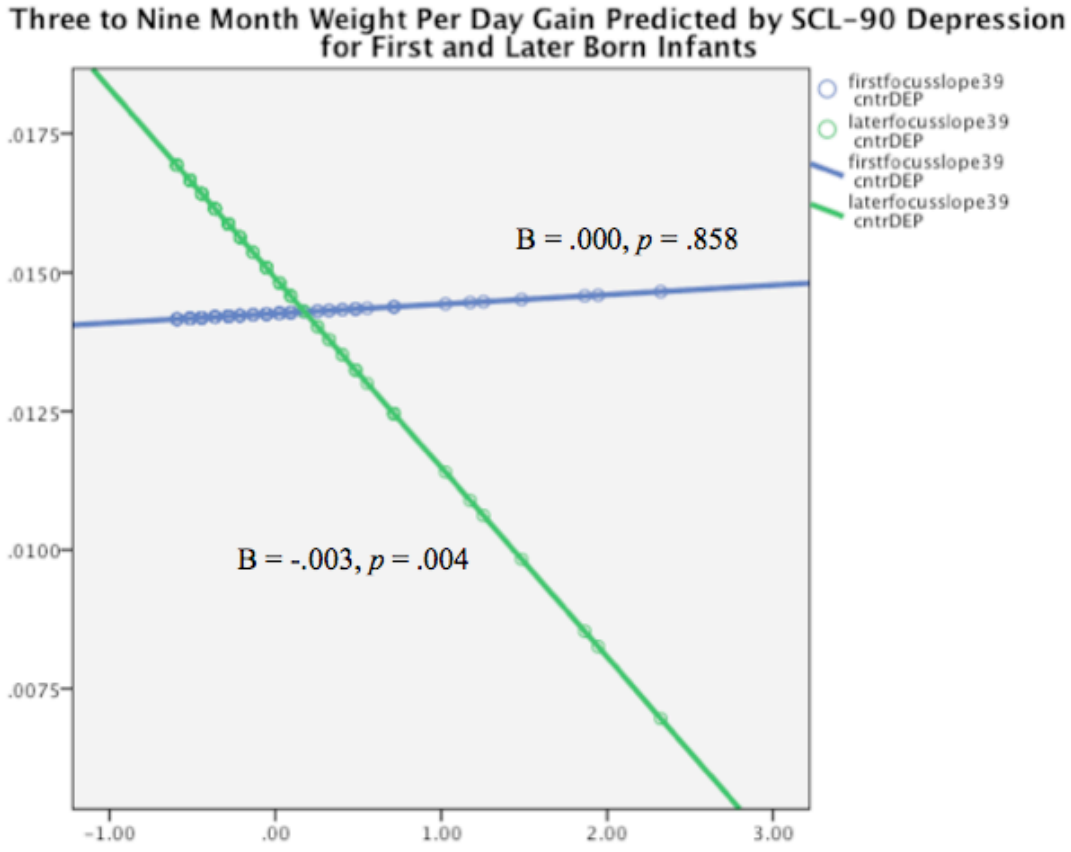


Figure 2

Hypothesis III



Oklahoma State University Institutional Review Board

Date:	Tuesday, December 11, 2007
IRB Application No	AS0783
Proposal Title:	Maternal Dietary Nutrients and Neurotoxins in Infant Cognitive Development
Reviewed and Processed as:	Expedited (Spec Pop)

Status Recommended by Reviewer(s): Approved Protocol Expires: 12/10/2008

Principal Investigator(s)

David Thomas
215 N. Murray
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

Tabitha A. Valtr

Candidate for the Degree of

Master of Science

Thesis: MATERNAL CHARACTERICTICS RELATED TO INFANT GROWTH

Major Field: Human Development and Family Science with specialization in Marriage and Family Therapy

Biographical:

Personal Data: Born in Enid, Oklahoma, On October 12, 1985, the daughter of David Valtr and Laurie Lorenz.

Education: Graduated from Pioneer-Pleasant Vale High School, Waukomis, OK in 2004; received the Bachelor of Science in Psychology and Bachelor of Business Administration in Accounting at Oklahoma State University, Stillwater, OK in 2009. Completed the requirements for the Master of Science in Human Development and Family Science with specialization in Marriage and Family Therapy at Oklahoma State University, Stillwater, Oklahoma in December, 2011.

Experience: Employed by Oklahoma State University, as a work study intern for Payne County Youth Services in Stillwater, OK from August 2007 thru May 2010; employed by Oklahoma Marriage Innitiative, Oklahoma, 2010 to 2011; employed by Oklahoma State University as a graduate research assistant and graduate teaching assistant, 2009 to present; worked as Therapy Intern for the Center for Family Services at Oklahoma State University, 2009 to present; worked as Therapy Intern for Youth Services of Tulsa in Tulsa, OK from March 2011 to present.

Professional Memberships: American Association for Marriage and Family Therapy, Oklahoma Association for Marriage and Family Therapy, Southwestern Psychological Association, Psi Chi Association.

Name: Tabitha A. Valtr Date of Degree: December, 2011

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: MATERNAL CHARACTERISTICS RELATED TO INFANT GROWTH

Pages in Study: 80 Candidate for the Degree of Master of Science

Major Field: Human Development Family Science

Scope and Method of Study: The purpose of this thesis was to evaluate links among maternal characteristics, maternal feeding patterns, and infant growth. Maternal characteristics included parenting styles and attitudes, stress, and affect. Mother-infant dyads (N=111) were recruited from the general population in a rural community. Dyads visited the laboratory when infants were 3, 6, and 9 months (mos.). Maternal measures included the Positive and Negative Affect Scale (PANAS), Symptom Checklist-90-Revised (SCL-90-R), Parenting Styles and Dimensions Questionnaire, Parenting Stress Index – Short Form, and Adult Adolescent Parenting Inventory – 2. Infant measures included anthropometric measures and amount of formula. Primary measure of infant weight was weight per day gain (wt-d-gain) to control time between visits. Correlation, regression, and ANOVA analyses tested the five hypotheses and two research questions.

Findings and Conclusions: Correlations confirmed hypothesis I that as daily formula at 6 and 9 mos. increased, wt-d-gain from 6 to 9 mos. increased, r = .204, p = .016 and r = .246, p = .005. The 71 infants who received no formula at 9 mos. had lower wt-d-gain from 6 to 9 mos. F (1, 109) = 8.022, p = .006, than the 40 infants who received some formula. The ANOVA for hypothesis II compared 3- to 6-mo. rapid weight gain ($\geq$ .67 SD versus < .67 SD) groups on the dependent variable of 9-mo weight. Infants $\geq$ .67 SD weight gain had higher 9-mo weight (M = 9.1945, SD = 1.07293) than infants < .67 (M = 8.6710, SD = 1.00773), F (1, 109) = 6.022, p = .016. For hypothesis III, 3- to 9-mo wt-d-gain was predicted by SCL90-R Somatization, R^2= .049, β = -.002, p = .039. Infant wt-d-gain from 6 to 9 mos. and 3 to 9 mos. were predicted by birth order X depressive symptoms. In opposition to hypothesis III: for later-born children, the higher the maternal depression, the lower the child wt-d-gain. Hypotheses IV (higher maternal insensitivity is associated with greater wt-d-gain) and V (permissive parenting is associated with greater wt-d-gain) were not supported. The ANOVA for research question I revealed gender differences in wt-d-gain from 3 to 6 mos., F (1,109) = 4.435, p = .039, and 3 to 9 months, F (1, 109) = 9.894, p = .002. Analyses of research question II found no significant correlation between authoritative or authoritarian style and wt-d-gain. There was a correlation between permissive style and amount of formula at 6 and 9 mos., r = .262, p = .008 and r = .196, p = .048, respectively.

ADVISER'S APPROVAL: Dr. Laura Hubbs-Tait