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The Relationship of Infant Feeding and Self-Regulation in Pediatric Obesity

Amy Rebecca Beck
Loma Linda University

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LOMA LINDA UNIVERSITY
School of Science and Technology
in conjunction with the
Faculty of Graduate Studies

The Relationship of Infant Feeding and Self-Regulation in Pediatric Obesity

by

Amy Rebecca Beck


A Dissertation submitted in partial satisfaction of
the requirements for the degree of
Doctor of Philosophy in Clinical Psychology

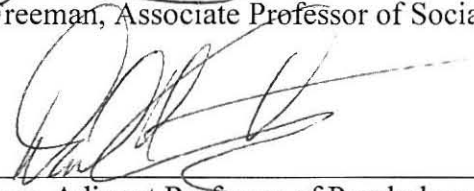
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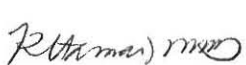
Amy Rebecca Beck
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Each person whose signature appears below certifies that this thesis in his/her opinion is adequate, in scope and quality, as a dissertation for the degree Doctor of Philosophy in Psychology.


_____, Chairperson
Kimberly Freeman, Associate Professor of Social Work and Social Ecology




David Chavez, Adjunct Professor of Psychology



Kim Hamai, Clinical Assistant Professor of Pediatrics



Esther Huecker, Associate Professor of Occupational Therapy



Ludmila Zaytsev, Postdoctoral Fellow in Pediatric Psychology and Neuropsychology

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ABSTRACT OF THE DISSERTATION

The Relationship of Infant Feeding and Self-Regulation in Pediatric Obesity

by

Amy Rebecca Beck

Doctor of Philosophy, Graduate Program in Clinical Psychology

Loma Linda University, September 2009

Dr. Kimberly Freeman, Chairperson

Pediatric overweight and obesity is a growing national epidemic with 15 percent of children ages 6-19 considered obese and at least 22 percent considered overweight. Although there are many suggested causes, treatments, and preventions for this epidemic, a construct that is showing promise in the current literature as a preventive factor against obesity is breastfeeding in infancy. However, the mechanisms by which breastfeeding may impact later childhood weight are unknown. Some of the literature posits the possibility of self-regulation as a key mechanism in the role of breastfeeding in pediatric overweight/obesity. The purpose of this study was to examine the differences in Body Mass Index in children ages 7-18 who were either breastfed or bottlefed during infancy, as well as a potential dose-dependent effect of duration of breastfeeding on decreased BMI. Further, the relationship between self-regulation, operationally defined as emotional eating in later childhood, and as measured by the emotional eating scale of the Dutch Eating Behavior Questionnaire (DEBQ) and BMI was investigated. Lastly, group differences between children who were breastfed or bottlefed in early childhood on the DEBQ were also evaluated. Data from 45 children and their caregivers was gathered from Pediatrics clinics at Loma Linda University. The hypotheses that children who were breastfed would have lower BMIs, and that duration of breastfeeding would be

associated with lower BMIs were unsupported. Further, results indicated no significant relationship between emotional eating and BMI or a significant difference in emotional eating between children who were either breastfed or bottlefed. These findings are generally inconsistent with previous research and are reflective of a number of limitations in the study. As such, the need for additional research with improved methodologies is discussed.

Introduction

Obesity has become a rampant public health problem in the US, and the pediatric population has not been spared in the epidemic. Recent estimates indicate 15 percent of children ages 6-19 are considered obese (National Institute of Environmental Health Sciences (NIEHS) Office of Management, 2007). In fact, because children who are obese are likely to remain obese into adulthood, it is estimated that by the year 2050, nearly 50 million Americans could be obese (Dietz, 1998; National Institute of Environmental Health Sciences (NIEHS) Office of Management, 2007). Researchers from a variety of disciplines have been concerned with this epidemic and are actively seeking any treatment or prevention method that can halt the alarming trend of continued increasing rates of overweight and obesity. Current interventions for treatment include exercise and dieting programs, various support groups and therapy programs, nutrition education, and surgical procedures. However, while treatment of an existing problem is necessary and beneficial, prevention is the only way to truly halt and reverse the etiology of the epidemic.

Prevention can begin in any stage of life, but as with most preventive measures, the earlier the better. Current research suggests that breastfeeding in infancy, as opposed to bottlefeeding, may have protective effects against childhood obesity (Gillman et al., 2001; von Kries et al., 1999; Liese et al., 2001; Armstrong & Reilly, 2002; Toschke et al., 2002; Bergmann et al., 2003). However, the existing research has not identified a mechanism by which this prevention is facilitated. Many of the attempts to understand this mechanism are of a biological nature, such as evaluation of the differences between the physical compounds of breastmilk versus infant formula, but not much work has been

done to investigate this from a psychological perspective. Several authors, however, have noted plausible differences in a child's self-regulation of food intake as a function of having been breastfed as opposed to having been bottlefed (Gillman et al., 2001; Liese et al., 2001; Toschke et al., 2002). Specifically, researchers have hypothesized that children who are breastfed develop greater self-regulation over food consumption than do children who are bottlefed, which can consequently lead to less overweight and obesity in childhood, as evidenced by a lower Body Mass Index (BMI). Once in childhood, self-regulation could possibly be considered as the construct of emotional eating. However, to date, this theory has not been directly investigated.

Because any movement toward discovering underlying connections between breastfeeding and childhood obesity, biological or psychological, is of import and may be of great benefit to the future of public health, this study aimed to directly investigate the relationships among method of infant feeding, a child's later self-regulation of food intake, and weight, as measured by BMI, which is a weight metric frequently used in obesity research (Lobstein, Baur, & Uauy, 2004). For the purposes of this study, the concept of subsequent self-regulation was operationally defined and measured as emotional eating, as emotional eating is considered the lack of regulation over food intake, and the consumption of food in response to non-biological hunger stimuli. Further, emotional eating is a measurable construct in children with the use of the Dutch Eating Behavior Questionnaire.

In light of the above, the first aim of this study was to further investigate protective effects of breastfeeding on later childhood weight by evaluating group differences in BMI between children who were breastfed as infants and children who

were bottlefed as infants. The second aim of this study was to further investigate dose-dependent effects of breastfeeding on later childhood weight, by evaluating duration of nursing and BMI. The third aim of this study was to explore the relationship between a child's subsequent self-regulation, as self-reported emotional eating, and current BMI. The fourth aim of this study was to explore group differences in self-reported emotional eating between children who were breastfed as infants and children who were bottlefed as infants.

Literature Review

Obesity

Obesity is characterized by excessive accumulation and storage of fat in the body (Merriam-Webster, 2007-2008). Primarily, obesity results from higher energy intake without a concomitant increase in energy expenditure. There are several methods of measuring and determining obesity. Among options such as skinfold thickness, ultrasound, bioelectric impedance analysis, magnetic resonance imaging, and anthropometrics, body mass index (BMI) has been established as an easy and reliable tool for determining overweight and obesity (Feld & Hyams, 2004). BMI is defined as weight in kilograms divided by height in meters squared, or weight in pounds divided by height in inches squared and multiplied by a conversion factor of 703 (Centers for Disease Control and Prevention, 2009). According to both the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO), for adults, a BMI of 25 or above is overweight and a BMI of 30 or over is obese (Lobstein, Baur, & Uauy, 2004; Centers for Disease Control and Prevention, 2004b). A BMI of 40 or greater is considered morbid obesity (Torpy, Lynn, & Glass, 2003). Additionally, BMI is more accurate when height and weight are measured by a trained person rather than when self-reported. With BMI, there is low observer error, low measurement error, and good reliability and validity. However, BMI may not be as sensitive in people who are exceptionally short, exceptionally tall, or have an unusual body fat distribution (Lobstein, Baur, & Uauy, 2004).

Pediatric Obesity

For children, BMI is also the most practical method for assessing adiposity for research and clinical purposes, as it is significantly associated to relative fatness in childhood and adolescence, as well as quickly and reliably obtained (Lobstein, Baur, & Uauy, 2004). Because of expected and normal child development and maturation, BMI in this population varies with age and gender. It generally has normal increase during the first months after birth, decrease after the first year, and increase again around age six. The increase in the sixth year is referred to as the “adiposity rebound” (Lobstein, Baur, & Uauy, 2004). Although absolute BMI values are calculated in the same fashion as for adults, BMI in children is interpreted according to age and gender and can be expressed as percentiles based on standard growth curve charts. Although there is some debate about the universality of such growth curve charts, particularly in reference to possible ethnic differences in BMI for children, most researchers and individuals in clinical practice utilize the growth curve charts designated by the Centers for Disease Control and Prevention. According to the CDC, children and adolescents between the 85th and the 95th percentiles based on BMI growth curve reference charts are referred to as overweight, and children at or above the 95th percentile are referred to as obese (Lobstein, Baur, & Uauy, 2004). However, for research purposes, use of BMI percentiles may be the least accurate as an estimate of body fat in children. When studying percentage of body fat in children, especially in samples of predominantly overweight and obese children, it appears that the use of absolute BMI values, particularly when adjusted for age, as the weight metric may be more appropriate (Field et al., 2003).

The trends and prevalence of child and adolescent overweight and obesity in the United States mirrors that of the adult population. Comprehensive data collected in the 1960s from the NHE I and II surveys and also the four NHANES surveys between 1971 and 2000, show that the combined prevalence of obesity and overweight among children and adolescents has more than doubled. The prevalence of obesity alone has increased fourfold (Lobstein, Baur, & Uauy, 2004). In the years from 1963-1970, approximately four percent of children age 6 to 11 were above the 85th percentile. Approximately five percent of adolescents age 12-19 were above the 85th percentile in these same years. In the year from 1999 to 2000, approximately 14 percent of both children and adolescents were above the 85th percentile (Feld & Hyams, 2004). Also, based on surveys on North and South American children compiled past 1990 that utilize International Obesity Task Force Criteria for overweight and obesity, approximately seven percent of boys in both the 5-9 and 13-17 year age groups are obese. Approximately 14 percent of boys ages 5-9 are overweight and approximately 26 percent are overweight from ages 13-17. For girls, about eight percent are considered obese in the 5-9 age range, and about six percent are considered obese in the 13-17 age range. Approximately 16 percent of girls are considered overweight in the 5-9 age range and about 28 percent are overweight from ages 13-17 (Lobstein, Baur, & Uauy, 2004).

The ever increasing incidence rate of children and adolescents who are overweight and obese becomes much more alarming when considering the fact that overweight adolescents have a 70 percent chance of becoming overweight or obese adults (Torgan, 2002). Therefore, this continuing trend will lead to an increased amount of overweight and obese adults. Even more frightening, according to the Centers for

Disease Control and Prevention, obesity is rapidly becoming one of the most common preventable causes of death in the United States; put in the same league as smoking (Centers for Disease Control and Prevention, 2004a; Centers for Disease Control and Prevention, 2005). This indicates that a significant number of individuals may begin losing their lives prematurely, perhaps even before adulthood, due to causes that could have been changed. The negative impact of obesity on the future of the population of the United States seems inevitable.

Medical Consequences

The ramifications of overweight and obesity is such a distressing problem because it truly is a physical disease. Individuals who are overweight or obese are much more likely to have severe health problems than individuals with normal weight. Such medical complications include, but are not limited to, diabetes, high blood pressure, osteoarthritis, high total blood cholesterol, gastroesophageal reflux disease, back pain, and/or increased risk for heart disease (Torpy et al., 2003).

Most importantly, the pediatric population is not excluded from this laundry list of medical complications. In fact, several risk factors for diseases that are usually considered adult diseases are springing up in childhood. For example, the incidence of type 2 diabetes has substantially increased in the pediatric population over the past decade (Feld & Hyams, 2004). In fact, one estimate describes a ten-fold increase over a 12-year timeframe (Yale-New Haven, 2004). This rise in incidence of type 2 diabetes has paralleled the increased prevalence of childhood obesity. However, even these estimated incidence rates may be low because of the lack of overt symptoms leading to diagnosis or the tendency to misclassify as type 1 diabetes (Feld & Hyams, 2004).

These figures are even more alarming when considering that long-term effects of early onset type 2 diabetes in children are unknown. In adults, complications associated with diabetes include increased risk of cardiovascular disease, end-stage renal disease, blindness, and vascular insufficiency of the lower extremities. Ten years after diagnosis, more than 20 percent of adult patients will have suffered a major cardiovascular event, about five percent will have developed blindness, and about two percent will have developed end-stage renal disease or had lower-extremity amputation. In fact, according to the American Diabetes Association, diabetes and its complications kill 193,000 Americans each year. Since the incidence of complications from diabetes increases with the duration of the illness and inadequate management, it is likely the children with type 2 diabetes may develop complications at a younger age. As such, there is a new expectancy to see more severe complications and attendant morbidity secondary to type 2 diabetes. These children may present with severe complications as they age past 30 years. Once again, these devastating consequences are detrimental for the individuals, their families, and the health care system (Feld & Hyams, 2004).

In addition to a complication of diabetes, cardiovascular risk factors such as hypertension are becoming another problem associated with childhood obesity. The American Heart Association has reclassified obesity as a major modifiable risk factor for coronary heart disease. Some studies have reported actual cardiovascular and organ injury in children. The Bogalusa Heart Study found that children with a BMI above the 85th percentile were more likely to have adverse levels of cholesterol, LDL, HDL, and triglycerides, and high blood pressure than normal weight children (Feld & Hyams, 2004).

Obesity is also a well-known risk factor for obstructive sleep apnea in adults. Obstructive sleep apnea can lead to severe cardiopulmonary problems. While obstructive sleep apnea is already a common condition in childhood, there is increasing evidence that it is a considerable problem in obese children. In fact, in a study on children who were ventilator-dependent, researchers discovered that sleep apnea was a primary reason for ventilator dependency, and a significant number of those children were also obese (Burley, 2002). While further studies are needed, early research indicates that there is a direct relationship between obesity and increased medical complications in children. Secondary factors associated with various medical conditions have also been found. For example, children with obstructive sleep apnea, tend to experience somnolence and fatigue, which further contributes to their obesity by impairing physical activity and creating an unfortunate positive feedback loop (Feld & Hyams, 2004). In another study conducted by Burley (2002) a relationship between increased BMI and increased anxiety in the ventilator-dependent children suffering from sleep apnea was also noted.

A multitude of orthopedic concerns are also evident in obese children. For example, Blount disease, which leads to bowing of the legs, and slipped capital femoral epiphysis are not uncommon (Feld & Hyams, 2004). About two-thirds of children with Blount disease are obese and approximately 50-70 percent of children with slipped capital femoral epiphysis are obese. As with obstructive sleep apnea, orthopedic concerns limit physical activity and consequently further promote obesity (Feld & Hyams, 2004).

A gastrointestinal complication known as non-alcoholic fatty liver disease is found in 60-70 percent of obese adults. In this population, this disease is a common

cause of liver fibrosis or cirrhosis. While the prevalence of non-alcoholic fatty liver disease is not known for obese children, some reports indicate up to 25 percent of obese adolescents present with warning signs (Feld & Hyams, 2004).

Lastly, while the impact of obesity on mortality from cancer is unknown, associations between adiposity and increased cancer risk have been widely reported. In adults who have BMIs greater than 40, there is a death rate from all cancers that is 52 percent higher for males and 62 percent higher for females when compared to normal weight individuals. Once again, while no prevalence statistics are known for obese children, the possibility for cancer at a young age in this population is a plausible threat (Feld & Hyams, 2004).

Causal statements cannot be made about obesity and these medical complications and not every child or adult who is overweight or obese will have a comorbid medical disease. However, the assertion can be made that each of these medical complications has an increased likelihood of onset in the adult and pediatric overweight and obese populations. Therefore, the etiology of obesity in the pediatric population must be better understood to prevent the possible onset of these complications.

Etiologies

Overweight and obesity develop in both children and adults in a predictable course. There are three consistent factors that contribute to the odds of becoming overweight and obese. These three factors are genetics, nutrition, and exercise.

There is clear evidence that certain genes are associated with obesity phenotypes. In fact, over 250 obesity-associated genes have been identified. However, there is no magic gene that explains obesity in all people. Nevertheless, there is a 75 percent chance

that children will be overweight if both parents are obese and there is a 25-50 percent chance if just one parent is obese. It is generally estimated that 50-70 percent of a person's BMI and degree of adiposity is determined by genetic influences (Feld & Hyams, 2004). However, although an important consideration, genetics are not the sole source of obesity. The prolific rise of obesity within the past several decades speaks to the existence of other very influential factors, as genetic shifts themselves do not occur this quickly. These other very influential factors include nutrition and exercise (Feld & Hyams, 2004).

There are several reasons why current Western diets are so nutritionally poor and contribute to levels of obesity. Over the past 20 years, the United States has fostered a boom in fast and convenient food options. These options, be they fast food, pre-packaged food, or snacking items, have become very common in the Western diet. Many calories come from sweetened beverages or colas that have minimal, if any, nutritional content. In fact, children are taking in less calcium and vitamins and more refined sugars and saturated fats as compared to children in previous generations. Fiber intake has also decreased. The birth of low-fat food products in the 1980s and 1990s was an attempt to combat this burgeoning nutritional issue. However, while the intake of fat did decrease, there was an accompanying increase in calorie and carbohydrate intake. Unfortunately, high carbohydrate foods and sugar increase serum glucose levels, which exaggerate the hunger response, and can lead to overeating. Additionally, over these same years, the overall caloric intake has increased approximately 200 kilocalories per day. To put this change in perspective, an increase of 120 kilocalories per day, which is the amount in one

can of soda, will produce a 50 kilogram increase in weight over 20 years (Feld & Hyams, 2004).

Research also indicates increased snacking on items that tend to be more energy dense and take the place of more nutritious foods (Feld & Hyams, 2004). Another concurrent change is the increase of calories in a typical fast food restaurant meal. One single meal, which weighs in at about 2000 calories, 84 grams of fat, and 12 grams of fiber, accounts for the daily caloric and fat requirements for most children. Fast food comprises more than 30 percent of the meals eaten by families in the United States. Lastly, school meals made available for children tend to be very high in total and saturated fat. Many schools also have vending machines full of high-calorie and high-fat snacks for students to supplement or replace their lunches, and only approximately 20 percent of schools sell more nutritious alternatives such as yogurt, fruit, or vegetables. (Feld & Hyams, 2004).

While poor nutrition by itself is enough to trigger substantial weight gain and maintenance, when it is combined with sedentary activity, overweight and obesity is all but guaranteed. Only 6-8 percent of school-age children are in daily physical education classes, and only 27 percent of high school students participate in moderate activity five or more days per week. There has been a 35 percent decline in daily activity levels that parallel the doubling of obesity rates for children and adolescents between nine and 19 years of age (Feld & Hyams, 2004). The time not spent in moderate activity has been replaced by sedentary activities, namely watching television, playing video games, or even doing homework. Watching television appears to be the most detrimental of the sedentary activities. Some studies suggest that children are so immobile while watching

television that they burn fewer calories than if they were still and not watching television (Klesges, Shelton, & Klesges, 1993). Additionally, children tend to eat while they watch television, opting for snacks higher in calorie, fat, and sugar content. The television programs themselves also influence obesity via the advertisements for unhealthy foods and products that children will subsequently desire and request. Many times these requests made on increasingly busy parents are honored, adding to the increasing amount of unhealthy snacks and meals these children consume. Unfortunately, television and other sedentary activities are being promoted by parents who are working longer hours and cannot supervise children outdoors, or who live in environments where it is not safe to be outside at all (Feld & Hyams, 2004).

Prevention

With the increasing number of children becoming obese and no end of the trend in sight, treatment and prevention are goals that must be achieved. Again, overweight adolescents have a 70 percent chance of becoming overweight or obese adults (Torgan, 2002), indicating difficulty in losing weight that has been acquired in childhood. Further, medical complications beginning in childhood because of early obesity are likely to persist into adulthood with the maintenance of obesity. At present, there are many types of programs designed to counteract childhood overweight and obesity, several of which strive to increase physical activity and promote healthy eating habits (Hawley, Beckman, Bishop, 2006; Council, 2006). Some programs implement additional psychological components and almost all programs include an element of educational programming. However, the acquisition of such knowledge does not always parlay into actual improvements and changes (Hawley, Beckman, Bishop, 2006). In fact, true change is

probably less likely to occur through any type of program, but rather through an overhaul of societal policies and community procedures (Dietz, 2006; Council, 2006). Therefore, it is strategies that target children before they are overweight or obese and that are simple, cost-effective and implemented early that most urgently need to be tackled by parents, doctors, and schools (Dietz, 2006). For example, specific prevention targets needing to be addressed in education policy include making healthier school lunch options, improving available snacks on campus, increasing nonfood incentives and reinforcers, and incorporating physical education, nutrition education, and recess into the curriculum. Ways to implement change and increase prevention through the general health care community would be to increase patient and parent education about obesity, thorough monitoring of high-risk populations, and by improving treatment referrals for people with obesity. Public awareness and policy could be enhanced by specific social marketing campaigns, simpler food labeling and packaging to encourage portion control, and increased money for childhood obesity research. Lastly, strategies to create safer neighborhoods would allow for more places for children to freely participate in exercise (Sothorn, 2006).

A more recent area of discussion related to obesity prevention has been infant feeding. For years researchers and clinicians have spoken out on the positive effects of breastfeeding on overall child health and nutrition. However, currently it has been gaining increased attention for a possible role in also preventing obesity in children.

Breastfeeding

Breastmilk is the physiological standard for normal human infant growth and development (Australian Breastfeeding Association, 2002). Exclusive breastfeeding is

ideal nutrition and sufficient to support optimal growth and development in the first six months of life (American Academy of Pediatrics, 1997). Immunological benefits and risk reduction of acute and chronic diseases such as diarrhea, lower respiratory tract infections, urinary tract infections, otitis media, and asthma have been associated with exclusive breastfeeding for at least four months (American Academy of Pediatrics, 1997; Raisler, Alexander, & O'Campo, 1999; Oddy et al., 1999). Shorter and less intensive periods of breastfeeding may be less protective. Further, studies have suggested improved cognition related to breastfeeding. The results for one such study found that cognitive developmental scores at 6-23 months for infants who were fully breastfed for six months were higher than scores for babies that were never breastfed (Anderson, Johnstone, & Remley, 1999). Conversely, the use of infant formula is still relatively new and the effects on infant health and growth are still being discovered (Australian Breastfeeding Association, 2002). However, the growing popularity of infant formula and the current focus on childhood overweight has been the topic of several recent empirical studies (Gillman et al., 2001; von Kries et al., 1999; Liese et al., 2001; Armstrong & Reilly, 2002; Toschke et al., 2002; Bergmann et al., 2003). Many of these studies have evaluated the body mass index outcomes of children and adolescents who were breastfed versus those who were bottlefed.

One of the largest reports to assess such potential infant feeding differences was a study in Bavaria, Germany. 9,357 German children, ages five and six, and their parents, who participated in a required health examination for school entry were utilized to evaluate lifestyle factors, infant feeding, and diet. This study defined overweight as the 90th percentile and obesity (or severe overweight) as the 97th percentile. There was a

clear dose dependent effect of duration of breastfeeding on the frequency of the children being overweight or obese at the time of school entry. Essentially, the longer the children had been breastfed as infants, the lower the prevalence of overweight or obese. There were several other potentially confounding variables that were also evaluated with the BMI outcome. Higher levels of parental education, premature birth, and low birth weight were inversely associated with being overweight or obese, but maternal smoking during pregnancy and if the child had his or her own bedroom were positively correlated with being overweight or obese. Children who had been breastfed for at least six months or more had a greater than 30 percent reduction in overweight and greater than 40 percent reduction of obesity (von Kries et al., 1999). The von Kries et al. study also discussed a previous finding by Kramer (1981) that a positive family history of being overweight is an important indicator of the genetic risk of overweight and obesity. However this was not a confound in the association of breastfeeding and overweight in this study.

Kramer's study stated that children of obese parents were more likely to be obese and less likely to be breastfed. However, when an analysis to control for this effect was performed, there was still a protective effect of breastfeeding on obesity. Additionally, in the original study by von Kries et al., the level of parental education was used as an indicator of socioeconomic status level (SES). SES has been reported as an important variable (Li, Jewell, & Grummer-Strawn, 2003) as mothers with a low level of education, namely finishing less than a high school degree, are approximately two and a half times more likely to not initiate breastfeeding than mothers who have at least a high school degree. Once again, however, Kramer found that even after controlling for SES, breastfeeding still had protective effects on obesity.

Another report examining the long-term outcomes of infant feeding utilized participants in the Growing Up Today Study. This study was comprised of children of participants in the ongoing Nurses' Health Study II, which is a cohort study of female registered nurses in which there were 15,341 children and adolescents ages 9 to 14. This study found that in comparison with infants fed predominantly infant formula, the approximate reduction of risk of being overweight or obese was 22 percent for those who were breastfed. The effects of risk reduction were also dose dependent with longer duration of breastfeeding being more protective. There were moderate confounding effects for maternal BMI, namely when maternal BMI was controlled for, the relationship between breastfeeding and later overweight was attenuated. The authors' stated that this attenuation could be due to the direct relationship between a mother and child's adiposity levels, which are based on genetic and environmental factors that are likely independent of breast or bottlefeeding. This study suggested that possible reasons for the relationship between breastfeeding and adolescent overweight and obesity is that most breastfed infants learn to regulate their own feeding schedules better than bottlefed infants. Parents who bottlefeed their infants may exert more control over their infants' appetite by putting them on a feeding schedule and pushing them to finish a bottle. Conversely, a breastfed baby may be more in control of his or her feeding schedule by ceasing feeding when feeling satiated (Gillman et al., 2001).

Another report evaluated a cross-section of 1,046 nine to 10 year olds in Dresden, Germany. Their parents completed a questionnaire for the International Study of Asthma and Allergies in Childhood Phase II. This questionnaire asked detailed questions about breastfeeding history. Once again, there was a dose dependent effect of length of

breastfeeding on decreased BMI and breastfed children were significantly less likely to be overweight than bottlefed children. This effect was present even after controlling for age, gender, and city residence, and also with the attenuation after adjustment for nationality, SES, number of siblings, and parental smoking. Similar to the study by Gillman et al. (2001), this report also suggested that the effects of breastfeeding on subsequent overweight and obesity may be behavioral and due to learned self-regulation by the infant (Liese et al., 2001).

Yet another report suggested that breastfeeding is associated with a decreased risk of childhood overweight and obesity. This study utilized 32,200 Scottish children who were 39 to 42 months in age. These children were part of the Child Health Surveillance Programme and were reviewed by a health visitor who collected feeding pattern information. Obesity was defined as the 95th percentile and extreme obesity was defined as the 98th percentile. After adjustment for the variables of SES, gender, and birthweight, there was still a significant association between breastfeeding and decreased risk of obesity. Birthweight was controlled for because by itself it was also positively significantly correlated with obesity. There were no significant interactions between breastfeeding and SES or birthweight (Armstrong & Reilly, 2002).

Another large scale epidemiological study in favor of breastfeeding for obesity prevention is a study evaluating children 6 to 14 years of age from Czechoslovakia. The children were assessed through the 5th National Anthropometric Survey of Children and Adolescents by which extensive sociodemographic data was collected. Overweight was defined as BMI at the 90th percentile and obesity was BMI at the 97th percentile. Children who were never breastfed had a 12.4 percent prevalence of overweight and a 4.4

percent prevalence of obesity. Children who were breastfed for more than six months had a 9.0 percent prevalence of overweight and a 3.5 percent prevalence of obesity. There was a duration of breastfeeding dose dependent effect on overweight but not on obesity. This could be due to the definition of obesity in this study being BMI at the 97th percentile, which does not incorporate as many children to evaluate as does the CDC definition of the 95th percentile. Further findings suggested that non-breast-fed children had fewer siblings, were more likely to watch TV for more hours per day, and were less likely to eat fruit. Their parents had lower education levels, were more often obese, and their mothers were more likely to smoke. Higher levels of obesity were associated with cases of parental obesity, maternal smoking, high birth weight, and more than one hour of television watching per day. Lower levels of obesity were associated with high parental education, sports outside of school, and having siblings. After adjustments for all the mentioned variables, the effects of breastfeeding remained significant. The authors concluded by theorizing that the protective effect of breastmilk was a function of learned self-regulation (Toschke et al., 2002).

Another study examined 480 children longitudinally for the effects of breastfeeding on later adiposity (Bergmann et al., 2003). Overweight was identified as the 90th percentile and obesity was identified as the 97th percentile. At birth, the BMIs were nearly identical for the children in the bottlefed and the breastfed groups. However, by three months, the bottlefed babies had significantly higher BMIs and thicker skin folds than the breastfed babies. From the sixth month on, the bottlefed children consistently had proportionally higher BMIs. From the ages of 4-5, and 6 years old, the prevalence of obesity in the bottlefed children nearly doubled and tripled respectively, while children

who were breastfed only experienced minor changes of obesity prevalence by these age markers. Therefore, with the large increase in obesity prevalence for the bottlefed group and the small increase in obesity prevalence in the breastfed group, the group differences of obesity prevalence became statistically significant by the age of six. Additionally, a maternal BMI of greater than 27, maternal smoking during pregnancy, and low SES were also significant predictors of overweight and obesity for children of six years of age (Bergmann et al., 2003).

However, none of the current research that points to the possibility of breastfeeding having a protective effect against obesity has examined the specific mechanics driving such a relationship. Additionally, due to the fact that the majority of the aforementioned studies utilized the child's mother's recollection of breastfeeding patterns, there has been some concern that many of the reports may not be accurate. However, several studies examined this concern and have indicated that maternal recollection is highly correlated with actual records. One study compared a mother's recall 8 to 9 years after birth with prospectively collected information from an infant longitudinal study. The association between the variables was .95 (Vobecky, Vobecky, & Froda, 1988). Another study evaluated the same variables, but after 20 years, with an association of .86 (Kark, Troya, Friedlander, Slater, & Stein, 1984). Therefore, the use of maternal recall for research information is an empirically viable option.

Self-Regulation

Several of the studies noted in the previous section have suggested that the protective benefits vis-à-vis obesity may be due to the behavioral mechanism of self-regulation (Toschke et al., 2002; Liese et al., 2001; Gillman et al., 2001). Unfortunately,

the extent to which the articles describe or explain what is meant by self-regulation is negligible. Self-regulation in the medical breastfeeding research is a phantom construct that vaguely explains the functional mechanism driving the relationship between method of feeding and later childhood weight. In fact, the construct is not defined at all, but is simply described as a learned feeding behavior. Fortunately, in less medically-oriented obesity research, the mechanism of self-regulation and its development, has been more closely examined. The mechanism of this construct can be better understood through the knowledge of attachment theory and its relationship to the psychosomatic theory of obesity.

Attachment Theory. Attachment theory was born from the research of John Bowlby and Mary Ainsworth. Bowlby began by fusing psychoanalytic theory and empirical evidence to validate the importance of what became known in the late 1950s as attachment theory (Goldberg, 1995). Bowlby proposed that a 12-month-old's attachment behavior is comprised of a number of instinctive responses that together function to connect the infant to the mother, and the mother to the infant. These responses include sucking, clinging, and following, as well as smiling and crying. He described attachment behavior as behavior that seeks closeness to an attachment figure, with an easily anticipated outcome, and whose evolutionary function is protection of the infant from danger. He stated that attachment has its own motivation, and does not stem from other survival instincts, such as mating. He described that these proximity-seeking behaviors, while fairly general at first, become focused on the primary figures who are most responsive to the infant's cries and who engage them in social interaction. Once these figures have been identified, they serve as a secure base for the infant's locomotive

exploration of his or her environment, and a safe haven for which to return for reassurance. The effectiveness of a caregiver as a secure base depends on the quality of social interaction, particularly the caregiver's sensitivity to the infant's cues. However, the clarity of the child's cues are also important (Bretherton, 1995). The bi-directional sensitivity to cues, according to Bowlby, is the precursor to the infant's internal working model about how the social world operates (Johnson, Dweek, Chen, 2007).

Expanding on Bowlby's research, Ainsworth and Bell conducted a study in 1969 that focused on mother-child interactions in the first three months of life, with a primary emphasis on feeding situations. The multiple features of the feeding interaction were reduced to four aspects: timing of the feeding, amount of food ingested by the infant, the mother's handling of her infant's preferences in kind of food, and the pacing of the rate of the infant's intake. The greatest factor of import was the mother's response to the infant's signals, which was represented by how she allowed the infant to determine the amount of food, how she handled disliked or rejected foods, and whether her feeding was geared to the infant's personal rate or not. There were two patterns of the mother's response to the infant's signals. The first pattern was an emphasis on gratifying the infant. In this pattern, the infant was an active partner in the feeding process and the mother was highly sensitive to the infant's signals. These mothers fed their infants in either a schedule feeding or a demand feeding method. The second pattern was mothers who fed their infants in yet again either a scheduled or demand feeding pattern, but tended to overfeed them in attempts to gratify the infant. These mothers fed the infants in response to a large range of cues and signals from the infant as if they all indicated hunger. A subgroup of this pattern was mothers who intentionally overfed their infants with the

desire to make them sleep a long time. When rated at 12 months, the infants with mothers who were highly sensitive to their needs and who allowed the infants to play active roles in the feeding process, showed the strongest and most secure attachment to their mothers. This was evidenced by the infants seeking out closeness to their mothers and becoming distressed in the mothers' absence (Bruch, 1973).

A feeding relationship is so important because feeding is one of the earliest forms of infant communication. Babies naturally establish a rhythm of sucking, where they suck approximately 8 to 10 seconds and pause for 3 to 5 seconds. Many caregivers use the pauses as opportunities for bonding activities such as talking to or caressing the baby. Because an infant's memory is approximately 5 seconds long, it is likely that the infant begins to learn that something will happen when he or she performs an activity, such as pausing. The sucking and pausing interaction between the infant and caregiver serves as one of their first "conversations" (Sumner & Spietz, 1994).

As established by Bowlby, the communication between the infant and caregiver is bidirectional. This means that the clarity of the infants cues are as important as the caregiver's sensitivity to these cues (Bretherton, 1995). Ambiguous and confusing cues can interfere with the caregiver's ability to understand and adapt to the communication, and consequently affect the quality of the interaction. During feeding, infants communicate cues of hunger, distress, satiation, interaction, and rest. When these cues are demonstrated clearly, readiness to eat is signaled by a display of tension at the start of a feeding, followed by a decrease in tension once the feeding has begun. Infants who provide clear cues tend to have periods of alertness during the feeding. Babies who are in the awake state prior to eating and begin to eat during the awake state tend to feed better

and take less time feeding than babies who are not in the awake state. Again, infants who are alert during a feeding are more likely to cue the caregiver for interaction with vocalizations and smiles, as well as cue the caregiver for a break or rest (Sumner & Spietz, 1994).

Clearly, there is a relationship between feeding research and attachment theory. An article published in 2006 specifically sought to evaluate the relationship between breastfeeding, bottle-feeding, sensitivity, and attachment security. The authors indicated the significant predictive relationship of the Sensitivity to Cues scale on the Nursing Child Assessment Satellite Training (NCAST) Feeding Scale to secure attachment as determined by the Ainsworth Strange Situation, which is an assessment to evaluate attachment style. The Sensitivity to Cues scale is a scale used by trained observers to note the presence or absence of particular caregiver characteristics during a feeding interaction, such as positioning of the child, verbalizations to the child, smiling at the child, and response to child cuing. Therefore, according to the article, the more sensitive the caregiver is to the child's cues while feeding, the greater the likelihood that the child will be securely attached at one year of age. The author continued to posit that mothers who choose breastfeeding over bottle-feeding may be more sensitive in responding to infant cues during early infancy (Britton, Britton, & Gronwaldt, 2006).

Psychosomatic theory of obesity. The relationship between feeding and attachment theory has been applied specifically to obesity. This is inherent in the psychosomatic theory of obesity. One of the leading researchers of the psychosomatic theory of obesity is Hilde Bruch. Her theory is based on the experiments done with monkeys by Harlow in 1966 and Mirsky in 1967. Harlow, in an effort to study the effect

on infant monkeys of complete isolation from a mother, took the removed monkeys and gave them sole access to a wire dummy, some of which were covered in a terry cloth. Three of these isolated monkeys were then taken and studied in Mirsky's lab. The monkeys at that time were between four and five years of age, and had spent the preceding three years living in a group of monkeys. Mirsky noted that the isolates were unable to respond physiologically or instrumentally to the nonverbal facial expressions of the other monkeys. The isolates were also unable to send recognizable messages back to the other monkeys. This indicated that the capability to understand and adequately express social behavior of others in the species is acquired by monkeys during early infancy. Mirsky also observed that the isolated monkeys consumed more fluid than the other monkeys. These monkeys had never received more food than any other monkeys during the development process and were therefore at the same weight as the other monkeys, but when they were presented with more food, the isolated monkeys always consumed the additional amount, regardless of how much of an increase there was. A different experiment by Voss, Buss, and Carroll in 1971, demonstrated that laboratory-raised baboons when fed through a self-feeding device, became noticeably fat, and were at four months old, 60 percent heavier than other infant baboons that were raised on amounts leading to normal growth. This study also indicated that the ostensibly innate hunger requires early learning experiences to become properly regulated. From this research, Bruch formulated a model of child development that integrates innate and experiential factors for a wide range of functions. She believed that a newborn is immature but not utterly helpless. Bruch states that a newborn's cry is an essential tool for signaling discomforts, wants, and needs. The method of which these cries are

attended to, or neglected, Bruch believes is the crucial point from which an infant becomes aware of personal needs. Starting at birth, there are two forms of behavior that must be differentiated: behavior initiated in the infant and behavior in response to stimuli from the outside. The mother's behavior toward the infant is either responsive or stimulating and the interaction between the environment and the infant is either appropriate or inappropriate. Appropriate responses to cues coming from the infant are necessary for the child to organize the infrastructure for development of self-awareness. Absent, incorrect, or contradictory responses to the infant's initially undifferentiated needs and cries will lead to the child growing up confused when trying to identify his personal needs and desires. According to Bruch, for healthy development, when a mother provides food in response to her infant's cries that signal hunger and nutritional need, the infant will develop the construct of hunger as distinctly different from other tensions or needs. However, if the mother responds to all of the infant's cries indiscriminately by providing food, as sort of a universal pacifier, the infant will not be able to discriminate between nutritional needs and other tensions or needs (Bruch, 1973). Charone in 1982 detailed in the *International Journal of Eating Disorders* that the extent to which a baby learns to associate pleasurable experiences such as being held, touched, and spoken to with only the feeding process, feeding may be sought out as a means of comfort or pleasure, as opposed to a way to meet nutritional needs (Charone, 1982).

Interestingly, in a 1990 study, Anisfeld, Casper, Nozyce, and Cunningham determined that there might be a causal relationship between increased physical contact between a mother and infant and the maternal responsiveness to the infant. This study concluded that physical contact, an example of which is breastfeeding, made mothers

more sensitive to the infant's needs. Conversely, the infants with mothers who overfed them did not seek out closeness to their mothers and did not resist when being released by the mother. This study corroborates with the Harlow and Mirsky studies that Bruch's theory is built upon, as well as speaking to attachment theory research. Just as the isolated monkeys did not undergo proper development as evidenced by their inability to understand or produce facial expressions and their inability to regulate food intake, the infants who had mothers that inappropriately responded to their feeding needs also did not attain proper development, as evidenced by their methods of later attachment. Therefore, Bruch's idea that early interactions between the mother and infant are crucial for the infant learning how to relate to others and even more importantly, for the infant to learn how to relate to him or herself, and specifically how to understand his or her personal hunger needs as opposed to any other internal arousal state appears to hold merit (Bruch, 1973).

The inappropriate mother-infant interactions that Bruch described may also occur, not only when the mother does not recognize the cues of the cries of the infant, but also when the mother cannot read the infant's facial expression. Facial expressions are just as important as crying in early interactions. In fact, young infants make almost all of the muscle movements and combinations that are used by adults to express the primary emotions, such as joy, disgust, surprise, and distress (Tronick, 1989). The Barnard model, around which the NCAST Feeding Scale was created, incorporates specific affective infant cues of engagement and disengagement (Sumner & Spietz, 1994). A study done by Baldaro et al. (1996) to test what Bruch describes as developmental obesity, which is when an excess of weight is gained in the first year of life and is maintained, evaluated

the nonverbal facial expression ability of the mothers of the developmentally obese children. This study indicated that mothers of the developmentally obese children made significantly more errors in decoding facial expressions than did the control group mothers. Also, the developmentally obese children themselves also made more errors than did the children in the control group. There was a positive linear correlation between the number of the errors made by the mothers and the number of errors made by the children. Both the mothers and the children more easily identified the happy and neutral faces, but the emotions of anger, disgust, surprise, fear, and sadness were not as easily identified. These results supported Bruch's theory that the mothers of infants who are obese from a very early age are incapable of properly discriminating infant facial expressions, which can also indicate an inability to correctly identify hunger needs appropriately. Also, the inability of the developmentally obese children to correctly identify facial expressions is reminiscent of Harlow's monkeys being unable to recognize and exhibit facial expressions properly. This is also indicative of the learning that Bruch and Bowlby proposed the infant undergoes from the mother-infant interaction, and that incorrect learning leads to incorrect differentiations of emotions. Further this shows the potential for a negative feedback loop in the mother-infant interaction because initially, the mother does not recognize the infant's cues, the infant is then confused and potentially cannot exhibit proper cues, and the cycle worsens as the infant develops, until the infant learns to eat in response to all tensions and needs. This is potentially very alarming as a number of researchers have noted the power of being able to understand facial expressions in emotional development, along with research indicating that the primary method in which children learn to understand, or in this case to not understand,

facial expressions is rooted in the mother-infant relationship (Walden & Smith, 1997; Calkins & Fox, 2002; Schultz, Izard, Ackerman, & Youngstrom, 2001).

Another experiment that adds merit to Bruch's theory is one that evaluated the effect of diffuse anxiety on overeating. In this study of male undergraduates from an urban college, a comparison was made of the obese person's response to anxiety states that are either clearly labeled as coming from an external source or are not clearly labeled at all. An obese person who is aroused from a labeled external source should not eat as much as an obese person who is aroused from an unlabeled, unclear source. This is because, according to Bruch's theory, a lack of learned differentiation of different types of internal arousal, leads to eating in response to all of them, which is how a person becomes obese. However, if the arousal is labeled for the obese person, and if the label is clearly not hunger, then the obese person should not eat as much because the obese person has been told that the arousal is not hunger. A group of normal weight participants was also utilized in this experiment as a between-group comparison to the obese participants. Also, any participants who participated in sports were excluded from the data because they would have had more weight due to muscle than fat, and secondly, all participants were tested directly after a lunchtime meal that served as a food preload. The results of the experiment confirmed the hypothesis according to Bruch's theory. The obese participants ate significantly more when experiencing the unlabeled arousal, especially when it was intense arousal, than in the clearly labeled arousal state. The normal weight participants did not have differences in eating in response to different gradations of arousal or in the clearly labeled or diffuse anxiety conditions. Lastly, the obese participants who did eat the most reported feeling better after they ate, indicating

that eating relieved the tension that they felt, even though it was not biological hunger (Slochower, 1983).

To better understand inappropriate and poor mother-infant interactions, the development of appropriate and healthy ones must be clarified. The Nursing Child Assessment Project, led by Dr. Kathryn Barnard, the author of the Barnard model, was begun in the 1970s to determine predictors that could provide very early identification of later developmental problems. The team soon realized through their work that very young children depend on adults to mediate experiences and create learning opportunities for them. The team developed a framework for child health assessment. This framework is depicted as three overlapping circles. The smallest circle is the child, and the child's main personal characteristics such as physical appearance, temperament, feeding/sleeping patterns, and self-regulation. The next circle, which is bigger, represents characteristics of the child's caregiver. These characteristics include the caregiver's physical health, mental health, psychosocial assets such as coping skills, life changes, education, expectations/concerns for the child, and the caregiver's caregiving style and adaptation skills. The largest circle is the environment encompassing both the child and the caregiver, including social and financial resources, such as the presence of a supportive adult, food, shelter, and community involvement. According to the team, the most important component of the model is not one of the individual circles, but rather the area of overlap. This overlap represents the interaction between the child, caregiver, and environment. The inclusion of the environment in the interaction adds an additional piece that can be frequently overlooked. However, the environment is an equally significant piece. For example, a caregiver can mediate the interaction between the child

and environment through the provision of safe and age-appropriate toys. Conversely, an over-restrictive and over-protective caregiver can mediate the environment by restricting a child's attempts to learn and master new skills. Also, the environment can facilitate or thwart the quality of the child-caregiver interaction. For example, it can be very difficult for a child and caregiver to engage in a meaningful moment during a very distracting occurrence or event. The team believed that this overall, tri-point interaction is a potent predictor of subsequent child development. The team also believed that the first and most potent lessons for a child are communicated in familiar daily interactions, such as feeding. During interactions such as feeding, there must be certain features for optimum development. There must be a sufficient repertoire of behaviors such as vocalizations, smiling, body movements, gazes, holds, and touches that can interlock into sequences and develop into a system. Secondly, these behaviors must be contingent responses to the partnering behaviors. There must exist a reciprocity of behaviors and actions between the caregiver and infant. Even as the infant grows and gains new skills, the caregiver must continue to be consistently contingent. Lastly, the adaptive patterns of the dyad must change over time, relative to the increasing developmental capacities of the child (Sumner & Spietz, 1994; Charon, 1982).

The infant has responsibilities in the dyadic interaction. The infant is responsible for transmitting clear cues to the caregiver to express his or her needs. Ambiguous and confusing cues can interrupt the caregiver's ability to understand what the infant needs. The infant must be able to withdrawal from the feeding when satiated. The infant must also be able to pause when needed to break stimulation, as well as to be able to explore

his or her surroundings both physically and visually while eating (Sumner & Spietz, 1994; Charon, 1982).

The caregiver has certain responsibilities in the dyadic interactions, as well. The caregiver must be able to recognize and respond to the child's cues. Caregivers demonstrate sensitivity through their behaviors of positioning of the child, the kinds of stimulation they provide, and the timing of this stimulation. The timing, force, and rhythm of stimulation are instrumental in setting the tone of an interaction. For example, the rate of maternal vocalizations significantly correlate with infant vocalization rate, meaning the more a mother vocalizes, the more likely her infant will vocalize, too. It is also the caregiver's responsibility to maintain a gaze with her infant. Infants can only demonstrate a certain amount of visual stimulation before having to pause, and caregivers who understand and are sensitive to this cycle will respond appropriately when the infant needs a break. Interestingly, most breastfed babies stare for longer periods of time at their mother's faces than do bottle-fed babies (Sumner & Spietz, 1994; Charon, 1982).

The caregiver is also responsible for appropriately soothing a distressed infant. First, the caregiver needs to recognize the cues as distress and secondly, the caregiver needs to know what behavior to exhibit to relieve the distress. Different forms of body motion, such as rocking, and different ways to hold and touch the baby can minimize distress cues. However, the caregiver should not utilize movement, holds, and touches in a restrictive manner, in which to prevent exploration by the child during feeding (Sumner & Spietz, 1994; Charon, 1982).

One method of creating healthy interactions is through a technique called Kangaroo Care. Studies on kangaroo care, or skin-to-skin contact between mothers and

infants indicated that premature infants who received this contact had more enhanced relationships with their mothers than premature infants who did not receive this contact. Skin-to-skin contact, or maternal proximity, describes the mother's physical presence in its entirety and includes a range of behaviors such as maternal touch, body heat, and nursing. One study's results show that even just after a few months of life, infants who received this kangaroo care, which in this procedure included undressing the infant and placing it between the mother's breasts to nurse, had a higher threshold to negative emotions and required more aversive stimuli to cry than did the control infants who did not receive this contact (Feldman, Weller, Sirota, & Eidelman, 2002). This experiment indicated that breastfed preterm infants require more aversive stimuli to cry. Another study indicates that when full-term infants who are away from their mothers begin to cry, their crying ceases when they are placed with skin-to-skin with their mothers (Moore & Anderson, 2007). Other studies also indicate that for preterm infants, the kangaroo care assists in cortical organization and sensorimotor development. Also, the physical proximity allowed by the kangaroo care allows for the mother to be more aware of the infant's needs (Tessier et al., 2003). This is suggested to be because the intense nearness of the mother functions as a "teacher" to the infant's immature body systems (Stuart-Macadam & Dettwyler, 1995). For example, when mother and infant share a bed, they also share sleep cycles (La Leche League International, 1997). With such a biological teaching mechanism in place, it makes perfect sense that such mothers would be more attuned to the nuanced differences in infant needs as expressed by cries and facial reactions because in essence, the mother is influencing those differences by her physical proximity. In fact, neonates who have very early skin-to-skin contact with their mothers

have enhanced breastfeeding success during the early postpartum period when compared to neonates receiving standard hospital care (Moore & Anderson, 2007). Such greater success is also plausibly greater success in the dyadic sensitivity to cues. Also, the effects of skin-to-skin contact are possible beginnings of how the mechanism of breastfeeding can possibly lower the risk of childhood obesity. If breastfeeding does enhance sensitivity by the caregiver (Britton, Britton, & Gronwaldt, 2006), then it should be harder for the caregiver to misunderstand infant cues. Once again, Bruch's theory can be applied, meaning that a lack of cues to misunderstand would lead to less of a chance for mothers to inappropriately feed the infant. Less inappropriate feeding of the infant then can mean that the infant learns to recognize true biological hunger more accurately. The actual act of breastfeeding is a method by which the infant and mother learn about each other and increase the much needed reciprocity in their interactions. As already stated by several researchers, the recognition and correct interpretation of the infant's cries and facial expressions is key in facilitating proper development of infant feeding models.

Emotional Eating. A necessary evolution of the construct of self-regulation, as defined by Attachment Theory and Bruch's theory, to a construct that can be directly assessed and measured, particularly in later childhood, leads to the common term of emotional eating. Emotional eating is a lack, or absence, of self-regulatory behaviors over hunger and an inability to only eat in response to biological hunger. Restated, emotional eating is consuming food in response to any arousal state (Van Strien & Oosterveld, 2008). Ultimately, emotional eating can be defined as self-dysregulation of food intake. A comprehensive literature review by Canetti, Bachar, and Berry (2002)

evaluated emotional eating in both the normal weight and obese adult populations. Most of the studies included found that the obese participants engaged in significantly more emotional eating than did the normal weight participants. Most studies also found emotional eating to be relatively common, with a strong relationship between eating and negative emotions or stressful life events. The authors also indicated that emotional eating is prevalent across social classes and genders and is most often preceded by negative emotions such as anger, depression, boredom, anxiety, and loneliness. However, emotional eating is not as commonly evaluated in the child population, although there does appear to be preliminary evidence of a relationship between emotional eating, as measured by the Dutch Eating Behavior Questionnaire and food intake in a child population, although such a relationship may be more common in older and/or overweight children (Braet & Van Strien, 1997; Braet et al., 2007). Additional research focusing specifically on emotional eating in young, pre-adolescent children, detailed that emotional eating in such a young population is rare, and reasons for its occurrence are significant, and must be understood (Van Strien & Oosterveld, 2008). Thus, one such possible way to understand emotional eating in children may be to evaluate it in relationship to method of infant feeding and overweight and obesity.

Statement of the Problem

In summary, according to previous research, pediatric obesity is a rapidly developing public health concern with significant lasting ramifications. Understanding methods of prevention is necessary to curb this trend. Current research indicates a link between method of infant feeding and later overweight and obesity. Specifically, children who are breastfed appear to have a decreased incidence of being overweight or

obese as children. Further, children who are breastfed for longer durations appear to have an even decreased risk of being overweight or obese. Although much of the research has been devoted to determining a biological reason for this difference, several researchers have made vague reference to the psychological mechanism of self-regulation to explain this relationship. However, this research does not thoroughly explain the construct of self-regulation, nor is this construct directly tested within the existing literature.

In evaluating the differences between breastfeeding and bottlefeeding, it appears clear that the self-regulation construct can be developed from attachment theory and the psychosomatic theory of obesity. Specifically, the physical contact that is afforded by breastfeeding does not exist in the same way for bottlefeeding. Generally an infant is held while being fed a bottle, but because holding is not always necessary, it will not always occur. A nursing baby must always be close to the mother to be fed. Even if a bottlefed baby is always held, that direct, intense, and alive skin-to-skin contact of the infant with the mother does not exist. Therefore, if a greater ability to recognize the infant's needs springs out of greater physical contact, the lack of such contact can be interpreted to mean that the mother's ability to discriminate true biological hunger needs of the infant will not be as accurate with a bottlefed baby. Further, bottlefeeding requires less effort and physiological awareness by the infant than does breastfeeding, because the flow of milk in the bottle is constant, whereas the content of breastmilk changes during a feeding episode, and requires nonnutritive sucking to begin the milk production. Research indicates that bottlefeeding is a completely different method of feeding than breastfeeding, despite efforts to make the two methods more similar (Li, Fein, & Grummer-Strawn, 2008). Consequently, the construct of self-regulation which develops

in the infant feeding relationship can be operationally defined as emotional eating in later childhood. This indicates that children who developed poor eating self-regulation in early childhood are more likely to misgauge true biological hunger cues and exhibit less awareness of internal physiological hunger signals, and consume food in response to multiple emotional and physiological sensations. It makes sense that children who eat more frequently in response to a wide range of emotions, would be eating more frequently overall, and consequently be more likely to be overweight or obese. However, this theory has not been directly tested in any literature.

Consequently, there is no research delineating a clear rationale for breastfeeding's proposed protective effects against childhood obesity. Further, there is no current research specifically evaluating the psychological mechanism of self-regulation that may drive the protective effects. As such, this study proposes a first step in operationalizing self-regulation through the use of the emotional eating construct. Therefore, this study will explore this theory by more specifically evaluating infant feeding behaviors and how they relate to emotional eating, as well as to childhood weight.

Hypotheses

The present study proposes four hypotheses.

Hypothesis 1: It is hypothesized that there will be a significant group difference in BMI, between children with a history of having been breastfed as infants and children with a history of having been bottlefed as infants, both as measured by parent report. It is expected that children with a history of having been breastfed, on average, will have lower BMIs. Further, the following covariates were delineated by prior research, and will be considered in the analysis: BMI of the mother at the child's birth and presently, age of

the mother, the presence of drug/alcohol/cigarette use during pregnancy, the ethnicity of the child, the birthweight of the child, parent socioeconomic status as measured by estimated annual income, the number of hours per day the child spends watching television, and child's participation in organized sports/activities.

Hypothesis 2: It is hypothesized that there will be significant positive dose-dependent effects for the duration of breastfeeding, as indicated by parent report, on childhood weight, as measured by BMI. The risk of obesity is expected to decrease with an increased number of months spent breastfeeding. Further, the following covariates were delineated by prior research, and will be considered in the analysis: BMI of the mother at the child's birth and presently, age of the mother, the presence of drug/alcohol/cigarette use during pregnancy, the ethnicity of the child, the birthweight of the child, parent socioeconomic status as measured by estimated annual income, the number of hours per day the child spends watching television, and child's participation in organized sports/activities.

Hypothesis 3: It is hypothesized that there is a significant positive relationship between the self-reported emotional eating scale of the Dutch Eating Behavior Questionnaire (DEBQ) and a child's weight, as measured by BMI. The risk of obesity is expected to increase with increased scores on the emotional eating scale. Further, the following covariates were delineated by prior research, and will be considered in the analysis: BMI of the mother at the child's birth and presently, age of the mother, the presence of drug/alcohol/cigarette use during pregnancy, the ethnicity of the child, the birthweight of the child, parent socioeconomic status as measured by estimated annual

income, the number of hours per day the child spends watching television, and child's participation in organized sports/activities.

Hypothesis 4: It is hypothesized that there will be a significant group difference between children with a history of having been breastfed and children with a history of having been bottlefed on the emotional eating scale of the Dutch Eating Behavior Questionnaire. It is hypothesized that children who were bottlefed, as a group, will endorse higher scores on the scale. Further, the following covariates were delineated by prior research, and will be considered in the analysis: BMI of the mother at the child's birth and presently, age of the mother, the presence of drug/alcohol/cigarette use during pregnancy, the ethnicity of the child, the birthweight of the child, parent socioeconomic status as measured by estimated annual income, the number of hours per day the child spends watching television, and child's participation in organized sports/activities.

Method

Participants

A sample of 128 children and their caregivers was proposed as necessary for 80% power with a medium effect size at the 0.05 level of significance. A sample of 64 children, ages 7-18, and their caregivers was obtained from Loma Linda University's Pediatrics clinics, which included the Growing Fit Program, the Pediatric Neuro-Assessment Program, the Faculty Medical Office's General Pediatrics Clinic, and the Pediatric Training Office. Caregivers and/or children who could not understand the materials based on language or cognitive barriers were excluded from participation. Further, based on the proposed exclusionary criteria, 15 children who were described by their caregivers as presenting with specific medical diagnoses, such as Type I diabetes, Prader-Willi Syndrome, pharmacologically treated mental health disorders, or other chronic or terminal illnesses, with the exception of asthma and allergies, were removed from the analysis due to components of such diagnoses impacting eating behaviors; as was one participant who did not have data included for that variable. Additionally, three participants were eliminated because their caregivers did not choose a primary method of infant feeding, rather choosing "other" and indicating a combination of both breastfeeding and bottlefeeding. This resulted in 19 deletions and reduced the sample of 64 participants to 45 children and their caregivers.

Materials

Body Mass Index (BMI). BMI is calculated by weight in pounds divided by height in inches squared and multiplied by a conversion factor of 703. This figure was obtained

from a Demographic Information Questionnaire given to caregivers asking for the weight and height of the child. This questionnaire was available in both English and Spanish versions (Appendices A and B).

Feeding Practices. The method of feeding was obtained from a Feeding Practices Questionnaire given to caregivers. This questionnaire was available in both English and Spanish versions (Appendices C and D). There is no standard questionnaire for evaluating method of feeding, so this questionnaire was devised to best fit the plan for statistical analysis of this study. Questions included: Was your child fed primarily by nursing at the breast (not including pumped breastmilk from a bottle) or infant formula? If primarily with infant formula, at what age in months was your child weaned? If primarily by nursing at the breast, until what age in months was this the main method of feeding? At what age in months was your child weaned?

Dutch Eating Behavior Questionnaire (DEBQ). The child's self-regulation scores were obtained from the child by the emotional eating scale from the Dutch Eating Behavior Questionnaire (Van Strien, 2002) and the Dutch Eating Behavior Questionnaire for Children (DEBQ-C) (Van Strien & Oosterveld, 2008). The DEBQ has been used on children as young as nine years of age, but a pilot study revealed that some of the questions may not be fully understood by children under the age of 12 (Braet & Van Strien, 1997). The DEBQ-C has been developed from the DEBQ to be administered to children as young as seven years of age. The emotional eating scales of both instruments are based on Bruch's psychosomatic theory. The DEBQ has 13 items that comprise that scale, and the DEBQ-C has seven items that comprise the scale. Each item on the DEBQ is scored on a five-point Likert scale, and each item on the DEBQ-C is scored on a three-

point response scale, with higher scores on both indicating a greater amount of the construct. The scale scores were combined into one variable for analysis. The DEBQ has a Cronbach's alpha of .94 (Van Strien, Schippers, & Cox, 1995) and the DEBQ-C emotional eating scale has a Cronbach's alpha of .80 (Van Strien & Oosterveld, 2008). The DEBQ has convergent validity with a Pearson correlation coefficient of .33 with the eating problems cluster that was formed using a principle components analysis on the Dutch Problem History Questionnaire (Van Strien, Schippers, & Cox, 1995). Therefore, the DEBQ demonstrates acceptable reliability and validity.

Demographics. The covariate variables were obtained by a Demographic Information Questionnaire administered to the caregivers. This questionnaire was available in both English and Spanish versions (Appendices A and B). It included questions such as: maternal height, maternal weight presently and at time of child's birth, highest level of education obtained by either caregiver, estimated annual household income, presence of drug/alcohol/cigarette use during pregnancy, age of child's biological mother, ethnicity of child, height and weight of child presently and at birth, does child participate in organized sports/activity, and number of hours per day the child spends watching television. All of these covariates were selected based on the literature because most of them served as covariates in prior studies. However, due to the inadvertent omission of the last page of the Demographics Information Questionnaire during preparation for data collection, the questions about child's participation in organized sports/activity and number of hours per day spent watching television, as well as additional questions about number of children in the household and a qualitative rating of caregiver eating habits were unable to be collected.

Procedure

The Dutch Eating Behavior Questionnaires, the Feeding Practices Questionnaire, and the Demographic Information Questionnaire were collected by the investigator and research colleagues from children and their caregivers who were approached using a standard script, available in both English and Spanish (Appendices E and F), in the waiting room of the Pediatric Training Office and General Pediatrics Clinics at the Faculty Medical Offices of Loma Linda University, as well as from participants in the Growing Fit Program and the Pediatric Neuro-Assessment Program. Both caregiver consent, available in both English and Spanish (Appendices G and H), and child assent, available in English (Appendix I), were obtained, and no identifying information was requested. Further, consents and assents were stored separately from completed questionnaires, making the information anonymous. Assistance was available for caregivers and children completing the questionnaires. After completion of the questionnaires, participants were able to select a \$5 gift card to a popular store.

Statistical Analyses and Data Screening

To evaluate the four hypotheses, the data set was evaluated for missing data. There were several variables with missing data percentages greater than 5 percent, which is the standard percent at which to test for patterns (Tabachnick & Fidell, 2001). A Missing Values Analysis was performed, and Separate Variance t Tests demonstrated a systematic relationship between missingness on BMI and income ($t=4.6$, $p<.05$, $n=37$). Further, the variables with the highest percentage of missing data were the covariates related to height and weight of the participant at birth, the height and weight of the biological mother at the participants' birth, and the current height and weight of the

biological mother. These variables are related in that they require retrospective information that would likely be easiest to be recalled by the biological mother, if at all, as well as could be considered sensitive information, and not as easily disclosed. Further, not all of the respondents were biological mothers of the participants. Independent t-tests were calculated to determine if there were group differences in the means of these variables when grouped by the reporter's relationship to the participant (biological mother/non-biological mother). There were no significant group differences, however, the relationship between those missing variables cannot be considered random because of the inherent connectedness. Therefore, the expectation maximization, a method of missing data imputation that is considered more sophisticated than mean substitution or regression, was not completed, because it is inappropriate for nonrandomly missing data (Tabachnick & Fidell, 2001). Consequently, missing data was eliminated in listwise deletions by analysis.

All quantitative variables were analyzed for normality and outliers at the univariate level by conversion to standardized z scores, and removal of all values greater or less than three standard deviations from the mean, as well as by evaluating skewness and kurtosis values (Mertler & Vannatta, 2002). This resulted in removal of DEBQ Emotional Eating Scale Scores from three participants, as well as the current BMI, mother's current BMI, and mother's BMI at child's birth values from one participant. Next, the proposed covariates that were available from the data collection were evaluated for their relationship with the dependent variables of BMI and the DEBQ Emotional Eating Scale Score, as well as with each other. Only one participant endorsed the use of drugs/alcohol/cigarettes during pregnancy, so that variable was no longer considered a

viable covariate. Further, because the majority of the caregivers endorsed child's ethnicity as Hispanic/Latino, this variable was dummy-coded into a dichotomous variable of Hispanic/Latino and non-Hispanic/Latino. Estimated annual household income was considered a continuous variable. None of the viable proposed covariates of BMI of the mother at the child's birth, the mother's current BMI, child's birthweight, the current age of the biological mother, the ethnicity of the child, or estimated annual income, was significantly related to either dependent variable, and was thus not included in the analysis (see Tables 1 and 2). This is supported by Tabachnick and Fidell (2001), who indicate that significance tests assess the usefulness of a covariate to adjust a dependent variable, and to include non-optimal covariates reduces power by reducing degrees of freedom.

Table 1

Bivariate correlations of covariates with BMI

	BMI
BMI of mother at child's birth	.327 (p=.110)
Current BMI of mother	.204 (p=.288)
Child's birthweight	.171 (p=.365)
Current age of mother	-.018 (p=.918)
Child's ethnicity	.123 (p=.475)
Annual income	-.151 (p=.393)

Table 2

Bivariate correlations of covariates with DEBQ

	DEBQ
BMI of mother at child's birth	.284 (p=.160)
Current BMI of mother	.125 (p=.502)
Child's birthweight	.287 (p=.117)
Current age of mother	.118 (p=.479)
Child's ethnicity	-.222 (p=.158)
Annual income	-.286 (p=.086)

An independent groups t-test was utilized to determine the first hypothesis of a significant group difference in BMI, between children with a history of having been breastfed as infants and children with a history of having been bottlefed as infants. For the second hypothesis, linear regression was utilized to determine the presence of a significant dose-dependent relationship between duration of breastfeeding and BMI. The third hypothesis of a significant positive relationship between emotional eating on the Dutch Eating Behavior Questionnaire and BMI percentile was also evaluated by linear regression. The fourth, and last, hypotheses of a significant group difference between children with a history of having been breastfed as infants and children with a history of having been bottlefed as infants on the DEBQ Emotional Eating Scale score was measured with an independent groups t-test.

Results

Participants and Descriptives

The aforementioned data reductions reduced the sample of 64 participants to 45 children and their caregivers. Of these 45 participants, the average age was 12, with the age range being 7-18, and a standard deviation (SD) of 3 years. Thirty-one percent of the participants were male, 69 percent were female, and 58 percent, comprising the majority of the sample, were classified by a caregiver as being Hispanic/Latino. The next largest ethnicity classification was Caucasian, followed by African-American, Asian, and Other respectively (see Table 3). Sixty-five percent of the participants fell within the normal weight range, according to the CDC BMI percentile cutoffs, while 19 percent were within the overweight range, and 16 percent were within the obese percentile range. Figure 1 and Figure 2 further illustrate the healthy weight, overweight, and obese CDC BMI percentile categories by ethnicity and by gender respectively. Thirty-eight percent of the participants' caregivers reported having completed "some college" as their highest level of education, and 55 percent of the caregivers reported earning \$50,000 or less as an estimated annual income. The average BMI for this sample was 22 (SD=4.8). The average age of the participating children's biological mothers was 41 years (SD=6), with those mothers' average current BMI being 27 (SD=5.4), which is in the overweight range, and their average BMI at the time of their child's birth being 30 (SD=4.9). The average birthweight of the participants was 7 pounds (SD=1). The caregivers sampled also reported that breastfeeding was the primary method of feeding for 21 percent of the children, or 9 participants, while bottlefeeding was the primary method of feeding for 79 percent of the children, or 34 participants. Of those children who were primarily

breastfed, 56 percent of them, comprising the majority, were primarily breastfed for 6 months. Of those children who were primarily bottlefed, 56 percent of them, comprising the majority, were primarily bottlefed for 12 months. Table 3 provides a description of the study participants.

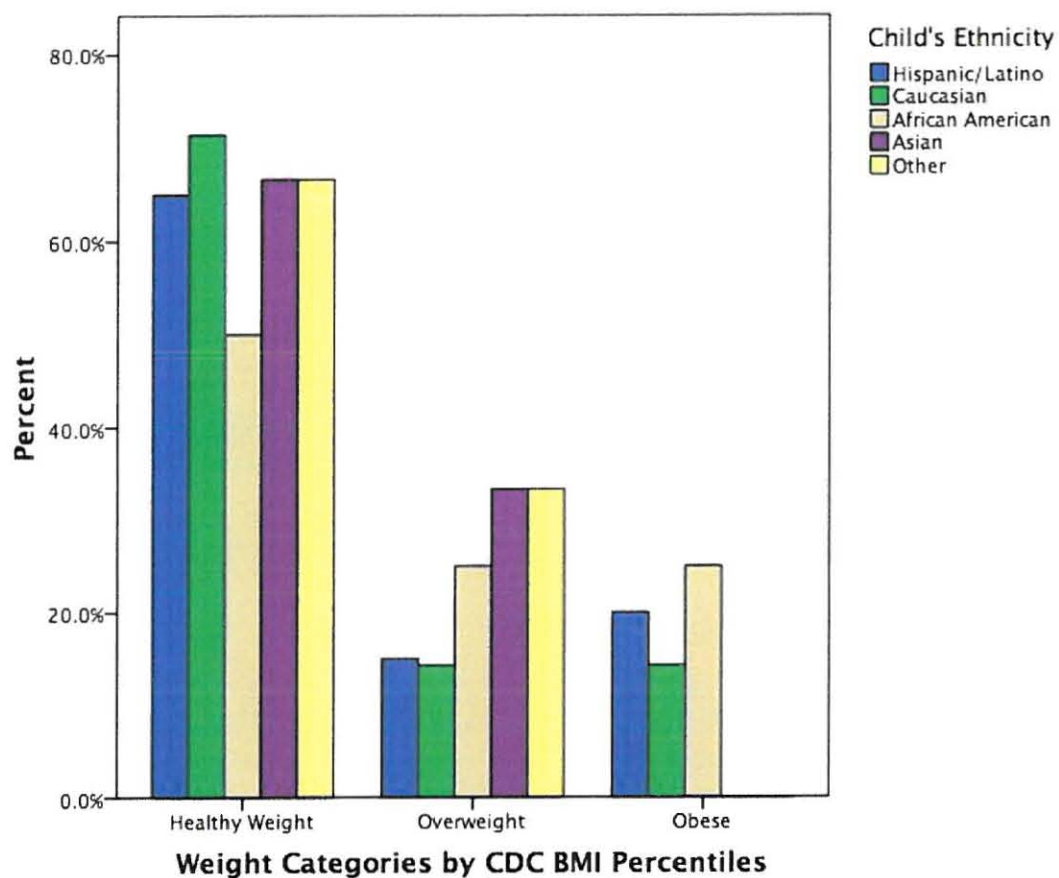


Figure 1. Child's ethnicity by BMI percentiles

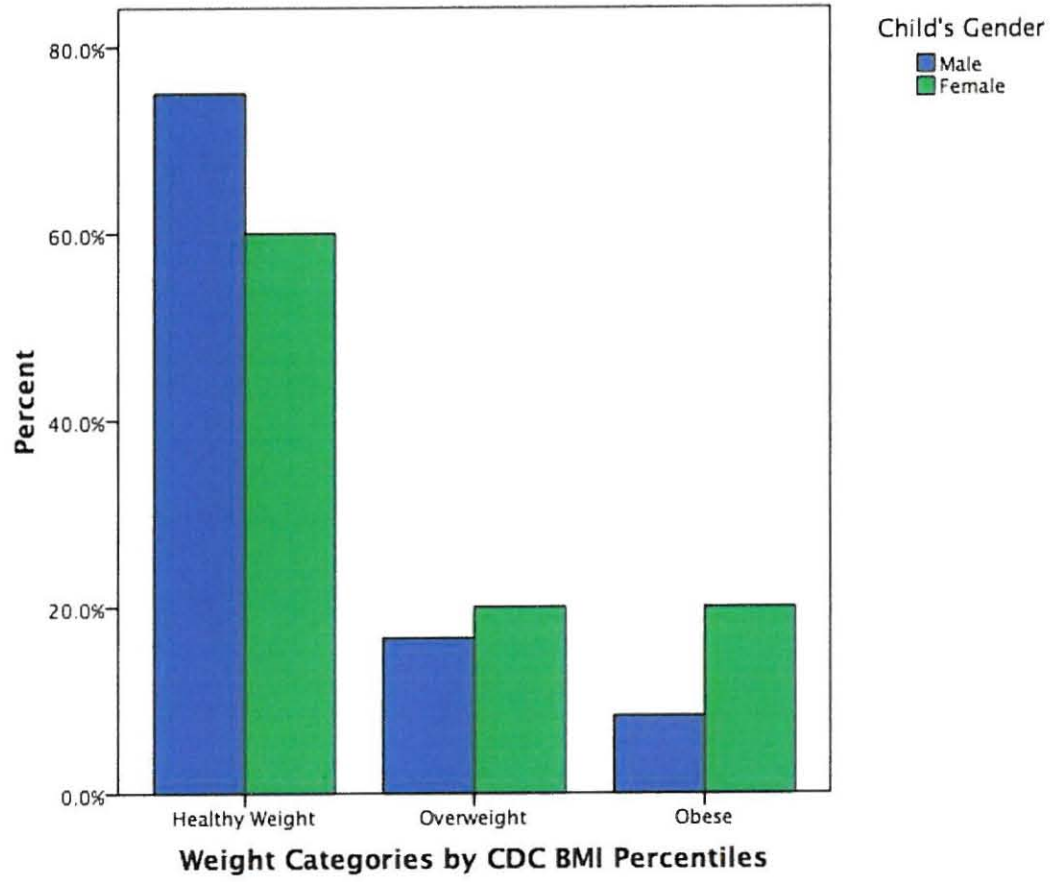


Figure 2. Child's gender by BMI percentiles

Table 3.

Participant demographics

Characteristic	N	%
Gender		
Male	14	31
Female	31	69
Ethnicity		
Caucasian	8	18
African-American	5	11
Hispanic/Latino	26	58
Asian	3	7
Other	3	7
Caregiver Education ^a		
Less than high school	4	10
High school degree	11	26
Some college	16	38
College degree	6	14
More than college	5	12
Caregiver Income ^b		
Less than \$20,000	6	15
\$20,000-40,000	11	27.5
\$40,000-60,000	8	20
\$60,000-80,000	4	10
\$80,000-100,000	6	15
\$100,000-200,000	4	10
More than \$200,000	1	2.5
Infant Feeding ^c		
Breastfeeding		
Less than 6 months	2	22
6 months	5	56
More than 6 months	2	22
Bottlefeeding ^d		
Less than 12 months	11	34
12 months	18	56
More than 12 months	3	9

Note. N=45, Average participant age=12. Average participant BMI=22.

^a3 participant caregivers had missing data.

^b5 participant caregivers had missing data.

^c2 participant caregivers did not indicate infant feeding type.

^d2 participant caregivers did not indicate bottlefeeding duration.

Further, examination of possible relationships or patterns between independent variables indicated no relationship between primary method of infant feeding, or duration of breastfeeding, with child's age, gender, or dummy-coded ethnicity (Hispanic/Latino and non-Hispanic/Latino), as measured by Chi-square tests of independence or bivariate correlations. There was no observed trend between highest level of caregiver education and primary method of infant feeding (see Figure 3) or estimated annual income and primary method of infant feeding (see Figure 4).

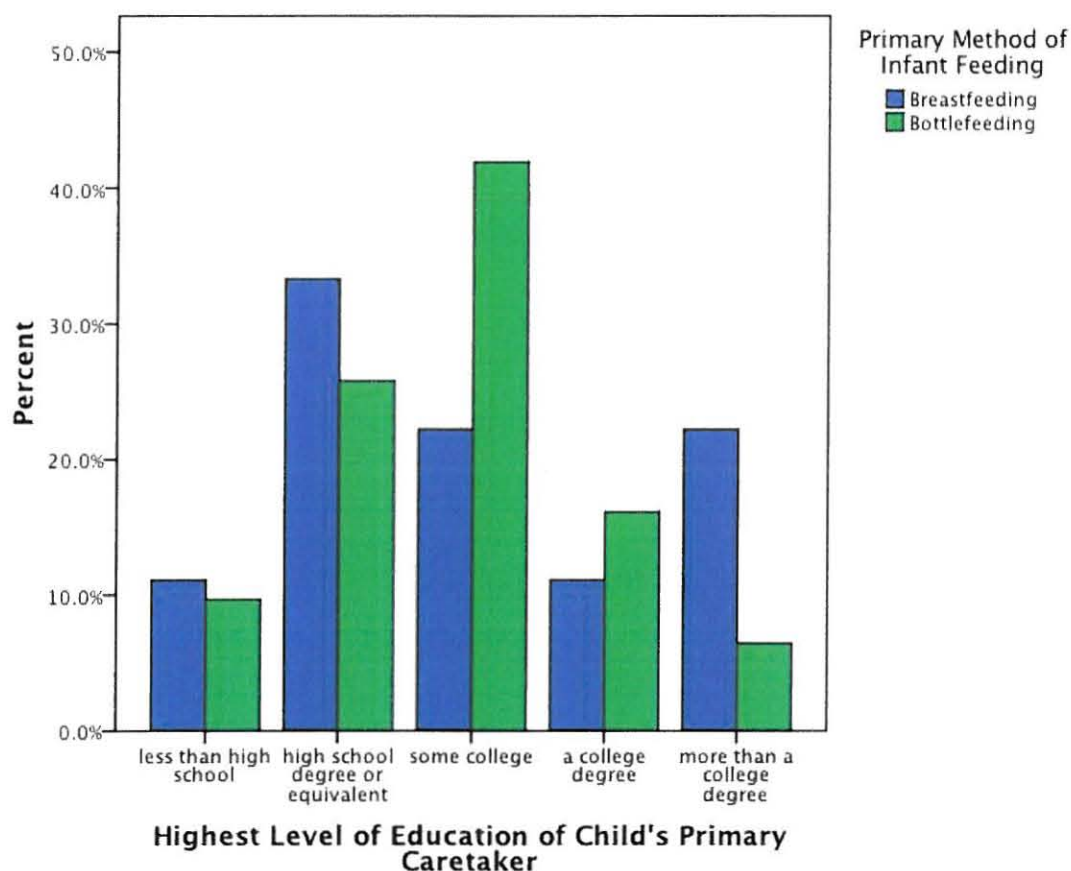


Figure 3. Method of infant feeding by primary caregiver education

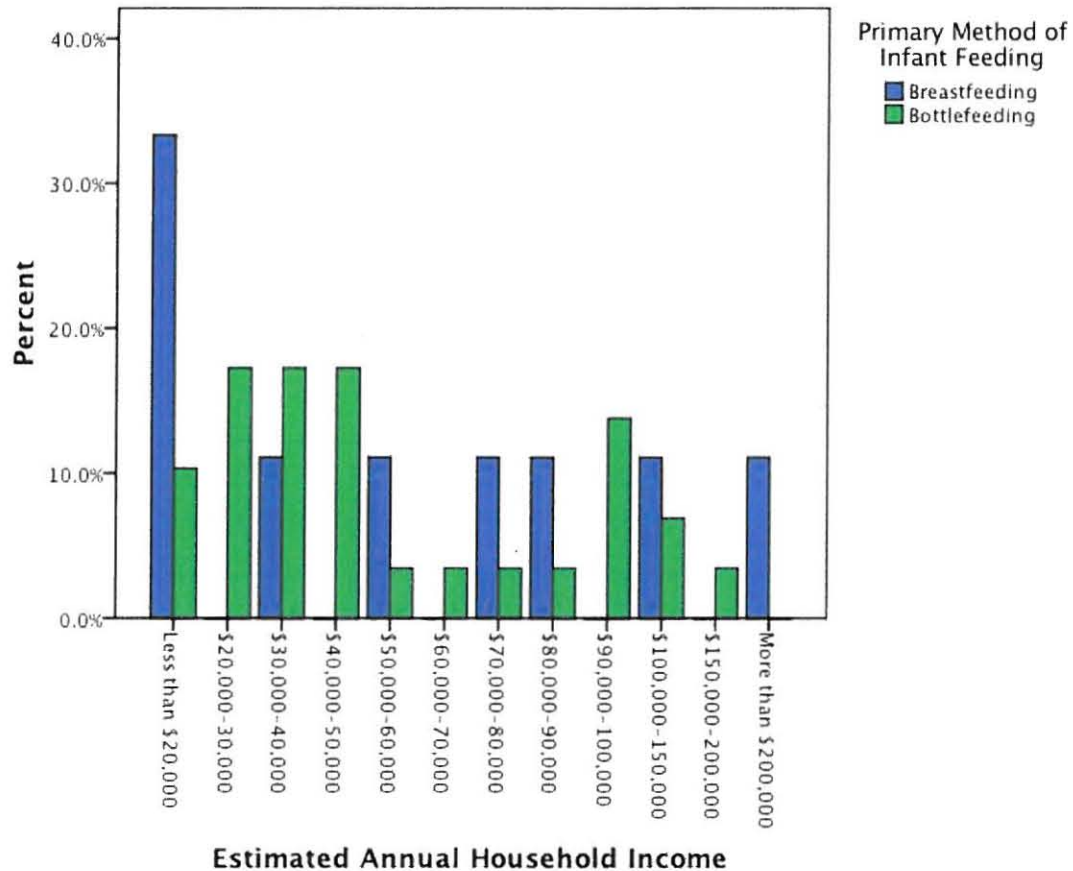


Figure 4. Method of infant feeding by estimated annual household income

Hypotheses 1: BMI and Primary Method of Infant Feeding

The first hypothesis stated that there would be a significant group difference in BMI between children with a history of having been breastfed as infants and children with a history of having been bottlefed as infants, and that children who were breastfed, on average, would have lower BMIs. For this hypothesis, data was screened at the univariate and multivariate level according to the procedures outlined in Mertler and Vannatta (2002). Missing data was handled by listwise deletion, group outliers were determined via stem-and-leaf plots, and four were deleted. The assumptions of normality and homoscedasticity were evaluated via Kolmogorov-Smirnov tests of normality and

Levene's test of equality of variances, and were met. As shown in Table 4, the remaining sample included 8 participants who had been primarily breastfed and 22 participants who had been primarily bottlefed. An independent samples t-test was performed; because none of the proposed covariates significantly correlated with BMI, thus eliminating the need for the proposed ANCOVA. No significant group difference was found ($t=1.027$, $p=.313$, $n=30$), and the average BMI for the participants who were breastfed was higher than the average BMI for the participants who had been primarily bottlefed, which was contrary to, and thus does not support the hypothesis (see Table 4). Further investigation revealed that a high percentage of participants in the overweight and obese categories, as defined by the CDC BMI percentile cutoffs, were breastfed than bottlefed (Figure 5).

Table 4.

Hypothesis 1

Group	N	Average BMI	SD
Breastfeeding	8	21	2.9
Bottlefeeding	22	20	2.3

N=30

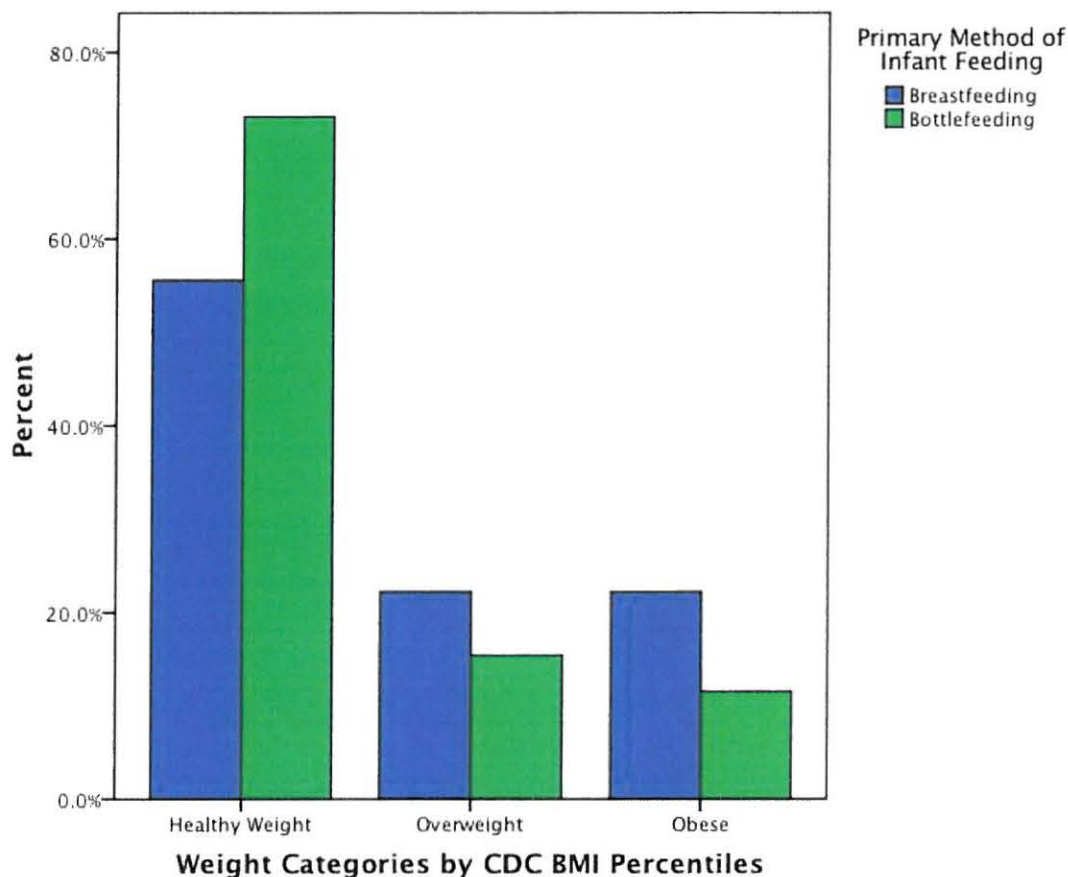


Figure 5. Method of infant feeding by BMI percentiles

Hypotheses 2: BMI and Duration of Breastfeeding

The second hypothesis stated that there would be significant positive dose-dependent effects for the duration of breastfeeding, as indicated by parent report, on childhood overweight and obesity, as measured by BMI. The risk of obesity was expected to decrease with an increased number of months spent breastfeeding. For this hypothesis, data was screened at the univariate and multivariate level according to the procedures outlined in Mertler and Vannatta (2002). Missing data was handled by listwise deletion, the presence of outliers was evaluated via stem-and-leaf plots and calculation of Mahalanobis distance, and one case was deleted. The assumptions of

normality, linearity, and homoscedasticity were evaluated via scatterplot matrix and residual plots, and were met. The remaining sample included 8 participants who had been primarily breastfed, with an average BMI of 21 (SD=2.9). A linear regression was performed without the proposed covariates, because of lack of significance with BMI. No significant relationship or meaningful effect size was found, thus not supporting the hypothesis ($F(1,6)=.022$, $p=.887$; $R^2=.004$).

Hypotheses 3: Emotional Eating and BMI

The third hypothesis stated that there would be a significant positive relationship between the self-reported emotional eating scale of the Dutch Eating Behavior Questionnaire and a child's overweight and obesity, as measured by BMI. For this hypothesis, data was screened at the univariate and multivariate level according to the procedures outlined in Mertler and Vannatta (2002). Missing data was handled by listwise deletion, the presence of outliers was evaluated via calculation of stem-and-leaf plots and Mahalanobis distance, and four cases were deleted. The assumptions of normality, linearity, and homoscedasticity were evaluated via scatterplot matrix and residual plots, and were met. The remaining sample included 30 participants, with an average DEBQ emotional eating scale score of 1.39 (SD=.36), and an average BMI of 20 (SD=2.4). A linear regression was performed without the proposed covariates, because of lack of significance with BMI. No significant relationship or meaningful effect size was found, thus not supporting the hypothesis ($F(1,28)=1.571$, $p=.220$; $R^2=.053$). Further investigation revealed that a total of only three participants endorsed an average emotional eating score indicating that they at least "sometimes" eat more in response to emotional stimuli, indicating a lack of participants self-reporting as emotional eaters.

Further, because of this indicated lack of variability in the sample, two of those three participants were deleted as outliers in the analysis.

Hypotheses 4: Primary Method of Infant Feeding and Emotional Eating

The fourth hypothesis stated that there would be a significant group difference between children with a history of having been breastfed and children with a history of having been bottlefed on the emotional eating scale of the Dutch Eating Behavior Questionnaire. Missing data was handled by listwise deletion, one group outlier was detected and determined via stem-and-leaf plots, but was not deleted because of the small sample size, and to preserve the existing 4:1 ratio between participants by group membership. The assumptions of normality and homoscedasticity were evaluated via Kolmogorov-Smirnov tests of normality and Levene's test of equality of variances, and were considered met. An independent samples t-test was performed; because none of the proposed covariates significantly correlated with the DEBQ, thus eliminating the need for the proposed ANCOVA. As shown in Table 5, the remaining sample included 8 participants who had been primarily breastfed and 32 participants who had been primarily bottlefed. No significant group difference or meaningful effect size was found, and the hypothesis was not supported ($t=-.173$, $p=.635$, $n=40$).

Table 5.

<i>Hypothesis 4</i>			
Group	N	Average DEBQ Emotional Eating Scale Score	SD
Breastfed	8	1.38	.42
Bottlefed	32	1.40	.33

N=40

Discussion

Pediatric obesity is a growing national epidemic with 15 percent of children ages 6-19 considered obese (National Institute of Environmental Health Sciences (NIEHS) Office of Management, 2007). In fact, because children who are obese are likely to remain obese into adulthood, it is estimated that by the year 2050, nearly 50 million Americans could be obese (Dietz, 1998; National Institute of Environmental Health Sciences (NIEHS) Office of Management, 2007). Researchers from a variety of disciplines are concerned about this trend and are actively seeking viable preventive and treatment options. Current treatment interventions include exercise and dieting programs, various support groups and therapy programs, nutrition education, and surgical procedures. However, while treatment of an existing problem is necessary and beneficial, prevention is the only way to truly halt and reverse the etiology of the epidemic. Prevention can begin in any stage of life, but as with most preventive measures, earlier is better. Current research and theory suggests that breastfeeding may have protective effects against childhood obesity (Gillman et al., 2001; von Kries et al., 1999; Liese et al., 2001; Armstrong & Reilly, 2002; Toschke et al., 2002; Bergmann et al., 2003). However the specific mechanisms of such prevention are unknown. Many of the attempts to understand this mechanism are of a biological nature, with little attention given to psychological factors. One construct that has received theoretical support is the concept of self-regulation, which was operationally defined as emotional eating for the purposes of this study. Generally, it is hypothesized that children who were breastfed in infancy develop greater self-regulation over their food intake, and are consequently less

overweight. As such this study explicitly explored the relationship between infant feeding, emotional eating, and subsequent childhood obesity.

In conducting this study, a sample of 64 children, ages 7-18, and their caregivers were included. During data screening prior to analysis, 19 participants were removed, leaving 45 remaining participants in the sample. Of these 45 participants, the average age was 12, with 31 percent being male and 69 percent being female. The majority of participants (58 percent) were classified by a caregiver as being Hispanic/Latino. The majority of the participants (65 percent), regardless of ethnicity and age, were within the healthy weight BMI percentile range, and 19 percent were classified as overweight, with 16 percent falling in the obese BMI percentile range. Within the sample, the average BMI was 22, with 21 percent of caregivers reporting that they primarily breastfed and 79 percent of caregivers reporting that they primarily bottlefed their child. Four hypotheses examining relationships between method of infant feeding, self-regulation as defined by emotional eating, and childhood BMI were explored. Although an attempt was made to control for covariates supported in the literature such as BMI of the mother at the child's birth, the mother's current BMI, child's birthweight, the current age of the biological mother, the ethnicity of the child, and estimated annual income, they were excluded from the analysis due to lack of a significant correlation with either dependent variable used in the study.

The first hypotheses proposed that there would be a significant group difference in childhood BMI between children with a history of having been breastfed as infants and children with a history of having been bottlefed as infants. Results indicated no significant group difference between children with a history of having been breastfed and

children with a history of having been bottlefed in childhood BMI. In fact, the average BMI for the participants who were breastfed was higher than the average BMI for the participants who had been primarily bottlefed, which was contrary to the hypothesis. This indicates that in this sample, children who were breastfed were on average, heavier, than children who were bottlefed, which contradicts previous research (Gillman et al., 2001; von Kries et al., 1999; Liese et al., 2001; Armstrong & Reilly, 2002; Toschke et al., 2002; Bergmann et al., 2003).

One significant difference between the current study and previous research is the sample size utilized. The current sample size is considerably smaller than the samples studied by previous researchers, which incorporated hundreds to thousands of children. The current study did not include enough participants to provide 80 percent power to determine differences. However, a quantitative review of 61 published studies evaluating the effect of infant feeding on later obesity, including each of the previous research studies referenced in this study, indicated that small studies provided the strongest relationship between breastfeeding and reduced risk of obesity (Owen, Martin, Whincup, Smith, & Cook, 2005). However, small studies in this review were defined as having fewer than 500 participants, which is still considerably more participants than available in the current study. This indicates the possibility that the difference hypothesized in this study may have materialized had a larger sample been utilized. The researchers who conducted the meta-analysis also noted that the protective effect of breastfeeding was stronger and more consistent when breastfeeding was exclusive. This was the case in only 4 of the total studies, and not the case in the present study, which may also

contribute to the existing lack of difference (Owen, Martin, Whincup, Smith, & Cook, 2005).

The second hypothesis proposed that there would be significant positive dose-dependent effects for the duration of breastfeeding, as indicated by parent report, on childhood BMI. Results yielded no significant relationship between length of time that breastfeeding is the primary method of feeding and childhood BMI. Much like the first hypothesis, it is very likely that the small sample size of 8 participants in this analysis contributed to the lack of discovered relationship, because of the lack of power to do so. Comparatively, in the meta-analysis by Owen, Martin, Whincup, Smith, and Cook (2005), in the 14 studies that included duration information, there was a clear duration effect on later obesity, and this effect was greatest for children who were breastfed for equal to or longer than 2 months than for any other duration time. In the current study, even among the few participants, there was little variability because the majority of them were breastfed for 6 months, further reducing the discovery of the possible relationship.

However, aside from the small sample size that reduced power, this study also had other factors contributing to the lack of support for the hypotheses. Specifically, the meta-analysis highlights significant information relevant to the further evaluation of infant feeding and its relationship to subsequent obesity (Owen, Martin, Whincup, Smith, & Cook, 2005). For example, choosing to measure the protective effects by means of odds ratios as opposed to not, appears to enhance the determination of relative risk. Of 29 studies included in the meta-analysis, 18 of them resulted in protective effects when reported by odds ratios, but of 35 studies reporting direction of association, only one reported protective effects, and one indicated increased risk of obesity associated with

breastfeeding. It also appears that studies not utilizing odds ratios were smaller in available sample size (Owen, Martin, Whincup, Smith, & Cook, 2005). This extends to the current study, which hypothesized group differences and an associated direction, but not an odds ratio. Notably, in the same meta-analysis, the odds ratios were not affected by different cut-offs of obesity used in the different studies or by if infant feeding type was recorded during in infancy, or evaluated retrospectively (Owen, Martin, Whincup, Smith, & Cook, 2005). This is interesting because the authors revealed marked heterogeneity in the designs and methodology among the 61 studies. Specific areas of methodology differences included determination of obesity by absolute BMI value, BMI z-scores, or BMI percentiles, and at what cut-off level was considered obesity, as well as what was considered breastfeeding, in relation to exclusivity and duration, and what variables were controlled for (Owen, Martin, Whincup, Smith, & Cook, 2005). Each of these variables also played a role in the current study, and along with the small sample size, likely played a role in the failure to rejecting the null hypotheses.

For example, this current study was proposed to utilize BMI as the continuous measure of adiposity because BMI values, particularly those over 20, have been demonstrated to be effective measures of childhood adiposity, and effective as the weight metric for survey purposes (Lobstein, Baur, & Uauy, 2004; Field et al., 2003). BMI values may also become more appropriate for measuring childhood adiposity when adjusted for age, but the adjustments may vary based on the normative reference used, particularly when considering ethnicity differences (Lobstein, Baur, & Uauy, 2004). In the current study, although age was not a proposed covariate, it was evaluated in relationship to BMI as a possible adjustment factor, but it was not significantly related,

and thus not included. Also, in the current study, because BMI was used as a continuous variable to determine relationships and not odd ratios, cut-off points of overweight and obesity were not established.

Additionally in this study, what was considered breastfeeding was not established by a priori parameters. The Feeding Practices Questionnaire completed by the caregiver was designed to be a forced choice determination of which method of infant feeding was considered at best, exclusive, or at least primary by the caregiver. Primary breastfeeding was also separated from feeding primarily by expressed breastmilk, as the relationship between expressed breastmilk was considered to be more similar to bottlefeeding for the purposes of this study. However, much like in the studies evaluated in the meta-analysis, this resulted in a level of ambiguity about grouping by primary method of feeding, mainly because exclusive breastfeeding appeared to be reported very rarely. What was reported commonly was a mix of some breastfeeding, with many more months of bottlefeeding. Without clear and established guidelines to delineate the breastfeeding group, there was ambiguity in deciphering some participants' group membership. Consequently, future studies would likely benefit from having such criteria.

The many studies investigated in the meta-analysis included a range of covariates to adjust for. Because true experiments to answer these research questions have significant ethical considerations, the majority of studies on breastfeeding's impact on later child weight are observational in nature. Consequently, confounding is an important consideration (Owen, Martin, Whincup, Smith, & Cook, 2005). The current study proposed to covary and adjust for several of the variables mentioned in the meta-analysis, such as maternal characteristics of BMI and socioeconomic status and birth size of the

child. However, none of these proposed covariates had a relationship with the dependent variables of BMI or of the DEBQ emotional eating scale, perhaps because of the small sample size, and were not utilized in the analyses. According to the authors of the meta-analysis, studies that controlled for these variables still demonstrated a protective relationship between breastfeeding and obesity, but the relationship is attenuated. The authors concluded that more studies are needed to understand the effects of some of these covariates on the relationship between breastfeeding and obesity (Owen, Martin, Whincup, Smith, & Cook, 2005).

The third hypothesis proposed that there would be a significant positive relationship between the self-reported emotional eating scale of the Dutch Eating Behavior Questionnaire and childhood BMI. Results yielded no significant relationship between the emotional eating scale of the Dutch Eating Behavior Questionnaire and childhood BMI. There are several possibilities for the lack of support for this hypothesis in this study. Again, the small sample size did not provide enough power to reveal a potentially small relationship. Current research indicating possible relationships between emotional eating and BMI have noted that such relationships are small (Braet et al., 2007). However, this relationship seems to be present in an overweight and obese population of children, but not when incorporating children of healthy weight, such as in the current study. Yet, in the current study, when further evaluating for a possible relationship between BMI and the DEBQ emotional eating scales in only the overweight and obese children, no further relationship was detected. According to Braet et al., when evaluating differences between groups of children having healthy weight and children who are overweight, there was no group difference on the emotional eating scale of the DEBQ.

However, evaluation of interactions and post-hoc analyses revealed more emotional eating for overweight adolescent girls, than for their normal weight counterparts (Braet et al., 2008). Therefore, it appears that when studying children exhibiting a range of BMIs, there is not much evidence to support an overall relationship between BMI and emotional eating. However, when incorporating age and gender, there appear to be significant interactions (Braet et al., 2008). This may have been true in the current study, had a larger sample been utilized, but there was no detected relationship between gender or age with the DEBQ emotional eating scales. More research by Braet et al. highlights further possible difficulty in measuring and determining support for this hypothesis. Their study indicates that children younger than the age of 10, may have more difficulty being aware of their own eating habits (Braet et al., 2007). These researchers utilized a DEBQ—Child Version, although it was not the same one utilized for the current study, to compare responses with a DEBQ completed about the child by the child's parent. There was acceptable correlation between the two versions, but it was revealed that young children may underreport emotional eating, possibly because they are unaware of their own patterns (Braet et al., 2007).

Lastly, the fourth hypothesis proposed that there would be a significant group difference between children with a history of having been breastfed and children with a history of having been bottlefed on the emotional eating scale of the Dutch Eating Behavior Questionnaire. Results yielded no significant difference between children with a history of having been breastfed and a history of having been bottlefed on the emotional eating scale of the Dutch Eating Behavior Questionnaire. Again, the lack of support of this hypothesis may likely stem from the available small sample size, and from the

absence of a priori parameters to constitute the primary breastfeeding group. However, other factors not considered within the realm of the study may also have an impact. The hypothesis was proposed to be supported because of the differences in the mechanisms of breastfeeding and bottlefeeding lending themselves to development of appropriate awareness and distinction of hunger cues. Specifically, children who were primarily breastfed, as opposed to children who were primarily bottlefed, were hypothesized to gain a greater and more accurate awareness of their internal hunger cues, based on the feeding relationship with their caregiver, and consequently develop a greater regulation of eating in response to true hunger cues compared to eating in response to emotions that were not actual biological hunger. However, additional research appears to indicate that other factors not included within the realm of this study may need to be considered.

According to research by Blissett and Farrow in 2007, infant breastfeeding duration predicts later maternal feeding style at the first and second years of children's lives. Specifically, shorter breastfeeding duration was related to greater use of pressure to eat by the mother at 1 year of age. Use of pressure to eat in the child's first year of life was predictive of pressure to eat by the mother in the child's second year of life, suggesting stability of this maternal feeding style. Conversely, breastfeeding had a negative relationship with restrictive or prohibitive feeding by the mother at the child's second year of life. Interestingly, this negative relationship was better explained by other factors such as infant temperament during the child's first year of life. These authors note the important role of infant temperament in these feeding relationships (Blissett & Farrow, 2007). Infant temperament was found to be related to feeding practices in the first two years of life, with the possibility of stability of these feeding practices later in the child's

life. Specifically, at 1 year of age, infants who were perceived as less dull received more feeding monitoring, and infants who were less predictable received less feeding restriction. At 2 years of age, infants who were more difficult received less feeding restriction by their mothers (Blissett & Farrow, 2007). These authors state that this is the first study to evaluate infant temperament in early childhood controlled maternal feeding patterns. Infant temperament is a variable of the Barnard model, a model to determine predictors that could provide very early identification of later developmental problems (Sumner & Spietz, 1994). However, infant temperament has not appeared to have had a significant role in the research investigating the role of early feeding on later eating practices and weight. Consequently, the influence of infant temperament as a construct appears to be a variable that could play in understanding the current study's lack of support for the hypothesis, and for future research.

Limitations

The primary limitation of this study was the limited sample size, and specifically the small number of participants who were classified with a history of having been primarily breastfed. Also, the small number of overall participants, regardless of primary feeding type, limited the power available to detect the significant differences and relationships proposed in the hypotheses. However, a larger concern was that only 21 percent of the participants in the sample were primarily breastfed. Mertler and Vannatta (2002) suggest that categorical variables with 90-10 splits between categories are unusable because the category with the 10 percent of participants can influence analyses more than the larger category. Although that is not the case in this study, the uneven distribution across the primary method of infant feeding category created difficulty in

meeting the assumptions for the parametric procedures utilized for this study. Of specific concern, of that 21 percent, the majority of the participants were breastfed for 6 months, further reducing the variability available to determine relationships.

A related limitation to this study was that the breastfed and bottlefed groups were not matched on related criteria. This again reduced the ability to detect small, yet meaningful differences in the groups on BMI or the DEBQ emotional eating scale. However, given the disproportionate number of participants in the breastfeeding and bottlefeeding groups, a matched design would likely have also resulted in a small sample size, limited by the number of participants who were primarily breastfed.

A third limitation was determination of the primary method of infant feeding. The Feeding Practices Questionnaire created for this study utilized a single item to determine primary method of feeding. The item was designed as a forced choice between breastfeeding, bottlefeeding, expressed breastmilk, and other, which was to include any other less common method. However, this item appeared to be confusing for many caregivers, who indicated multiple methods of feeding instead of choosing one that they considered primary or exclusive. The most frequently reported feeding combination was of a few number of months of breastfeeding and many more months of bottlefeeding. Further, because it was designed to be forced choice, the question did not allow for caregivers to indicate which method was chosen first, or if there was any overlap, in the methods of feeding, and very few caregivers added qualitative data to elaborate upon and clarify their responses. Additionally, no a priori parameters of what constituted primary breastfeeding were established for this study, making it more difficult to effectively utilize the single item to ascertain the primary infant feeding grouping. Further, no

question was included to ask for qualitative information, such as why caregivers chose the feeding method used, or if the child had any feeding difficulties. Future studies would benefit from requesting such qualitative information, as well as determining a priori parameters to define what would be considered primary or exclusive breastfeeding.

Another limitation to the study was the self-report of height and weight information, both about the participant child and the caregiver. Although the majority of the reporting caregivers were biological mothers, some were not, and were unable to report on the information required about the participants' biological mothers. This contributed to non-random missing data patterns that could not be statistically imputed. However, regardless of reporter, accuracy would have likely increased if the height and weight data came from a trained professional and from historical records (Lobstein, Baur, & Uauy, 2004). However, to request and include such data would have likely eliminated the anonymity of the survey format, and increased privacy concerns among participants.

A related limitation was the use of BMI that was unadjusted for age or gender as the primary weight metric. Although BMI is an appropriate weight metric for research purposes, especially for children approaching obesity with a minimum BMI of 20, the majority of this sample was in the healthy weight range, indicating that a different metric, such as BMI adjusted for age, may have been more appropriate for analysis (Field et al., 2003). An attempt was made to adjust BMI for age, but there was no significant relationship, and consequently the adjustment was not made. Had a larger sample size been available, this relationship may have been apparent and the appropriate adjustment made. Further, the Demographics Questionnaire designed for this study only utilized a question for child's age in years, but not a specific birth date from which age in years and

months could be calculated, which is an additional limitation, because the more specific age is a more appropriate adjustment.

An additional limitation to this study was the disproportionately large number of participants who were identified as Hispanic/Latino. According to the United States Census Bureau, San Bernardino County, the location where this research was conducted, has a 47 percent Hispanic/Latino population (United States Census Bureau, 2009). The proportion of this population was even higher in this study, comprising the majority of the sample, and thus reducing generalizability of the study to the broader population. Further reducing generalizability because of population-specific characteristics, according to 2003-2004 NHANES data, there is a higher prevalence of Latino children at or above the 85th BMI percentile when compared to non-Latino Black and non-Latino White children of the same age (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006, as cited in Sussner, Lindsay, Greaney, & Peterson, 2008). Additional research from the New York City WIC population suggests that this difference may be apparent at an early age. Data from that population indicated that Latino preschoolers are more than twice as likely to be at risk for overweight compared to other ethnic groups (Nelson, Chiasson, & Ford, 2004, as cited in Sussner, Lindsay, Greaney, & Peterson, 2008). Further, a cross-sectional study of preschool children from 20 urban cities across the United States suggests similar results from their data, indicating that Latino children had the highest prevalence of obesity when compared to Black and White children when controlling for sociodemographic factors (Whitaker & Orzol, 2006, as cited in Sussner, Lindsay, Greaney, & Peterson, 2008). Nevertheless, although the prevalence of Hispanic/Latino participants is a limitation in this study because it affects the

applicability of the results to the greater population, it does facilitate further knowledge about the Hispanic/Latino population, which is a strength.

A related limitation of this study was the question used to identify participants' ethnicities. Some caregivers indicated their children as being multiple ethnicities, and the question used did not restrict caregivers from selecting more than one ethnicity. Consequently, for the few children indicated as bi- or multiracial, only one ethnicity was entered into the dataset. However, regardless which ethnicity was entered into the dataset for analysis, the majority of the sample was consistently comprised of participants who were indicated as being Hispanic/Latino, with no other ethnic background listed. Thus, this did not significantly affect the use and relationship of the ethnicity variable, which was coded into Hispanic/Latino and non-Hispanic/Latino, with the two dependent variables. However, for future studies, the method of soliciting ethnicity data should incorporate more specific parameters to prevent ambiguity in reporting.

Another limitation in this study was the method of measuring participants' emotional eating. The Dutch Eating Behavior Questionnaire was utilized because it demonstrated appropriate psychometric properties and was based upon the same psychosomatic theory of obesity from which the hypotheses were designed. Further, there was available evidence of its utility in a child population (Van Strien, 2002). However, clinical experience with this measure indicates that it can still be difficult for children to independently understand, particularly because it is written in British English. A more recent version designed for children was added to this study to incorporate a wider age range of participants, and to increase item comprehension by younger children. There is evidence to demonstrate acceptable clinical utility of this new version (Van

Strien & Oosterveld, 2008). However, the Dutch Eating Behavior Questionnaire-Child version is also written in British English and is not yet published. During administration, several children continued to exhibit some difficulty in comprehending the questions, lending concern to the benefit of its addition to the protocol. The development of additional measures designed to appropriately and effectively measure the emotional eating construct in children would greatly benefit future research in this area, as well as any replication of this study.

A further significant limitation to this study was the inadvertent omission of the last page of the Demographics Information Questionnaire that included questions to gather data for some of the proposed covariates, such as those related to a familial health and eating environment. This is not a methodological flaw, but rather a research error. Because of the anonymous nature of the surveys, there was no way to collect the missing data once the oversight was realized.

Future Directions

This study endorses the need for continual investigation into the relationships among primary method of infant feeding, emotional eating, and weight, with explicit regard to the addressed methodological limitations to fully evaluate the benefits of breastfeeding on later childhood weight. Specifically, future studies would greatly benefit from the inclusion of qualitative data, such as the possible presence of infant feeding difficulties, and a priori parameters around feeding type on the Feeding Practices Questionnaire. This would also allow for a clearer comparison among groups of children who were breastfed, bottlefed, or a combination of both. Other methodological improvements would be to include measurements of family health and eating

environment factors, which would be able to serve as covariates in further analyses. Further, the construct of infant temperament appears to be a viable addition to this research in exploring early feeding relationships and how they may later affect a child's ability to regulate food intake, and consequently his or her weight. Including these methodological enhancements in longitudinal studies would also likely significantly enhance, and be appropriate next steps for, the growing body of knowledge of infant feeding and pediatric obesity.

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Demographics Information Questionnaire

Directions: Please answer the following items to the best of your knowledge.

- 1) How old is your child? _____ years old
- 2) What is your child's gender? _____ male _____ female
- 3) How tall (feet and inches) is your child?
_____ feet and _____ inches
- 4) How much (in pounds) does your child weigh?
_____ pounds
- 5) Were any of the following used during pregnancy: any type of drug, alcohol, or cigarettes?
_____ no
_____ yes
If yes, please
describe: _____
- 6) How much did your child weigh at birth and how long was your child at birth?
_____ pounds _____ ounces
_____ inches
- 7) How much did your child's biological mother weigh (in pounds) at your child's birth? How much (in pounds) does your child's biological mother weigh now?
_____ pounds at child's birth
_____ pounds now

8) How tall (in feet and inches) is your child's biological mother?

_____ feet and _____ inches

9) How old is your child's biological mother currently?

_____ years old

10) What is your child's ethnicity?

_____ Hispanic/Latino

_____ Caucasian

_____ African American

_____ Asian

_____ Other (please explain) _____

11) Has your child been diagnosed with any significant medical conditions (Type I diabetes, Prader-Willi Syndrome, chronic or terminal illness, etc.)?

_____ no

_____ yes

If yes, please indicate condition(s):

12) Does your family have a history of significant health conditions (diabetes, heart disease, stroke, high blood pressure, high cholesterol, cancer, etc.)?

_____ no

_____ yes

If yes, please indicate condition(s):

13) Has your child been diagnosed with depression or mood disorder by a mental health professional?

_____ no

_____ \$80,000-\$90,000

_____ \$90,000-\$100,000

_____ \$100,000-\$150,000

_____ \$150,000-\$200,000

_____ More than \$200,000

17) How many children live in your child's household (including your child)?

_____ children

18) How many hours per day does your child spend inactive, such as watching tv, doing homework, reading, playing computer/video games, etc.?

_____ hours per day

19) How many hours per week does your child participate in organized sports or activities?

_____ hours per week

_____ what

activity(ies): _____

20) How would you describe the eating habits of your child's primary caretaker?

_____ poor

_____ fair

_____ good

_____ excellent

Información Demográfica Cuestionario

Instrucciones: Por favor conteste las siguientes preguntas según su mejor conocimiento.

- 1) ¿Qué edad tiene su hijo(a)? _____ años
- 2) ¿Cuál es el sexo de su hijo(a)? _____ hombre _____ mujer
- 3) ¿Cuánto mide (pies y pulgadas) su hijo(a)?
_____ pies y _____ pulgadas
- 4) ¿Cuánto pesa (en libras) su hijo(a)?
_____ libras
- 5) ¿Consumió cualquier tipo de droga, alcohol o cigarrillos durante el embarazo?
_____ no
_____ sí
En caso afirmativo, describa:

- 6) ¿Cuánto midió y pesó su hijo(a) al nacer? _____ libras
_____ onzas _____ pulgadas
- 7) ¿Cuánto pesaba (en libras) la madre biológica de su hijo(a) en el momento del parto? ¿Cuánto pesa (en libras) la madre biológica de su hijo(a) ahora?
_____ libras en el momento del parto
_____ libras ahora
- 8) ¿Cuánto mide (en pies y pulgadas) la madre biológica de su hijo(a)?
_____ pies y _____ pulgadas

9) ¿Qué edad tiene la madre biológica de su hijo(a) actualmente?

_____ años

10) ¿Cuál es el origen étnico de su hijo(a)?

_____ Hispánico/Latino

_____ Blanco

_____ Afroamericano

_____ Asiático

_____ Otro (por favor explique) _____

11) ¿Ha sido su hijo(a) diagnosticado(a) con una enfermedad significativa (Diabetes tipo I, Síndrome de Prader-Willi, enfermedades crónicas o terminales, etc.)?

_____ no

_____ sí

En caso afirmativo, indique qué enfermedad(es):

12) ¿Tiene su familia antecedentes de problemas de salud significativos (diabetes, enfermedades cardíacas, apoplejía, hipertensión, colesterol alto, cáncer, etc.)?

_____ no

_____ sí

En caso afirmativo, indique qué

enfermedad(es): _____

13) ¿Ha sido su hijo(a) diagnosticado(a) con depresión o trastornos del estado de ánimo por un profesional de salud mental?

_____ no

_____ sí

En caso afirmativo, ¿hace cuánto tiempo fue diagnosticado(a)?

¿Está tomando algún medicamento actualmente?

14) ¿Cuál es el nivel de educación más alto de la persona que cuida a su hijo(a) la mayor parte del tiempo?

___ menor a un título de escuela superior

___ graduado de escuela superior o su equivalente

___ un poco de universidad

___ título universitario

___ más de un título universitario

15) ¿Cuál es la ocupación actual de la persona que cuida a su hijo(a)?

16) ¿Cuál es el ingreso anual de su familia?

___ Menos de \$20,000

___ \$20,000-\$30,000

___ \$30,000-40,000

___ \$40,000-\$50,000

___ \$50,000-\$60,000

___ \$60,000-\$70,000

___ \$70,000-\$80,000

___ \$80,000-\$90,000

_____ \$90,000-\$100,000

_____ \$100,000-\$150,000

_____ \$150,000-\$200,000

_____ Más de \$200,000

17) ¿Cuántos niños viven en el hogar de su hijo(a) (incluyendo su hijo(a))?

_____ niños

18) ¿Cuántas horas por día está su hijo(a) inactivo(a), como por ejemplo, mirando televisión, haciendo deberes, leyendo, jugando videojuegos, etc.?

_____ horas por día

19) ¿Cuántas horas a la semana participa su hijo(a) en deportes o actividades?

_____ horas por semana

_____ qué

actividad(es): _____

20) ¿Cómo describiría los hábitos alimentarios de la persona que cuida a su hijo(a)?

_____ malos

_____ pasables

_____ buenos

_____ excelentes

Feeding Practices Questionnaire

Directions: Please answer the following items to the best of your knowledge.

- 1) Was your child fed primarily by nursing (at the breast only, this DOES NOT include pumped breastmilk), by infant formula, or by exclusively pumped breastmilk?

_____ fed primarily by nursing (if selected, please answer **1A**)

_____ fed primarily by infant formula (if selected, please answer **1B**)

_____ fed primarily by exclusively pumped breastmilk (if selected, please answer **1C**)

_____ other:

1A: How many months was nursing the primary method of feeding? _____ months

1B: How many months was infant formula the primary method of feeding?
_____ months

1C: How many months was exclusively pumped breastmilk the primary method of feeding?
_____ months

- 2) At what age in months was your child fully weaned?

_____ months

- 3) What is your relationship to your child?

_____ Biological mother

___ Biological father

___ Sibling

___ Grandparent

___ Other: _____

Encuesta de Hábitos Alimentarios

Instrucciones: Por favor conteste las siguientes preguntas según su mejor conocimiento.

- 1) ¿Su hijo(a) fue principalmente alimentado(a) con leche materna (sólo en el pecho, esto NO incluye la leche materna extraída con un extractor), con fórmula infantil o exclusivamente con leche materna extraída con un extractor de leche?

_____ principalmente con leche materna (si es seleccionada, conteste **1A**)

_____ principalmente con fórmula infantil (si es seleccionada, conteste **1B**)

_____ principalmente con leche materna extraída solamente (si es seleccionada, conteste **1C**)

_____ otro:

1A: ¿Por cuántos meses fue la lactancia el método principal de alimentación? _____ meses

1B: ¿Por cuántos meses fue la fórmula infantil el método principal de alimentación? _____ meses

1C: ¿Por cuántos meses fue solamente la leche materna extraída con un extractor el método principal de alimentación?

_____ meses

- 2) ¿A qué edad en meses su hijo(a) dejó de tomar el pecho?

_____ meses

3) ¿Cuál es su relación con su hijo(a)?

___ Madre biológica

___ Padre biológico

___ Hermano(a)

___ Abuelo(a)

___ Otro: _____

Letter of Presentation

Hello, my name is _____, and I am a graduate student with Loma Linda University. If it is okay with you, I would like to invite you and your child to volunteer in a brief research study while you wait in the doctor's office today. If you give your permission, and if your child is ok with it, there are two very short questionnaires for you to complete, and one for your child to complete, which should only take about 10-15 minutes, beginning now, and when we are finished, there is a \$5 gift certificate for your family to thank you for your time. The purpose of this student research project is to learn how early childhood feeding behaviors relate to current childhood eating habits and physical status. Would you be interested in volunteering? You may stop participating at any time, and your child's medical treatment will not be affected by your participating or not participating in this study.

Carta de Presentación

Hola, mi nombre es _____, y soy un estudiante graduado de Loma Linda University. Con su aprobación, me gustaría invitarle a usted y a su niño(a) a ser voluntarios en un pequeño estudio de investigación mientras espera en el consultorio el día de hoy. Si usted lo autoriza y su niño(a) está de acuerdo, desearíamos que usted complete dos formularios cortos y su niño(a) complete otro, los cuales deberían llevar entre 10 y 15 minutos comenzando ahora. Cuando finalice, le daremos un certificado de regalo de \$5 en agradecimiento por su tiempo. El propósito de este proyecto de investigación de este estudiante es aprender cómo los hábitos de alimentación en la infancia se relacionan con el estado de salud y los hábitos de alimentación actuales. ¿Le interesaría participar de esta encuesta? Usted puede dejar de participar en cualquier momento y el tratamiento médico de su niño(a) no será interrumpido al participar de este estudio.

Informed Consent Disclosure

Loma Linda University

The Relationship of Infant Feeding and Self-Regulation in Pediatric Obesity

INFORMED CONSENT

Purpose and Procedure:

We would like to invite you and your child to participate in a research study about children's eating behaviors. The purpose of the study is to examine the effect of infant feeding on childhood physical status and eating behaviors.

If you decide to participate, you will be asked to complete two brief questionnaires about your child while your child completes one questionnaire about his or her eating behaviors. Participation in this study should take approximately 10-15 minutes of your time.

Risks:

Some of the questions are very personal and may be difficult to answer. You may skip any questions you find too difficult or uncomfortable answering.

Benefits:

While you will not benefit personally, the results of this study may help provide general knowledge about infant feeding and its impact on childhood physical status.

Participants' Rights:

Participation in this study is voluntary. Participating or not participating in this study will not affect your child's present or future medical treatment at Loma Linda University.

Confidentiality:

All results are strictly anonymous. All data is kept in a locked filing cabinet and can be accessed only by authorized research personnel. Any published document resulting from the study will not disclose your identity without your permission.

Additional Cost:

There is no cost to you for your child's participation in this study.

Reimbursement:

A gift certificate of \$5 will be offered to your family to say "Thank you" for your participation.

Impartial Third Party Contact:

If you wish to contact an impartial third party not associated with this study regarding any complaint you may have about the study, you may contact the Office of Patient Relations, Loma Linda University Medical Center, Loma Linda, CA 92354, (909) 559-4647, patientrelations@llu.edu for information and assistance.

Informed Consent:

I have read the contents of this consent form and have listened to the verbal explanation given by the investigator. My questions concerning the study have been answered to my satisfaction. I hereby give voluntary consent to participate in this study and my child to participate in this study. Signing this consent document does not waive my rights nor does it release the investigators, institution, or sponsors from their responsibilities. I may call Kiti Freier Randall, Ph.D. during routine office hours at 909-379-1507 should I have additional questions or concerns.

Consent Copy:

I have been given a copy of this consent form.

California Experimental Subject's Bill of Rights:

I have received a copy of the California Experimental Subject's Bill of Rights and have had these rights explained to me.

This protocol has been explained to my child at a level that he/she can comprehend and I give my consent for my child to participate in the study.

Name of Child

Signature of Parent/Guardian

Date

I have reviewed the contents of the California Experimental Subject's Bill of Rights and this consent form with the person signing above. I have explained potential risks and benefits of the study.

Signature of the Investigator

Phone Number

Date

Consentimiento Informado

Loma Linda University

La Relación de la Alimentación Infantil y la Autorregulación en Obesidad

CONSENTIMIENTO INFORMADO

Propósito y Procedimiento:

Nos gustaría invitarlos a usted y a su hijo(a) a participar de un estudio de investigación acerca de hábitos alimentarios en niños. El propósito de este estudio es examinar el efecto de la alimentación infantil en el estado físico y hábitos alimentarios de la niñez.

Si usted decide participar, se le pedirá que complete dos cuestionarios cortos acerca de su hijo(a) mientras su hijo(a) completa otro cuestionario acerca de sus hábitos alimentarios. La participación en este estudio llevará alrededor de 10 a 15 minutos.

Riesgos:

Algunas de las preguntas son muy personales y pueden ser difíciles de contestar. Usted puede saltarse cualquier pregunta que le parezca difícil o incómoda.

Beneficios:

Mientras que usted no se beneficiará personalmente, los resultados de este estudio pueden ayudar a suministrar un conocimiento general de la alimentación infantil y su impacto en el estado físico en la niñez.

Derechos del Participante:

La participación en este estudio es voluntaria. Participar o no en este estudio no afectará el tratamiento médico presente o futuro en Loma Linda University.

Confidencialidad:

Todos los resultados son estrictamente anónimos. Todos los datos se guardan en un gabinete bajo llave, al cual tiene acceso sólo el personal de

investigación autorizado. Cualquier documento publicado que resulte de este estudio no revelará su identidad sin su consentimiento.

Costo Adicional:

No existen costos adicionales para usted o su hijo(a) por la participación en este estudio.

Compensación:

Se ofrecerá un certificado de regalo de \$5 para su familia en forma de agradecimiento por su participación.

Contacto Imparcial de Terceros:

Si usted desea contactar a una tercera persona no asociada con este estudio acerca de cualquier queja que tenga de este estudio, puede contactar a la Oficina de Relaciones con Pacientes, Loma Linda University Medical Center, Loma Linda, CA 92354, (909) 559-4647, patientrelations@llu.edu para información y asistencia.

Consentimiento Informado:

He leído los contenidos de este formulario de consentimiento y he escuchado la explicación oral dada por el investigador. Mis preguntas acerca del estudio han sido respondidas a mi satisfacción. Por la presente, doy mi consentimiento voluntario de participación en este estudio y el de mi hijo(a). Al firmar este documento de consentimiento no renuncio a mis derechos ni libera a los investigadores, la institución o patrocinadores de sus responsabilidades. Puedo llamar a Kiti Freier Randall, Ph.D. durante las horas de oficina al 909-379-1507, por cualquier pregunta o inquietud adicional.

Copia de Consentimiento:

He recibido una copia de este formulario de consentimiento.

Declaración de Derechos del Sujeto en Investigación Experimental de California:

He recibido una copia de la Declaración de Derechos del Sujeto en Investigación Experimental de California y estos derechos me han sido explicados.

Este protocolo ha sido explicado a mi hijo(a) a un nivel que él o ella puede comprender y doy mi consentimiento para que mi hijo(a) participe en el estudio.

Nombre del Niño(a)

Firma del Padre, Madre o Guardián

Fecha

He repasado los contenidos de la Declaración de Derechos del Sujeto en Investigación Experimental de California y este formulario de consentimiento con la persona firmante. He explicado los riesgos potenciales y beneficios de este estudio.

Firma del Investigador

Teléfono

Fecha

Child Assent

You are invited to participate in this research study because you came to the doctor's office today. In this study we will ask you to answer some questions. The questions are about how you eat. We will also ask your parent some questions about you and your family. It should not take longer than 10-15 minutes to finish, and your family will be given a \$5 gift certificate.

You don't have to answer any questions that you don't want to and you can stop anytime you want. No one will get mad at if you want to finish early. It won't make any difference to your doctor if you do or don't want to be in the project. If you feel strange or bad about any of the questions that you answer, you can talk to the person who gave you this piece of paper or your parents.

Your name will not be on the question page. No one will be able to know who you are or what your answers are—not even your doctor, teacher, or parents. The person who gives you the question list can help you read or understand what the questions mean.

If you have any other questions, you can ask the person who gave you this piece of paper, your parents, or you can have your parents call Dr. Kiti Freier Randall at (909) 379-1507.

Child's Signature

Date

Investigator's Signature

Date