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Chronic Stress and Obesity in Children

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Chronic Stress and Obesity in Children

by

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Dedication

To my son, Neill, my mother, Joan Marie Brennan Ferran, and in loving memory of my father, Joseph Daniel Ferran

Acknowledgements

Through the years I have been fortunate to have many people supporting me. My family has been there to physically and mentally keep me moving in the direction of success. Good friends have been understanding about my deadlines and have provided good company and 'spirits' as often as possible.

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Nursing has been a wonderful journey for me, and I look forward to moving in new directions....many thanks to all of you!

Chronic Stress and Obesity in Children

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Childhood obesity has been prevalent for a number of years despite programs designed to educate children and families on healthy diets and activities. Multiple disciplines have reported chronic stress can interfere with normal neuroendocrine functions in the body which include energy balance. Research into alternate mechanisms contributing to childhood obesity is just beginning to include psychosocial factors' and their influence on biology. Healthy coping strategies can reduce the effects of stress and influence perceptions of what is stressful. Warm, secure relationships with parents, family connectedness, and a secure stable environment all contribute to the buffering of chronic stress as well as promote the ability to cope with stress. Through the years, changes in the family environment through divorce, single parenthood, and cohabitation may play a role in the child's ability to cope with stress. Therefore, the purpose of this study was to explore relationships between the child's perceptions of chronic stress,

coping strategies, family connectedness, family characteristics, and weight in 4th and 5th grade children.

This study used a cross sectional and correlational design. The conceptual framework guiding this study was the Bio-Psycho-Social Model for Health integrating the three dimensions (biological, psychological, and sociological) as they relate to obesity in children. Well established instruments were used to measure chronic stress, coping, family connectedness, and weight.

Results did not reveal a relationship between chronic stress and children's weights. The 'frequency the family sat down to eat dinner together' was significantly related to weight: the more dinners together the lower the body mass indices and accounted for 14.7% variance in children's body mass indices. Frequency of family meals was also correlated with the frequency of cooking dinner and negative trending of both 'frequency' and 'helpfulness' of coping strategies: possibly suggesting less need for the coping strategies. Parents' education was positively correlated with more sleep on school nights for children.

The findings suggest the importance of family time together is related to lower body mass indices in children.

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Chapter 1

Introduction

Childhood obesity has become endemic in the United States over the last three decades and the incidence continues to rise [Centers for Disease Control (CDC), 2007; United States Department of Health and Human Services (USDHHS), 2007]. The National Health and Nutrition Examination Survey database demonstrated this trend across three age groups and three time frames: 1976-80, 1988-94, and 2003-06 (See Figure 1). The NHANES surveys reveal that for children aged 2-5 years overweight prevalence increased from 5% to 13.9%, in 6-11 year olds it increased 4.2% to 18.8%, and in 12-19 year olds overweight prevalence increased from 4.6% to 17.4% in the United States. Obesity is becoming a global epidemic (Kime, 2008). Studies in the United Kingdom estimated that childhood obesity prevalence would rise to 20% in 2010, thereby imposing a heavy tax burden on their healthcare system. The consequences of unremitting overweight and obese status in children are evidenced by poor health outcomes such as hypertension, abnormal blood lipid levels, visceral adiposity, asthma, obstructive sleep apnea, gastroesophageal reflux, insulin resistance, and diabetes (Charmandari, Kino, Souvatzoglou, & Chrousos, 2003; Dietz, 1998; Nelson, 2005; Roth, Qiang, Marban, Redelt, & Lowell, 2004).

In 2003 the National Conference of State Legislatures (2006; 2008) reported annual obesity associated medical costs to be approximately $75 billion. In the United States obesity related healthcare costs are predicted to be 3.8% of the gross national product by 2014 (Kime, 2008). Current obesity treatment and prevention programs for children concentrate education efforts on improving physical activity and nutrition despite

Figure 1

Childhood Overweight Prevalence (percentages reported)

NHANES

AGE	1963-70	1971-74	1976-80	1988-94	1999-2000	2001-02	2003-04
2-5 years	--	5	5	7.2	10.3	10.6	13.9
6-11 years	4.2	4	6.5	11.3	15.1	16.3	18.8
12-19 years	4.6	6.1	5	10.5	14.8	16.7	17.4

Source: National Health and Nutrition Examination Survey (NHANES), Centers for Disease Control's National Center for Health Statistics, www.cdc.gov/childhood overweight prevalence, 2007.

multidisciplinary studies providing evidence of a relationship between stress, the hypothalamic pituitary adrenal axis (HPA) and cortisol, and weight gain (Dimitriou, Maser-Gluth, & Remer, 2003; Greeno & Wing, 1994; Lustig, 2001; McEwen, 2003a, 2007). Stress interference on hormones and chemical signals, involved in energy balance [i.e. neuropeptide Y (NPY), leptin, ghrelin, insulin, and cortisol], were observed in animal model studies (Charmandari et al., 2003; Kuo, Kitlinska, Tilan, Li, & Baker, 2007). Cortisol, a key glucocorticoid, is released diurnally according to the human body's circadian rhythm. Chronic stress interferes with diurnal cortisol levels thereby changing the physiological energy needs of the body (Nelson, 2005). Excess cortisol is secreted by the adrenal cortex during HPA activation when stress is prolonged or repetitive, disrupting basal metabolic processes and promoting storage of calories for future energy needs (Nelson, 2005). Dysregulated neuroendocrine pathways have been associated with pathologic health conditions in humans (Charmandari et al., 2003) such as obesity, diabetes, and metabolic X syndrome.

Chronic stress in children is defined as both 'what' is stressful to the child and 'why' it is stressful. According to Lazarus and Folkman (1987), children's emotional processing of stress drives their ability to cope. The ability to cope depends upon what the child has learned about their immediate environment and whether they are capable of having control/ mastery over their stress, can influence the problem (problem-focused coping) or can summon strategies to protect self and regulate the associated emotional distress (emotion- focused coping) (Lazarus & Folkman, 1987). The quality of the family and home environment affects the child's health, emotional development, and coping responses and manifests in internalizing and externalizing behaviors exhibited by children (Appleyard, Egeland, van Dulmen, & Sroufe, 2005). Repetti, Taylor, and Seeman (2002)

reported risky family environments as those lacking in warm, nurturing parenting, being deficient in emotional support and nurturing, or keeping chaotic schedules and lack of consistent boundaries which impedes the child's ability to regulate emotions, develop coping strategies, and attain mastery with developmental skills. Chaotic and unsupportive home environments affect the child by promoting a more stressful environment requiring continuous adaptation, and by limiting the development of coping skills in the children.

In 2007, Brobeck, Marklund, Haraldsson, and Berntsson conducted a qualitative study to determine how a sample of 29 fifth graders defined *stress*. Three common themes were identified: (a) fear of being late, (b) not having sufficient time/ doing too many things, and (c) vicariously experiencing the stress of a significant other. Their study supported the theory that "everyday problems" (p. 8) or daily hassles had the greatest impact on the fifth graders' physical and mental health and were associated with stress-related somatic complaints such as headaches, stomachaches, feeling sad, nervousness, and anger (Brobeck et al., 2007; Lazarus & Folkman, 1987).

Significant changes in family structure and stability have occurred over several decades (Cooper, McLanahan, Meadows, & Brook-Gunn, 2009). While the divorce rate is declining so is the rate of marriage (Jayson, 2005). Current home environments of children may include single parent homes, a parent cohabitating with a new partner, stepfamilies, and living with unmarried parents with the inherent risk for family instability (Compas, 1987; Dunn, 2002; Jayson, 2005; Popenoe & Whitehead, 2007; Ruggles, 2006). Such family diversity may contribute to problems regarding children's development and well being. Repetti et al., (2002) reported the importance of family environments for children learning how to appraise and respond to stress. Family cohesion (defined as an awareness, involvement, and knowledge of each other) and communication are building

blocks for family connectedness needed for the development of children's healthy emotional regulation and coping (Franko, Thompson, Bauserman, Affenito, & Striegel-Moore, 2008). Kime (2008) cites the World Health Organization's (WHO) definition of health as being "created in the relationship between the individual and their environment" (p. 316).

To date, the field of childhood obesity research has not emphasized psychological and sociological factors as important dimensions related to behaviors associated with weight gain in children. The family and home environment is foundational to the child's emotional development. Research on childhood obesity requires an exploration of factors that can influence the child's psychological and emotional health with the potential to advance knowledge regarding the obesity phenomenon (Allan, 1998; Engel, 1980; Rice, 2000).

Purpose

The purpose of this cross- sectional, correlational study was to explore the relationships between children's perceptions of chronic stress, children's coping, and family connectedness on weight in fourth and fifth grade children.

Background and Significance

Historical Overview of Childhood Obesity

Obesity research in children emerged in the mid-20th century as adult diseases were found to have roots in childhood. Autopsies performed on soldiers who died in the Korean War, mean age of 22, showed that 77% had some degree of atherosclerosis (15% had 50% narrowing of at least one coronary artery) according to Garson, Bricker, and McNamara (1990). As a result, cardiovascular disease was determined to begin in

childhood. The National Institutes of Health funded a three year prospective study, *Child and Adolescent Trial for Cardiovascular Health* (CATCH) to address health promotion behaviors, via education on nutrition and physical activity, to reduce future cardiovascular disease. Being overweight was found to be a risk factor for cardiovascular disease in adults (Dietz, 1998; Garson et al., 1990), so the CATCH study also addressed the increasing body weight in children. The foundational assumptions of this study were high fat and high caloric diets drove overweight status and abnormal lipid and cholesterol levels. CATCH results showed success of the school based program with regards to a decrease in caloric intake (*intervention group 38.7% to 31.9%* vs. control group 38.9% to 36.2%, $p < .001$), fat intake (*intervention group 32.7% to 30.3%* vs. 32.6% to 32.2% control group, $p < .001$), and intense physical activity (*intervention group 58.6* minutes vs. 46.5 minutes in control group, $p < .003$) (see Nader, Stone, Lytle, Perry, & Stavroula, 1999). However, no significant differences between groups were found regarding anthropomorphic measures such as body mass index (BMI), skin fold thickness, blood pressure, or cholesterol levels (Luepker, Perry, McKinlay, Nader, & Parcel, 1996; Nader et al., 1999). Three years later, a follow up study for maintenance behaviors noted the intervention groups remained significantly lower on energy intake from fat and had more daily vigorous activity than control groups, but did not significantly differ on BMI, blood pressure, and related measures (Nader et al., 1999). While the CATCH studies did not find the desired reduction in several important indicators, it did highlight the utility of the school environment as a safe and secure forum for health promotion and also drew attention to the poor nutritional offerings available in the schools.

Subsequently, the United States Department of Agriculture (USDA) implemented the School Meal Initiative to focus on healthy and balanced school meals and required

school meals to adhere to the standard daily percentage requirements for calories from total fats, saturated fats, protein, and carbohydrates (Hoelscher, Mitchell, Dwyer, Elder, & Clesi, 2003). The National Conference for State Legislatures (2006; 2008), in some states, mandated the adoption of nutrition and physical activity education programs in school districts to address childhood obesity rates as well as the removal of soda and candy machines from school campuses (Ortolon, 2003).

The Healthy People Initiative, created in 1979 by the USDHHS as a public service program to empower citizens in support of achieving better health outcomes in their communities, had a 2010 goal to drastically reduce obesity rates in children (www.healthypeople.gov). Despite programs and interventions designed around energy consumption and energy expenditure the prevalence of obesity in children remains static. Current overweight rates for children aged 10 – 11 years are 18.8% today and has increased from 11.3% 20 years ago and 6.5% 30 years ago (See Figure 2).

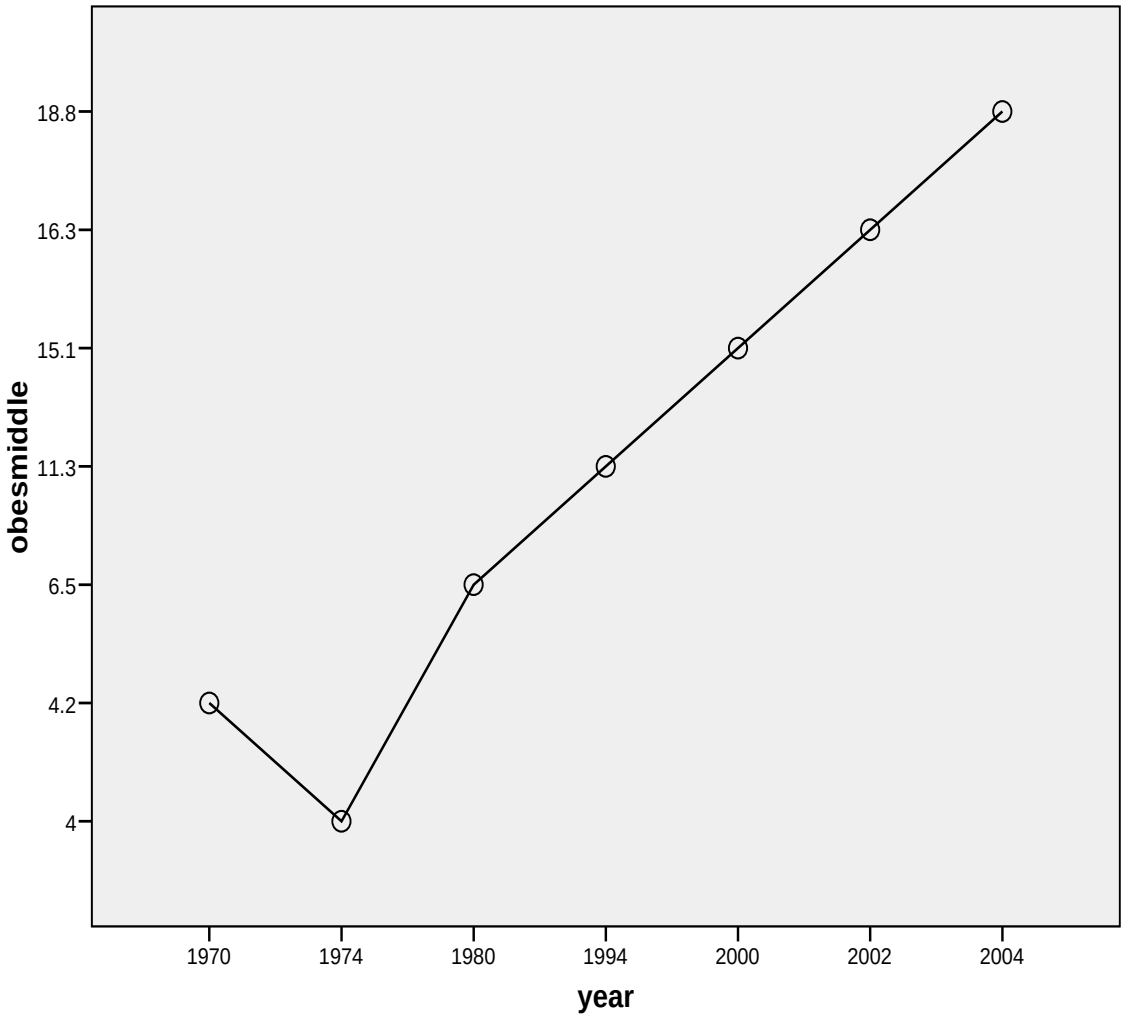
To date, childhood obesity research programs and related interventions have focused on one area of the biological dimension of obesity: the balance between energy (calories) intake and energy expenditure. However obesity research in animals provides evidence that chronic stress influences preference for energy dense foods and potentiates the actions of cortisol and HPA reactivity in states of repetitive stress (McEwen, 1998). Future childhood obesity research has empirical support for exploring psychological and sociological dimensions that interact with the biological dimension of the child.

Neuroendocrine System and Stress

The nervous system and the endocrine system are linked by signaling and feedback pathways that monitor and regulate the body's physiological processes to maintain a balanced state. This balanced state, known as *allostasis*, is the dynamic process of

Figure 2

NHANES data: Percentage of Overweight in 6-11 year olds by year



Source: National Health and Nutrition Examination Survey (NHANES), Centers for Disease Control's National Center for Health Statistics, www.cdc.gov/childhood overweight prevalence, 2007.

maintaining stability and homeostasis and allows the body to adapt to internal or external states or novel stimuli (McEwen, 2000). Stress occurs when a threat to self is perceived that requires energy resources for coping (Lazarus & Folkman, 1987). According to McEwen (1998) novel or threatening stimuli resulting in *stress* are categorized as: 'acute' stress (e.g. major life events, abuse, trauma), or 'chronic' stress (e.g. cumulative load of minor, day to day problems or irritations). When the experience of stress is chronic, either repeated or prolonged, *allostatic load* can occur. Allostatic load results when the stress response is activated chronically, resulting in 'wear and tear' on the body and exhausting available resources, and thus setting the foundation for pathological health states (McEwen, 1998; 2000).

Perceived Coping

Children's perceptions of chronic stress relate to the perceived threat accompanying it and their ability to cope with it. Coping strategies are adaptive mechanisms to maintain allostasis and regulate the self during the stress or novel stimuli. Self regulation is learned from early interactions with parents and is described as a reciprocal transactional sharing of nonverbal cues and emotional exchanges setting the foundation for future relationships and new experiences (Schore, 2003a). These early relationships advance the development of the emotional right brain, which includes the limbic system (amygdala and hippocampus), storing memories of past events and interactions to support future responses. Mechanisms for coping, *coping strategies*, develop early and are reinforced by observing the actions of others. Coping strategies can be categorized as *problem-focused*, in which the stressor is acted upon directly, or *emotion-focused*, where the person works to adapt and regulate emotions associated with the stress. Emotion focused avoidant behaviors (i.e., isolating self, watching television, distracting the self, changing the topic,

wishful thinking, and use of food/ alcohol/ substances) are coping strategies correlated with poor metabolic control in diabetic children (Cooper, Shaver, & Collins, 1998; Ryan-Wenger, Sharrer, & Wynd, 2000). These coping strategies may result in sedentary activities meant to reduce sensory over stimulation and soothe emotional distress (Rice, 2000).

Chronic Stress and Weight Gain

Lustig (2001) found that genetics alone cannot be responsible for the current childhood obesity trend for the "genetic pool moves a lot slower than that" (p. 909). Chronic stress impacts energy balance through stimulatory effects on feeding behavior such as energy dense food craving during chronic stress and promotion of energy stores (Lustig, 2001). Cortisol, a glucocorticoid, is released when HPA activation occurs and increases blood glucose secondary to its role to regulate and mobilize glucose for energy (de Kloet, 2008). In return, insulin levels increase to facilitate the efficient use of glucose by the cells yet chronically elevated blood glucose provokes the risk for insulin resistance, adiposity, diabetes, and abnormal lipid levels (Sharma & McNeill, 2006; Smart, Tolle, & Low, 2006; Soros, Zadik, & Chalew, 2008). Energy dense food (i.e. comfort food) craving during chronic stress (Dallman, Pecoraro, Akana, laFleur, & Gomes, 2003; Torres & Nowson, 2007) exemplifies behavior that is driven by the hormonal signals related to HPA activation and may be associated with insulin resistance. Unhealthy coping strategies contribute to the energy imbalance already occurring during states of chronic stress. These unhealthy coping behaviors include avoidant and solitary activities such as computer or television viewing, being by oneself, not seeking social support, and use of food, chemical substances, and alcohol to make the self feel better and initiate pleasure reward centers of the brain (Rice, 2000; Ryan-Wenger, Sharrer, & Wynd, 2000). Chronic stressors, described

as daily hassles or irritants, include financial problems, living in small or crowded homes, living in noisy environments, and inconsistent family routines (Compas, 1987; Evans, Kim, Ting, Tesher, & Shannis, 2007; Garbarino, Kostelny, & Dubrow, 1991; Lazarus & Folkman, 1987; Repetti et al., 2002; Strauss & Knight, 1999).

Changes in the Child's Environment

A downward trend in two parent homes has been taking place as childhood obesity has become more prevalent (Alwin, Converse, & Martin, 1985; Popenoe, 2007; Ruggles, 2006). Changes in the family have been implicated in the increased need for psychological counseling (depression and anxiety) in college freshmen over the last several decades (Twenge, 2000). Increases in marital dissolution, diversity of family units (e.g. single-parent, two-parent, step-parent), out of wedlock births, and cohabitation in parents with dependent children influences the emotional development in children, according to Popenoe (2007). He reports divorce rates have gradually decreased from a peak in the 1960's to the early 1980's, but this phenomenon is offset by a decreasing marriage rate (7.65% in 1970 to 4% in 2005) and the concomitant increasing cohabitation among adults (Jayson, 2005). In 2006, Ruggles reviewed trends in family composition data from 1850's to 1990 and found that families have become smaller, most elderly live alone, more than half of marriages end in divorce, and 33% of babies are born to unwed mothers (p. 1-655) resulting in the decline of multigenerational families and an increase in the presence of single family homes.

Data on families is important when appreciating the influence parents and the home environment has on the optimal development of a child's emotional processing and ability to cope with stress. A nurturing environment has been shown to physiologically support

the child through a stressful encounter either by reducing the perceived threat or using learned coping strategies. In contrast, risky and chaotic home environments interfere with the child's ability to cope (Repetti et al., 2002). Cooper, Shaver, and Collins (1998) describe the maternal child relationship as a working model for future relationships and found securely attached adolescent girls coped more effectively with negative emotions than insecurely attached girls. Cohen (2004) highlights the importance of social integration in the perception of a threat and an individual's emotional regulation involved in managing or responding to the threat. The child's family and environment are their earliest social relationships and foreshadows their future relations with others.

Children in single parent homes or with divorced parents may experience inconsistent family routines, meal times, supervision, and food consumption unrelated to hunger (Franko, Thompson, Bauserman, Affenito & Striegel-Moore, 2008; Kime, 2008; Vidovic et al., 2005; Yannakoulia et al., 2008). The diversity in family structures – single parent homes, cohabitation with parents' significant others, and weekly variations in who lives in the home – effects the quality of the parent child relationship and contribute to the quality of the home environment (Dunn, 2002). Dunn described more positive relations between biologically related individuals in step-families and emphasized the importance of consistent and nurturing parenting to offset adjustment with new living conditions and to promote family cohesion. Kime discussed the importance of the family setting on eating behaviors in children, suggesting changes in the family structure have eroded traditions associated with the family coming together to share evening meals (2008). Exploring the family and home environment of children with regards to perceptions of chronic stress, coping strategies, and weight will contribute to knowledge regarding the phenomenon of childhood obesity.

Statement of Problem

Current treatment and prevention programs addressing childhood obesity have not reduced the incidence or prevalence of obesity. While promotion of healthy eating and increased activity are important to a healthy lifestyle, recent empirical studies have demonstrated the influence of chronic stress on the neuroendocrine pathways driving metabolism, satiety, and food cravings (Bose, Olivan, & Laferrere, 2009; Charmandari et al., 2003; Dallman et al., 2003; Nguyen-Rodriguez, Chou, Unger, & Spruitt-Metz, 2008) and the importance of healthy and adaptive coping strategies to self regulate one's emotionally driven behavior. The Biopsychosocial (BPS) model provides a holistic approach to childhood obesity research by focusing on the relationships between biological, psychological, and sociological phenomena. This model guided the exploration of relationships between children's perceptions of stress, children's report of coping strategies, family connectedness, and weight in school-age children. Evidence of interrelationships between biopsychosocial phenomena will direct future development of both obesity intervention and prevention strategies for children.

Research Questions

This study addressed the following research questions:

1) Are there relationships between perceived chronic stress, coping strategies, family connectedness, and weight in fourth and fifth graders?

2) To what extent do chronic stress, coping strategies, family connectedness, meals eaten together, and children's school night sleep add to the variance in children's weight?

3) Are there significant relationships between: parent's marital status, number of people in the home, parent's educational level, parent's weight, child's sleep on school

nights, breakfast eaten at home, number of times family cooks dinner per week, and number of times family eats dinner together per week, family connectedness, and weight in fourth and fifth graders?

Conceptual Framework

Theoretical Approach to Obesity

Despite research supporting the relationship chronic stress has on weight gain, the central tenets of current obesity treatment and prevention programs rely on a causal model or *reductionist* medical model. The reductionist model reduces symptoms to disturbances in measurable somatic processes (Engel, 1977). As a result, obesity interventions have focused almost exclusively on biological factors including nutrition and physical activity to balance the energy needs of the body. This reductionist model emphasized the measurable parameters of body height and weight in children for standardizing the calculation of body mass index (BMI) and plotting on an age and gender specific graph created in 1980 by the Centers for Disease Control (CDC, 2005). Popkess-Vawter, Wendel, Schmoll, and O'Connell (1998) discussed the profound failure of traditional weight control programs partly due to their unidimensional approach through calorie reduction to reduce weight, and discussed the lack of an organizational framework that incorporates the multiple factors that contribute to obesity in order to design an effective intervention. Therefore, this study uses the Biopsychosocial (BPS) model of health (Engel, 1977) to explore psychological and sociological dimensions as it relates to weight in children and may promote the creation of a framework on the biological, psychological, and sociological factors contributing to childhood obesity.

Biopsychosocial (BPS) Conceptual Model

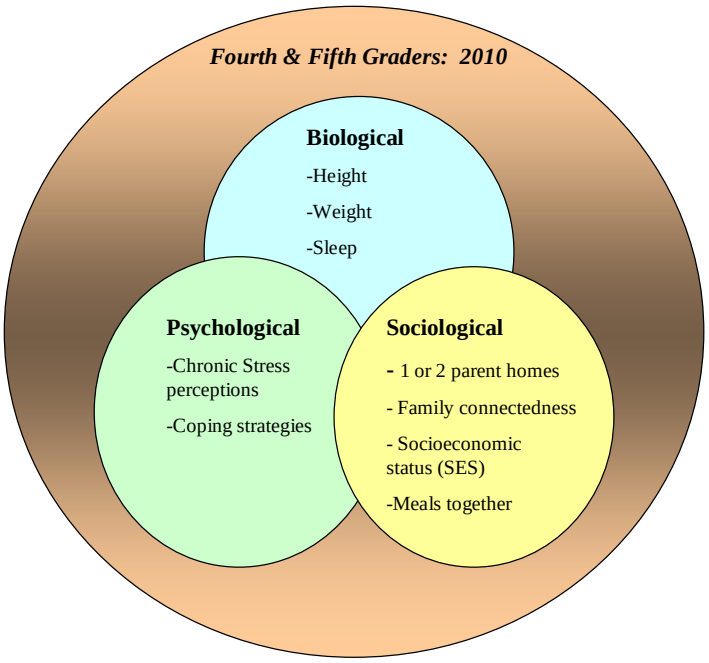
The BPS model provides a novel, holistic approach to childhood obesity consistent with the paradigm of nursing and its focus on *the person, the environment, health, and nursing* (Walker & Avant, 2005). Within the context of childhood development, the biological, psychological, and sociological dimensions iteratively interact molding the child and his/her ability to perceive stress, process emotions related to the stress, and the evolution of coping strategies to reduce distress. Some coping strategies can drive behaviors associated with weight gain. The importance of the home environment on the ability of the child to process emotions and respond to chronic stress will be explored in the context of childhood obesity (See Figure 3).

Biological Dimension

The biological dimension acknowledges the role genetics and individual physiological processes (preservation of allostasis) play in childhood obesity. The influence of chronic stress on the body's *circadian rhythm* and neuroendocrine activity of the body, responsible for energy balance, is not addressed in most programs concerned with children's weight. Chronic stress at critical times during childhood development can bring about brain plasticity, changes to brain development and signaling pathways related to new experiences, which can affect the individual's emotional reactivity and ability to cope with stress (McEwen, 2007; Miller, Chen, & Cole, 2009; Repetti et al., 2002). Living with chronic stress disrupts the neuroendocrine systems of the body and interferes with reproduction, metabolism, immunity, growth, and sleep (Charmandari et al., 2003). In this study heights and weights will be attained to measure BMI and hours of sleep on school nights will be examined.

Figure 3

BPS Conceptual Model of Childhood Obesity



Children and adolescents need approximately 10-11 hours of sleep per night but in reality average 9- 9 ½ hours according to a study in 8-11 year olds (Ievers-Landis, Storfer-Isser, Rosen, Johnson, & Redline, 2008). Ievers-Landis et al. reported a slow decrease in children's hours of sleep over the last thirty years. Using this information as a catalyst, a correlational study was conducted showing an inverse relationship between hours of night-time sleep and weight in 9-10 year old children with more sleep significantly related to healthier weights (Ievers-Landis et al., 2008). Sleep plays a role in circadian rhythm and maintenance of the neuroendocrine system's release of hormones (leptin, ghrelin, and thyroid stimulating hormone), essential to reduce hunger, maintain blood glucose levels, and balances energy storage with energy expenditure (Charmandari et al, 2003; Keith, Redden, Katzmarzky, Boggiano, & Hanlon, 2006). Reduced sleep in children, presence of chronic stress, lack of daily routines, and variable eating patterns can dysregulate the HPA axis and interfere with healthy neuroendocrine functions (Bose, Olivan, & Laferrere, 2009; Landis, Parker, & Dunbar, 2009; Repetti et al., 2002).

Psychological Dimension

Psychological dimensions can include individual differences, temperament/ personality, and one's *affect* or mood (Schore, 2003a). But these components emerge *and remain* due to the iterative relationship between the biological and sociological dimensions. The evolution of *perceptions of stress* and ability to protect the self through *coping* mediates the resultant psychological health in the individual.

The individual's ability to perceive, appraise, and cope with stress is described by Lazarus and Folkman's transactional stress theory (1987). Stress occurs as an interaction between the person and their environment contingent upon the value system of the individual. The value system includes one's cultural belief systems, morals, and ethics

which shape appraisals of 'what is stressful' to them as well as influence coping strategies. Primary appraisal relies on the personal stake one has in the encounter, determined to be either harmful or beneficial, and progresses to *problem focused coping* where the transaction is changeable or *emotion focused coping* that requires acceptance and management of one's emotions (Lazarus & Folkman, 1987). The children's ability to cope is essential to avoid allostatic load, when presented with chronic and prolonged stress, and thus maintain stable neuroendocrine regulation.

The chronic upset associated with daily hassles (minor irritations influencing activities of daily living) has been reported to cause more stress than do acute but infrequent major events according to Compas (1987). Some chronic stressors, reported by children, include observing parental discord, not spending enough time with parents, having nothing to do, pressure for good grades, lacking enough time for tasks, and feeling sick (Appleyard et al., 2005; Brobeck et al., 2007; Lewis, Siegel, & Lewis, 1984).

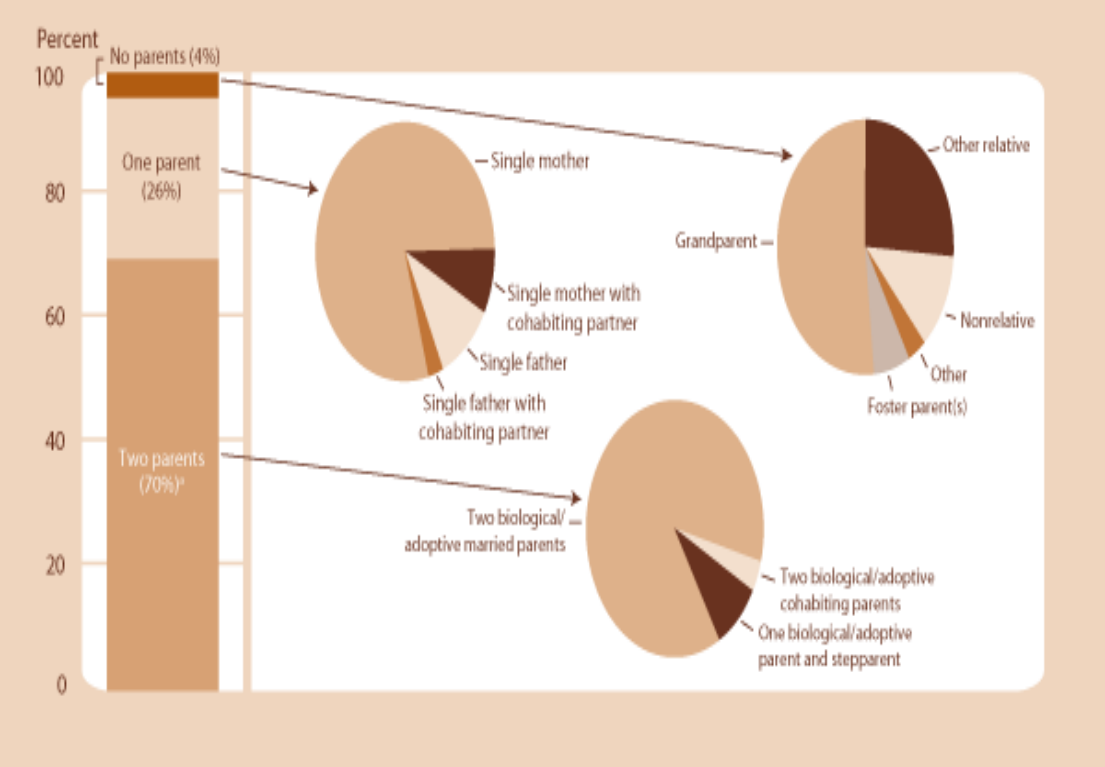
Sociological Dimension

The family represents the earliest social relationship a child experiences. Having emotionally available parents buffer the experience of stress for children (Evans et al., 2007; Gunnar & Quevedo, 2007; Kochanska, Philibert, & Barry, 2009) both by reducing exposure to stress, providing assistance with stress, and facilitation of epigenetic changes. Cooper et al. (1998) indicated that family structure and dynamics can affect attachment and interfere with the development of emotional processing in the child and both are needed to organize emotions and regulate feelings of security. *Family connectedness* can reduce the perception and experience of stress for children and aid the development of coping strategies, yet family connectedness is threatened as the structure of the family has changed through the decades (Jayson, 2005). Popenoe (2007) described the weakening of the

marital union resulting in more single parent homes and children living apart from a parent(s). Ruggles (2006) reported that 25% of children were living with a single parent in 1990. Dunn (2002) reports that in the United Kingdom, more than 12% of children less than 16 years of age live or will live in a blended family in which one of their parents have remarried. Stressors for children of divorce are transitions that result and include the process of separation, learning to alternate between households, relocation of home and /or schools, decreased quality of parenting, interparental conflict, change in socioeconomic status (SES), and remarriage of a parent (Dunn, 2002; Ruschena, Prior, Sanson, & Smart, 2005). Yannakoulia et al. (2008) reported divorced families typically experience periods of single parenting, change in SES, more permissive parenting, not having meals together as a family, and diminished parent wellbeing, all of which are reported as moderators affecting higher BMI status in children from divorced homes (see Figure 4).

With these changes in the family, customs and traditions regarding meals have also changed. Kime (2008) reports that sitting down to a meal as a family was part of an established pattern in years gone by and less important or valued in the present day. Sociological dimension of the BPS model of obesity ranges from the effects of the environment on gene expression, secure early relationships that create an individual's emotional template, the protective nature of family connectedness against the perception of stress, to the daily routines within the family that support a healthy lifestyle. Family connectedness (FC), marital status of families, SES, and family meals eaten together were explored to identify their relationships to weight in children.

Figure 4
Percentage of children ages 0–17 living in various family arrangements



SOURCE: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplement, 2009.

Definitions

The following definitions clarify the major concepts of this study:

Childhood is generally used to define the ages of 2-18 years across research articles and government databanks. In this study '*children'* refers to fourth and fifth graders, typically 9-11 years of age.

Stress is defined as an interaction between an individual and their environment, exerting a demand on the individual, challenging their ability and resources for coping (Gunnar & Quevedo, 2007).

Chronic stress is defined as frequent or prolonged challenges requiring extended resources for *allostasis*, the dynamic process of maintaining the body's homeostasis, and reported as more burdensome that acute stress. Chronic stress includes daily hassles that are recurrent in nature such as: being late to school, concern for good grades, and not spending time with parents to name a few (Brobeck et al., 2007; Compas, 1987; Lewis et al., 1984).

Coping is a dynamic adaptive process initiated to maintain allostasis when the body experiences stress (Volling, McElwain, Notaro, & Herrera, 2002). Habituated strategies for coping can be healthy or harmful (seeking social support or asking questions versus isolating self or use of distraction). The BPS model is concerned with the number of coping strategies reported as well as the frequency and helpfulness of these strategies influencing behaviors (Lazarus & Folkman, 1987; Repetti, 2002).

Family connectedness is the product of an attached relationship between the child and parents that promotes a cohesive, safe, and nurturing environment. This environment fosters the ability for the child to share thoughts and experiences with their parents. A cohesive family environment buffers the child from chronic stress by either reducing their

exposure to it or by influencing their perception and ability to cope with the stress (Bowlby, 1982; Elliott & Reis, 2003; Franko et al., 2008).

Obesity is determined by a body mass index (BMI) greater than the 95th percentile for a child's age and gender (CDC, 2007).

Operational Definition

Chronic stress will be operationally defined as a score on the Feel Bad Scale (FBS) which scores the *frequency* of 20 items, reported to be stressful to children, and the *intensity* of these items. Total scores can be attained by multiplying the frequency rating by the intensity rating for each child.

Coping will be operationally defined as scores on the Schoolagers' Coping Strategies Inventory (SCSI). The SCSI has two subscales: a frequency subscale and an effectiveness subscale (Ryan-Wenger, 2004). A score for the frequency of coping strategies can be attained by summing responses and a helpfulness score can be attained by summing responses for how effective the coping mechanisms were for the child. Also, a count of the number of coping mechanisms a child has is another score that can be attained.

Family connectedness will be operationalized as children's responses to the 7 item family connectedness tool. The children rate the communication and cohesion they feel with regards to their family. The answers will be summed for a single total score.

Obesity will be operationally defined as a body mass index (BMI) of $\geq$ 95% for age and gender versus overweight (BMI $\geq$ 85th to < 95th percentile). BMI is calculated using by: weight in pounds/ height in inches/ height in inches x 703 which is then plotted on a gender specific growth chart. Once plotted, this will determine an individual's percentile ranking (www.cdc.gov/growthcharts). BMI will be calculated utilizing the Children's

Hospital of Philadelphia's online BMI and Z Score Calculations in Children program once height, weight, and date of birth are attained (http://stokes.chop.edu/web/zscore/).

Assumptions

The following assumptions were identified for this study:

1) Children experience multiple stressors in their everyday lives.
2) Children are able to evaluate their own stress experience.
3) The proposed instruments are valid measures of the proposed variables as experienced by children.
4) The children and parents will answer the questionnaires honestly.

Strengths

1) This will be one of the first studies to focus on chronic stress as a moderator of obesity in children and exploring family environment and connectedness as potential mediators of obesity in children.
2) Relationships between chronic stress, coping strategies, and family connectedness and weight will add to the knowledge base of childhood obesity.

Limitations

1) A cross sectional convenience sample may not be representative of all Austin area fourth and fifth grade children, but this information will be meaningful to the population under study, and may set a precedent for future research.
2) Only English speaking/ literate participants will be included in this study to reduce variance/ error due to the translation of concepts in this exploratory study.
3) Concepts are measured with self-report instruments. The responses will be limited to what the subjects are willing to report with the potential for social

desirability response set bias (tendency to give an answer that is consistent with social values or what the subject thinks the researcher would like).

4) Sampling is limited to one geographic area of central Texas and a sample of convenience.

5) Internal validity of this study may be threatened by external circumstances. This limitation is minimized by having data collected at one point in time with the child.

Summary

Current treatment for childhood obesity has not reduced its prevalence. Multiple disciplines report the role chronic stress has on an individual's neuroendocrine system and energy balance. Secure and nurturing relationships with parents aid children in learning how to process emotions, cope, and self regulate when exposed to stress. Unhealthy coping strategies can develop and drive behaviors related to obesity. Family connectedness has been found to buffer and moderate the experience of stress to the child, even when the caregiver is not physically present. This study will look beyond eating and activity behaviors in order to explore children's reports of chronic stress, the children's coping strategies, family connectedness, and weight in a group of fourth and fifth grade students in Central Texas.

Chapter 2

Literature Review

The high prevalence of obesity in children continues despite weight loss and prevention programs that primarily focus on calorie restriction and increasing activity levels to correct an imbalance between calorie intake and calorie expenditure. The increasing prevalence of obesity has been considered to be a result of the availability of a preponderance of fast food restaurants and unrestricted use of technological devices such as computers, cellular phones, television, and electronic games (Davis, Gance-Cleveland, Hassink, Johnson, & Paradis, 2007; Roth et al., 2004). As obesity in children tends to continue into adulthood and is associated with mounting health care costs, efforts to discern etiological factors of obesity are crucial (Dietz, 1998).

The literature supports exploring relationships between chronic stress, effective coping, and weight (Dimitriou et al., 2003; Gunstad, Paul, Spitznagel, Cohen, & Williams, 2006). Chronically elevated cortisol promotes abdominal adiposity and is associated with obesity, diabetes, hypertension, insulin resistance, and hyperlipidemia- a cluster of conditions known as 'metabolic X syndrome' (Brobeck et al., 2007; Charmandari et al., 2003; Romeo & McEwen, 2006; Smart, Tolle, & Low, 2006).

Components in the process of the chronic stress response include *elevated cortisol*, affecting blood glucose, insulin, leptin, and ghrelin levels involved in satiety signaling, *glucocorticoid receptors*, needed to bind cortisol and terminate the HPA axis response, and the evolution of *coping strategies* to mediate the stress response (Lustig, 2001; Nelson, 2005). Early nurturing behaviors of the parent towards their child, influence the evolution of coping abilities and demethylate glucocorticoid receptors so they are available to bind with circulating cortisol (Evans et al., 2007; Gunnar & Quevedo, 2007; Van den Bergh,

Calster, Smits, Van Huffel, & Lagae, 2008). The influence of the environment, during critical periods of childhood development, was considered a risk factor for depression and obesity in young adults according to Hasler, Gergen, Ajdacic, Gamma, and Eich (2004) as it supported the 'gene by environment' (G x E) phenomenon suggesting the environment influences how genes are expressed. A G x E interaction that resulted in a dysregulated stress system has been deemed common in both depression and obesity research by Bornstein, Schuppenies, Wong, and Licinio (2006).

Use of the BioPsychoSocial (BPS) model allows for a holistic approach to individual health by exploring the interrelatedness of biological, psychological, and sociological dimensions. After a review of the literature on the BPS model, the chapter will be organized by dimensions as they pertain to childhood obesity.

BioPsychoSocial Model Review

Dr. George Engel, creator of the BPS model, believed in the interrelatedness of the biological, psychological, and sociological dimensions on the health of individuals (1977). As a psychiatrist Engel questioned the relevance of the medical model to his practice as during that time disease was described as "sufficient deviation from normal" and that "elimination of those deviations will result in cure or improvement" (p. 129). Engel described the origin of the medical model as taking root centuries ago when 'mind- body dualism', the perspective that mental processes and physiological processes were separate entities, was the leading paradigm. This paradigm was based on the Christian doctrine wherein the mind was related to the *soul* and tampering with the head was considered sacrilegious (1977). The mind- body dualism was the basis for medical models of pathology and care for decades and emphasized measurable physiological indicators as the

basis for diagnosis and treatment of illness and disease. Engel reported "*how* a patient and his problem is approached is influenced by the conceptual models around which the *physician's knowledge is organized*" (1980, p. 535). Based on a systems approach, he believed contextual factors of the patient's life figured into their diagnosis and treatment (Engel, 1980) as these factors contribute to the attributes of being human. Systems theory allows for organized 'wholes' as well as component parts to be studied. Human beings are on one level the *sum* of their component parts, but they are also *smaller elements* of a larger and more complex system. Utilizing this holistic approach to view obesity as a) a component of a larger complex system and b) the sum of a constellation of neurochemical processes contributing to weight allows for the exploration of dimensions of the individual not currently reflected in weight management programs. Using a holistic approach to childhood obesity through use of the BPS model, may advance knowledge and provide for evidence based nursing interventions.

Thoreson and Eagleston (1983) utilized the BPS model to create a working model of chronic stress in children. As children have different assessments and/or appraisals of stress, exploring differences among children was essential. Thoreson and Eagleston identified four interrelated dimensions associated with the emotional processing of stress to guide coping: cognitive, physiological, behavioral, and environmental influences. These four influences were believed to be reciprocal and created demands on the body requiring resources for coping and adaptation (1983).

The use of the BPS model by a group of physicians resulted in a critique of whether it led to new scientific findings in clinical medicine. Borrell-Carrio et al., (2004) took issue with the BPS model on the ability to incorporate mental-physical aspects of health to physiological processes, models of circular causality that must be made to fit linear

treatment options, and a more participatory clinician-patient relationship. Overall, Borrell-Carrio et al., (2004) supported the BPS model in the clinician's *own* practice to improve self-awareness, empathy, curiosity, and promote better relationships with their patients but were reluctant to give up paternalistic interactions and missed the point of the model, which was focused on better methods of health maintenance and disease management. Engel (1977) promoted thinking beyond measurable, scientific, and physiological indicators to listen and observe the person with regards to their social realm, their daily environment, and their ability to manage life's challenges.

Conceptual Model of Childhood Obesity

Biological Dimension

Genetic predisposition for obesity was dogma for a period of time (Dietz, 1998) until advances in high technology devices led to more sedentary activity and access to fast foods was blamed as exacerbating the prevalence of obesity (American Academy of Pediatrics, 2003). Yet balancing calories consumed and calories expended, to maintain weight, is dependent upon a complex relationship between hormones and the nervous system.

Cushing's syndrome, a state of persistent HPA hyperactivity and cortisol secretion, has been used as a model of the impact cortisol has on the development of obesity (Charmandari, 2003). In obese *rats* genetically engineered for Cushing's syndrome, their weights and appetites were drastically reduced after undergoing an adrenalectomy, thus discontinuing the availability of corticosterone (analogous to cortisol in humans), but weights and eating behaviors increased when exogenous cortisol (dexamethasone) was administered (Bornstein et al., 2006; Dallman et al., 2003). Masuzaki et al., (2001)

reported one cause of visceral adiposity and metabolic complications was the exposure to excessive levels of glucocorticoids. This finding was supported by Soros, Zakik, and Chalew (2008) who identified the importance of adaptive suppression of the cortisol response to minimize tissue exposure to glucocorticoids. They also reported cortisol suppression failure as related to difficulty maintaining glucose homeostasis that may impair insulin secretion (Soros et al., 2008). Stress induced alterations of the HPA axis interfere with leptin levels, interfering with appetite suppression, and elevated amounts of unbound cortisol in the blood providing support for the role of stress in the upset of the body's physiological processes (Bose, Olivan, & Laferrere, 2009). Daily metabolic processes depend on a balance between hormones secreted, receptors to bind them, and feedback pathways to monitor them (Nelson, 2005). Routine neuroendocrine system release of hormones, such as early morning cortisol peaks, are dependent upon individuals' circadian rhythms which develops in response to a pattern of sunshine exposure, sleep, and eating routines. Landis, Parker, and Dunbar (2009) observed a sample of adolescents to study circadian rhythm influence on the body's neuroendocrine activity. A number of variables were measured including hunger, snacking, food cravings, amount of sleep at night, and daytime napping and found that reduced night time sleep and increased day time sleep significantly predicted food cravings.

Greeno and Wing (1994) reported individual differences as responsible for emotional eating. In a synthesis of animal studies, researchers using shock to represent acute stress and tail pinches to represent chronic stress, revealed mixed results. Chronic stress resulted in a preference towards sweeter food versus usual chow in a number of studies. They pondered that some individuals may not be able to differentiate between anxiety and hunger, thus a history of overeating after stress may condition their responses

to future stressful states and may be a learned mechanism to cope with stress. Dallman, Pecoraro, Akana, laFleur, and Gomes (2003) reported craving energy dense food during chronic stress as a way to shut down a dysregulated HPA axis. Torres and Nowson (2007) review human and animal studies and found support for emotional eating with stress as dependent on the food available, as calorie dense food was preferred. Nguyen-Rodriguez, Chou, Unger, and Spruigt-Metz (2008) did not find significant links between emotional eating and weight in a group of Latino adolescents. Eating and food cravings are responses to stress and related to how an individual adapted to the experience of chronic stress. Romeo and McEwen (2006) described the sensitivity of brain regions to cortisol especially during childhood and adolescence.

Stress affects neuroendocrine physiology by influencing how signaling and feedback pathways develop (in utero and early childhood), by upsetting diurnal/ basal neuroendocrine processes potentially reprogramming pathways in chronically stressful states, and has the potential to disorganize and damage the hippocampus and its responsiveness to stress (Charmandari et al., 2003; McCarthy & Crews, 2008; McEwen, 2003a; Nelson, 2005; Romeo & McEwen, 2006). Besides the hippocampus, brain plasticity, the ability to restructure secondary to environmental influence, may occur in the amygdala responsible for memories and fear response and is involved in the appraisal of stress modulating the strength of the HPA axis. Spiegel, Leproult, L'Hermite-Baleriaux, Copinschi, and Penev (2004a) conducted a study in 11 young men and determined significant correlations between reduced sleep affecting neuroendocrine cycles in cortisol, thyroid stimulating hormone, and leptin levels deemed as an activation of some biological mechanisms of the stress response.

Leptin, a fat derived hormone, is released during night time sleep and inhibits appetite. Shorter sleep duration in children has been correlated with increased BMI in children (Ievers-Landis, Storfer-Isser, Rosen, Johnson, & Redline, 2008; Landis et al., 2009; Spiegel et al., 2004a). Chronic stress in children exposes the developing brain to elevated cortisol levels and interferes with normal growth exhibited by shorter stature, reduction in thyroid hormone production, promotion of fat and visceral adiposity storage, inhibition of the immune response, and dysregulation of the stress response (Charmandari, 2003).

A growing list of genetic defects has been recognized to interrupt the metabolic processes of the body. Leptin deficiency and deficiency of the melanocortin 4 receptor are related to dysfunctional feedback of metabolic processes and an inability to turn off the signal to eat (Roth et al., 2004). Corticosterone (analogous to cortisol in humans) is associated with increased energy storage and visceral obesity in rodents (Smart, Tolle, & Low, 2006) with mutations of the receptors for proopiomelanocortin genes. Dimitriou, Maser-Gluth, and Remer (2003) described the role of 11B HSD in rejuvenating inactive cortisone to active cortisone, playing a role in adipocyte development and leptin release, and correlating elevated glucocorticoid levels with elevated fat mass in three samples of children aged 4 – 13 years who were grouped by Tanner stages. Fat mass accumulation associated with elevated cortisol may occur because of cortisol's hyperphagic effect in the body (Masuzaki, Paterson, Shinyama, Morton, & Mullins, 2001) or secondary to fat angiogenesis related to neuropeptide Y mediation of white adipose tissue with sympathetic nervous system activity (Kuo, Kitlinska, Tilan, Li, & Baker, 2007).

Changes in gene expression can be influenced by in utero and/ or early childhood chronic stress as Bornstein et al. (2006) found, highlighting the gene x environment

interaction in the shared biology of obesity and depression (See Table 1), finding evidence for HPA axis dysregulation in obesity and depression (Bornstein et al., 2006; Caspi, Sugden, Moffitt, Taylor, & Craig, 2003; Charmandari, Tsigos, & Chrousos, 2005; Friedman & Brownell, 1995). Elevated cortisol levels, related to living with chronic stress, rewires the signaling and feedback networks requiring less stress to trigger the HPA axis (hypersensitive), a stronger response (hyperreactive), and a slower recovery (Charmandari et al., 2003; Mietus-Snyder & Lustig, 2008). Bornstein et al. described associations between excess levels of glucocorticoids and increased visceral adiposity and features of metabolic X syndrome [abnormally elevated lipid panels, hypertension, insulin resistance, and hyperglycemia (2006)]. deKloet (2008) described genetic factors moderated by early life events result in a phenotype that is vulnerable to stressful experiences later in life secondary to epigenetic changes early in life.

Psychological Dimension

For years psychological factors were considered to be related to obesity. In 1982 Sahakian stated that education on diet alone did not reduce excess weight in hospitalized children long term. He suggested multiple etiologies may be responsible for obesity and believed in the influence of psychological factors on eating behaviors. Mellbin and Vuille (1989) followed a cohort of elementary school children and found a significant association between experiencing early psychosocial stress and rapid weight gain. They suggest early conditioning to stress in this sample of 7-13 year olds may result in hyperphagia. While the relationship between psychological factors and weight gain has been implied across studies, directionality of the relationship varied.

Table 1

Interrelationship between depression and obesity

(1) Depression and obesity frequently co-exist.

(2) Both disorders are substantial health problems worldwide.

(3) Obesity can follow depression that occurred earlier in life.

(4) Depressed mood can be a side effect of obesity treatments.

(5) Weight gain and obesity can be a side effect of antidepressant treatments.

(6) Several neuropeptidergic and neurotransmitter systems involving molecules as CRH, NPY, serotonin, and norepinephrine are involved in the regulation of mood as well as body weight.

(7) Depression and obesity are important risk factors for cardiovascular disease, potentially causing or worsening the metabolic syndrome.

(8) Genetic polymorphisms may underlie the predisposition both to cardiovascular disease and to depression.

(9) Drugs used in depression studies predominantly affect either serotonin or norepinephrine in CNS.

(10) Obesity treatment includes central inhibition of both serotonin and norepinephrine uptake.

Source: Bornstein, SR. (2006) Approaching the shared biology of obesity and depression. *Molecular Psychiatry, p. 893. Reprinted by permission from Macmillan Publishers Ltd: [Molecular Psychiatry] (reference citation), copyright (2006)*

The stigmatization of being an overweight/ obese individual was assumed to result in depression, lower self esteem, and negative body image however a meta-analysis by Wardle and Cooke (2005) found that not to be true. Friedman and Brownell (1995) highlighted inconsistent findings in previous studies on psychological correlates of obesity and based inconsistent results on varying definitions of psychological constructs, types of instruments used, and varied populations of interest. As many eating disorders have links to psychological distress, Friedman and Brownell concluded it is premature to cease exploration of these constructs (Popkess-Vawter, Wendel, Schmoll, & O'Connell, 1998). After a review of previous research they created a *three generational risk factor model for obesity* studies. The first generation of studies explored psychopathology among samples of obese and nonobese individuals with no consistent correlations resulting between weight status and psychopathology. The second generation of studies identified risk factors in the obese population. Risk factors were categorized as: *independent risk* which could happen to anyone, *potentiated* risk where the risk was higher among obese people, and *interactive* risk factors which required an obese status for deleterious effects to occur (Friedman & Brownell, 1995). As future research on risk factors take place, they believed it would be the springboard for a third generation of studies exploring psychopathology and obesity. So, while directionality was initially assumed to be: *obesity -> psychological correlates*, Friedman and Brownell acknowledged that the risk factors for obesity may be psychopathology in itself: *psychological correlates -> obesity*, and required further investigation (1995).

In 2001 Pine, Goldstein, Wolk, and Weissman found early childhood major depression was significantly associated with elevated BMI in adulthood in a prospective study of 6-17 year olds followed for 15 years speculating that depression could interfere

with food choices and activity levels. Based on Pine et al.'s findings, Goodman and Whitaker (2002) followed healthy adolescents and found baseline depression scores in normal weight 7-12th graders predicted elevated BMI on a one year follow up. Depression and obesity were believed to be functionally related and likely to co-occur according to Stunkard, Faith, and Allison (2003). Their literature review included the National Health and Nutrition Examination Survey data highlighting the leanest 15 -19 year old adolescents had the lowest scores for depression while the obese adolescents had the highest scores (20% for males, 30% for females). While this finding did not suggest directionality, Stunkard et al. considered the roles of moderators and mediators in the occurrence of these conditions and defined: " ***moderators*** as factors that specify for whom and under what conditions agents exert their effects and ***mediators*** as identifying why or how they exert their effects" (p. 330). Moderators of depression and obesity were identified as the severity of depression, the severity of obesity, gender, socioeconomic status, G x E interactions, and adverse childhood experiences. Mediators of depression and obesity were determined as physical activity, teasing, disordered eating, and stress. Stress impacts the HPA axis and is implicated in both depression and obesity via cortisol levels (Stunkard et al., 2003) and advanced the hypothesis that the two constructs have a similar etiology. Isnard, Michel, Frelut, Vila, and Falissard (2003) found increased anxiety in obese adolescents seeking treatment and suggested obesity and psychological distress were related. Zaider, Johnson, and Cockell (2002) recruited 15 – 18 years olds (seeking medical attention for minor ailments at clinics or doctors' offices) for a prospective study to explore the relationship between anxiety, depression, mood or personality disorders, and substance abuse with the presence of eating disorders. Adolescents with dysthymic disorder, anxiety, panic disorder, and major depression at baseline were more likely to

have bulimia or binge eating behaviors on follow-up. In female college students, same day depressed affect/ mood and greater psychological stress were associated with same day binge eating behaviors suggesting eating was being used as a coping mechanism (Yacono-Freeman & Gil, 2004). Bornstein et al., (2006) advocated the dysregulation of the HPA axis as implicated in obesity and depression potentially related to the G x E interaction of early stress dysregulating gene expression.

Psychological distress results from inadequate emotional processing required for coping (Repetti et al., 2002) during the experience of stress. A disconnect between the *need* to cope and the *inability* to cope results in distress and the potential for poor coping strategies including internalizing and externalizing behaviors (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). Experiencing stress has been associated with choosing calorie dense foods in an effort to terminate the HPA stress response (Dallman et al., 2003) and others report obese individuals unable to differentiate between hunger and anxiety or learn to associate the two in early childhood (Greeno & Wing, 1994). Nguyen-Rodriguez et al., (2008) referred to BMI as a moderator between emotional eating in some overweight adolescents in response to negative stress, and binge eating was related to emotional eating which is also associated with obesity.

Lazarus and Folkman (1987) viewed the experience of stress as a transaction between the person and their environment. The person is the sum of their values, beliefs, and experiences that have coalesced from their childhood family environment. In support of the gene by environment interaction, early life affects how novelty in their world will be appraised. Novel stimuli are assessed as harmful or beneficial based on the individual's stake in the encounter and accounts for their vulnerability and ability to cope. A stressor requires an action or reaction to adapt. A stressful state occurs when stimuli, the

individual's appraisal of its threat to self, and the ability to cope effectively do not match. In children, stimuli such as daily hassles represented chronic stress and were considered better predictors of stress than were major life events (Compas, Davis, Forsythe, & Wagner, 1987; Lazarus & Folkman, 1987). Thoreson and Eagleston (1983) defined chronic stress as a persistent state where demands on the body exceeds its resources, and supported the importance of the environment and the child's social system in the ability to learn how to cope with stress.

Supportive and nurturing caregivers demonstrate an attachment bond to the child. This attachment aids and shapes the maturation of the brain, limbic system, and evolution of the child's HPA axis. Role modeling effective coping strategies by the parents and mirroring how valuable the child is to them *teaches* the child healthy ways to regulate emotions and learn healthy coping strategies during novel experiences. By influencing the child's appraisal of stress and choice of coping, these mechanisms can be healthy buffers to the child's HPA axis and response to stress (Cohen, 2004; Gunnar & Quevedo, 2007). The symbiotic effect of the parent/ child dyad is illustrated in a 15 year prospective study of mother-adolescent pairs. This study highlighted the consequences of in utero exposure to stress. In the 14 – 15 year old offspring of mothers who experienced anxiety at 12-22 weeks gestation, Van den Bergh, Calster, Smits, Van Huffel, and Lagae (2008) showed elevated and flattened diurnal cortisol curves significantly different than offspring from the non-anxious mothers (p=.0463). Elevated diurnal cortisol levels lacking the typical downward drift, thus remaining elevated and flattened, is indicative of HPA dysregulation and the experience of allostatic load (McEwen, 2003a).

Cartwright, Wardle, Steggles, Simon, and Croker (2003) found higher levels of stress related to unhealthier eating in a group of adolescents. In their study, unhealthy

eating referred to preference for higher fat foods, more snacking, and less consumption of fruits and vegetables. Torres and Nowson (2007) cited two studies where rodents and human participants preferred highly palatable and energy dense foods when stressed. The severity of the stress predicted eating behaviors. Torres and Nowson reported decreased eating in marines preparing for combat, signifying acute stress, and an increase in energy dense food consumption among high school students preparing for exams, signifying chronic stress and this was significantly different than eating behaviors exhibited on 'nonstress' days: 2225 vs. 2074 kcal. They suggest that chronic elevations of cortisol promote secretion of neuropeptide Y (NPY) and inhibit leptin thus promoting eating and storage of energy reserves.

Sociological Dimension

Children's development is continually influenced by the quality of their environments and their relationships, from in utero to adulthood (Schore, 2003a). Brain development begins in the fetus and early life events imprint and stimulate synaptic wiring for future recollection and response habituation. Exposure to maternal stress has implications for epigenetic plasticity for the fetus (Belsky & Pluess, 2009; Charmandari et al., 2003; Miller, Chen, & Cole, 2009; Weaver, Cervoni, Champagne, D'Alessio, Sharma, & Meaney, 2004) and underscores the malleability of the developing child. Prenatal exposure to maternal nutrient restriction and adversity/ stress resulting in elevated glucocorticoids puts the infant at risk for altered stress responsivity (Jones et al., 2006)

Elliott and Reis (2003) discuss attachment theory supporting the ability of a child to learn and attain mastery of their environment and their emotions through exploring their environment in the presence of a protective and caring caregiver. Having a secure base from which to explore builds the child's self-esteem and confidence and builds a

foundation for future novel experiences. Parental responsiveness and caring promotes the child to view him/herself as important and worthy of compassion (Schore, 2003a). The quality of the parent-child relationship sets the emotional tone for future interactions with people and environments by encoding past experiences in the amygdala of the limbic system (McEwen, 2003; Zahn-Wexler, Klimes- Dougan, & Slattery, 2000). A healthy environment and nurturing parents provide emotional security and acquisition of healthy behaviors to cope with novelty in the future when the parent is not accessible to the child (Kochanska, Philibert, & Barry, 2009). Maternal responsiveness was identified as a buffer to cumulative exposure to stressors in a group of seventh and eighth grade students, with the more securely attached students experiencing less allostatic load than insecurely attached children (Evans, Kim, Ting, Tesher, & Shannis, 2007).

It is important to consider that the ability to respond to stress is learned: It develops in response to maternal care after birth (Vasquez, Eskandari, Phelka, & Lopez, 2003). The Perinatal- Infant-Mother Attachment Cortisol Study (PIMCO) at the University of Michigan suggested the influence of early stress on the infant's developing neuroendocrine pathways can alter signaling/ feedback circuits responsible for hormonal and behavioral responses to stress and increasing the individual's vulnerability to pathologies such as depression, anxiety, and substance abuse (2005). According to the PIMCO website (2003) being touched and nurtured in early childhood promotes optimal stress response patterns.

Social interactions between the developing child and nurturing adult supports synaptic pathway development in the brain thus creating a working model of affect regulation for future coping needs. Attached mother-child dyads aid the maturation of the primitive brain to more sophisticated left and right brain functions concerned with

cognitive rational assessments and emotional regulation, respectively (Schore, 2003a; 2003b). Troop and Treasure (1997) highlighted the importance of learning how to negotiate risk situations with adequate coping. Rearing practices affects emotional regulation necessary for the management of stress and reduction of allostatic load (Cacioppo, Amaral, Blanchard, Cameron, & Carter, 2007). Luther (2007) described parenting typologies as extensions of *secure* and *insecure* attachment. Securely attached children come from **authoritarian** parenting, in which parents' exhibit sensitivity to the child's age, cognitive ability, and input before consistently making decisions and setting boundaries for the child. Insecurely attached children tend to live with one of three parenting styles, **authoritative** parenting that exhibited a lack of sensitivity to the child's input and strict discipline, **permissive** parenting which was indulgent and without discipline, or **neglectful** parenting where the parent was not involved emotionally and did not set rules. Growing up in cold, unsupportive, or neglectful homes or homes characterized by family conflict, anger/ aggression, or deficit nurturing made it difficult for the child to learn how to control and express their emotions, and dysregulates the signal/ feedback systems to stress (McEwen, 1998; Repetti et al., 2002). Lack of nurturing parents disrupts normal attachment required for exploration of the environment and promotion of child mastery (vs. helplessness) for competence in facing novel situations (Bowlby, 1982; Elliot & Reis, 2003).

The maternal child relationship becomes a working model for future relationships that involve coping as seen in a study of 13 -19 year old adolescents, in which having secure and attached relationships with one's parents was associated with better coping with negative emotions when compared to insecurely attached adolescents (Cooper, Shaver, & Collins, 1998). These relationships set the foundation for the child's temperament, baseline

neuro-endocrine activity, and coping that influence reactions to novel stimuli and keep the body in allostasis. In a two year prospective study that followed 54 children aged 9-18 years to explore the relationship between lower SES and cortisol reactivity, Chen et al. (2010) found higher daily cortisol output was related to lower family SES. The lower SES families had significantly less financial savings, rented rather than owned homes, and reported higher *perceptions of threat,* and more *chaotic home life experiences,* than did higher SES families. Maternal responsiveness, attachment, and parenting are reported to be mediators in the stress response of children (Appleyard et al., 2005; Brobeck et al., 2007; Charmandari, 2003).

Cohesion is described as the "emotional connection between family members and is important for children's development and function" (p. 360) and families with high cohesion scores had significantly healthier diets (Franko, Thompson, Bauserman, Affenito, & Striegel-Moore, 2008). As emotional eating may represent a conditioned coping response to stress, attention to the forces driving eating behaviors could improve the weight loss success (Nguyen- Rodriguez, Chou, Unger, & Spruigt-Metz, 2008). Young college aged women with eating disorders, such as bulimia and anorexia nervosa, rated their families as less cohesive and communication with their mothers as poorer than matched controls (Vidovic, Juresa, Begovac, Mahnik, & Tocilj, 2005). Bulimic women seeking treatment scored their families higher on being achievement oriented and lower on cohesion than normal weight college females comprising the control group (Blouin, Zuro, & Blouin, 1990).

Nurturing parenting was related to family cohesion and healthy eating behaviors in adolescent girls (Franko et al., 2008). They reported less soda ingestion and more breakfast consumption in cohesive families when compared to less cohesive families and

suggested efforts to strengthen the family would be valuable in increasing adolescent health. Kime (2008) supported the exploration of the family setting with regards to eating behaviors and believed rebuilding a cohesive family was important for creating healthy eating environments. In light of the changing family structure, Kime stated it was "having an effect on the ways families operate in relation to food and eating" (p. 316). In a qualitative study of three generations in each of 9 families, Kime found in the grandparents' generation the family had an orderly routine that included daily life, work schedules, and family meals eaten together, and at consistent times (2008). Changes in family routines occurred in the parental generation with differences discerned between families with obese and nonobese children. Families with obese children lacked consistent meal times and locations of eating meals as compared with nonobese children's families in which they had a more traditional way of eating three meals a day together at a table. Kime supported researching obesity in children from this ecological standpoint. Yannakoulia et al., (2008) found children of divorced parents had higher BMI than children of married parents. They suggest inadequate parenting, children's emotional security, unfavorable SES changes, more TV/computer screen time, and inconsistency in meal time routines as possible moderators of eating behaviors and weight in the children of divorced parents. Dunn (2002) showed support for challenges children in divorced families faced with respect to home and school changes, lack of access to extended families (i.e. grandparents), new households, blended families (i.e. step parents and/ or step siblings) all of which contribute to their stress load and require coping to prevent allostatic load.

Children in divorced or single parent homes are more attuned with the affect of their primary parent. This exposes them to challenges with the parent's physical and

mental health, the parent's ability to supervise and monitor the children's activities, and inconsistencies in family routines (Lansford, 2009). Consistency in parenting, daily routines, and communication provides needed boundaries for children to assist them with maturation and development of their cognitive abilities.

Summary

The parent-child relationship has the potential to buffer the child from stress and buffer children's perception of what is stressful to them. Nurturing parents and secure home environments promote optimal neuroendocrine pathways setting the foundation for long term management of emotional processing required to identify and manage stress. The inability to manage emotions may influence eating and physical activity contributing to the onset of obesity. Optimal adaptation to stress requires the individual to emotionally regulate themselves without using toxic coping mechanisms (Schore, 2003b). In light of the changes in modern families, the existence of chronic stress, variability in family connectedness, and increasing prevalence of obesity in children the literature supports exploring these constructs with theoretical links to weight in children utilizing the Bio-Psycho-Social dimensions as its foundation.

Chapter 3

Methodology

Previous research has explored relationships between chronic stress and weight gain in a variety of living subjects. The Bio-Psycho-Social model was utilized to frame the inter-relatedness of the family and environment on coping strategies and perceptions of chronic stress with weight status in children as suggested by a review of the literature. Therefore, the focus of this research study was to explore self reports of chronic stress, coping strategies, and family connectedness as they related to weight in children.

Research Design

This cross-sectional exploratory study was designed to look for correlations between chronic stress, coping strategies, family connectedness, family characteristics (from the family questionnaire), and weight in children. A convenience sample of fourth and fifth grade students was recruited from the Austin Independent School District (AISD) to answer these questions:

1) Are there relationships between perceived chronic stress, coping strategies, family connectedness, and weight in fourth and fifth grade children?

2) To what extent do chronic stress, coping strategies, family connectedness, meals eaten together, and children's school night sleep add to the variance in children's weight?

3) Are there significant relationships between: parent's marital status, number of people in the home, parent's educational level, parent's weight, child's sleep on school nights, breakfast eaten at home, number of times family cooks dinner per week, and number of times family eats dinner together per week, family connectedness, and weight in fourth and fifth graders?

Strengths of this one time data collection is lack of attrition and, for the majority of the participants, a brief face-to-face discussion of the purpose of the research study and assurances of privacy and confidentiality. A weakness of the study is the lack of generalizability beyond the population sampled, as well as the fatigue associated with answering all of the questionnaire items.

Setting/ Population

Children move through developmental stages quickly. To reduce possible confounders in this study, pre-pubescent children (or children in early puberty) were sought. Studies from the 1990's demonstrated that schools were useful sites to recruit children and/or their families. Nader et al., (1999) showed schools provided access to heterogeneous populations from which to draw representative samples for research purposes. Two school districts were contacted, Lake Travis Independent School District and Austin Independent School District (AISD). Lake Travis did not give permission to recruit from their schools. AISD gave their permission stipulating classroom time could not be used to recruit or administer study materials. Two elementary school principals gave permission to send research materials home to parents and children. One principal expedited the research at her school by introducing key staff members to the investigator. The second principal requested waiting to recruit until the end of the school year which was outside our data collection timeframe and proved to be a difficult time, as it were, due to a district and statewide budgetary emergency pre-empting any previous verbal agreement. Decisions were made to contact after school programs in order to broaden access to a population of fourth and fifth grade children. The AISD after-school programs were managed by the YMCA, Extend-A-Care (EAC), or special AISD sponsored programs free to qualifying families. Consent was received from the directors of the EAC program

and Third Base (AISD sponsored program). The two after-school programs provided access to children from nine schools in AISD.

Sample Size

A power analysis was performed utilizing G*Power 3.1.2 (Faul, Erdfelder, Buchner, & Lang, 2009). Sample size for this study was determined based upon: a significance level set at .05 level (alpha = .05), medium effect size – Cohen's d = .30, and the power level of .80, as suggested for use in many areas of behavioral science research, and a one-tailed test (based on the literature for the impact of chronic stress on weight). A proposed sample size of 68 participants was suggested to perform correlational analysis between chronic stress and weight. (A post hoc power analysis was run as a two tailed test, based on the exploratory nature of the study, and a sample size of 84 was recommended.)

The statistical analyses needed to answer the research questions include: Pearson's correlations and multiple linear regressions for significant correlations between the variables.

Sampling

A convenience sample of fourth and fifth grade elementary students from AISD were recruited for this study. This age group is common in psychological research as the children have the ability to decide to participate in research studies, are able to read and comprehend questions, are pre-pubescent and early in maturational changes, and have maturing cognitive abilities (Jenkins & Rew, 2005; Mellbin & Vuille, 1989; Sharrer & Ryan-Wenger, 1995). Inclusion criteria for participating children were (a) being in grades 4 and 5, (b) able to read English, (c) have parental consent, and (d) provide assent to participate. Exclusion criteria included (a) read a language other than English, (b) parental

consent received but child does not assent, and (c) a history of hospitalization in the previous two weeks. Children experiencing a recent hospitalization have the potential for alterations in their school and home routines affecting their perception of stressors and their ability to cope with stress.

Protection of Human Subjects

The Austin Independent School District was approached for recruitment of their students pending The University of Texas at Austin, Internal Review Board (UTIRB) approval of the study proposal. Approval was given by AISD pending: changes in the informed consent to include sensitive questions on the *Feel Bad Scale*, receipt of the UTIRB approval, and assurance that class room time would not be used for data collection.

AISD board perceived some questions on the Feel Bad Scale as being sensitive and resulting in distress for the child so sample questions were included into the consent to make the parent aware. Some examples include: 'How stressful is it to feel sick?' 'How stressful is it to have your parents argue in front of you?', and 'How much do you feel your family understands you?'.

None of the children voiced being upset by the questionnaires. A few children asked if their parents would see their answers and were assured that they would not. Other children came in saying their parents told them to skip questions that made them feel uncomfortable. It is not clear if missing answers are related to the children's concern over the question. As the Feel Bad Scale, Schoolagers' Coping Strategies Inventory asked two subscale questions for each item and the missing responses appear random (i.e. a frequency question but not severity question may be missing, or a helpfulness but not a frequency question) it seems unlikely that the child refused to answer secondary to feeling uncomfortable. Only one child with parental consent did not provide assent.

To protect confidentiality and anonymity of the children, a researcher-generated number was assigned to the parent-child data as the children's questionnaires were received. Participants' personal information was not used on the survey forms. The de-identified surveys were filed separately from the parental consents and child assents and these items will stay locked in the researcher's office for a minimum of six years. Participants were informed that data will be analyzed as group data. No data the children provided on their questionnaires will be shared with anyone outside the research team.

Recruitment

Once IRB approval was secured recruitment commenced. Invitational letters were sent out to the first group of children recruited entirely through the school's weekly communication folder. A total of 250 data packets (parent consent, parent family demographic sheet, child's assent form, and children's questionnaires) were sent home to parents of fourth and fifth grade children at the one participating elementary school for them to fill out and return the following week. Only the children giving assent returned the folder to the school's mailroom for the investigator to collect. A total of seven completed packets were returned with one packet containing the parent consent and family demographic sheet but no child's data. A follow up letter was sent to the parent to allow the child an opportunity to participate but there was no response to that letter. Due to the overall poor response rate, a reminder letter was sent to the parents two weeks later encouraging them to return the study packet if they were interested in participating. One packet was returned with only the child's assent and questionnaires completed and no parent consent for this study- but the packet did contain parent consent for another study taking place at the school from Texas A & M University. [Investigator contacted the A&M investigator and mailed the consent to her]. The school assisted in getting a second

consent and family questionnaire mailed to the family, which was ultimately returned, allowing the child to be included in the study and have appreciation gifts sent to her.

This response rate (*n*=7) was insufficient to conduct the study and so the directors of the after-school programs were approached to discuss the possibility of inviting their students to take part in the study. The remaining children were recruited from the after-school programs. The *Extend-A-Care* program and AISD's *Third Base* program were active in promoting this research study. *Extend-A-Care* allowed for posters to be place in the schools being recruited each week and resulted in better response rates. Their site directors handed study packets containing the parent consents and family questionnaires to the parents for return within 3 days. Only the children with parental consents were approached: no child refused to participate. *Third Base* provided address labels to mail parent packets (containing parental consents and family questionnaires) to the children's homes with instructions to return the consents to the program the next day. The investigator approached the children of consenting parents at the school: no child refused to participate in the study. Some children, in both programs, asked if their parents would see their answers on the questionnaires and were assured that the parents would not see the study materials and study ID numbers would be used so even the investigator would not know how the children answered their questionnaires. (See Table 2 for a summary of recruitment methods and locations.)

Table 2

Elementary School and After School Recruitment

Distribution methods	Location	Research packets distributed	Research packets returned (n)	% returned
Packet sent home with student	**Elementary School**	**250**	**7**	**2.5**
	After school Programs	**164**	**44**	**27**
a) Parent invitation letter, consent, and family questionnaire sent home	**1) Extend-A-Care**			
b) Child approached in after school program when parental consent received	a	20	7	35
	b	20	3	15
	c	18	13	72
	d	15	1	6.7
	e	17	2	11.8
	f	13	4	30.8
	2) Third Base			
	g	20	8	40
	h	20	5	25
	i	21	1	5.8
	TOTALS	**414**	**51**	**12.30%**

Sample

Fifty one parents gave consent (12.3%) and one child did not return assent or questionnaires resulting in 50 participants. The sample was composed of 28 girls or 54.9%. (See Table 3 in Chapter 4 for a demographic summary of the children.)

Data Collection Procedures

Procedures

In the first group of children whose packets were completed at home, the parental consents and child assents were collected, identification numbers assigned to the study materials, and appreciation gifts (University of Texas spiral notebooks and $5 gift cards) were sent to the children at their homes. When recruitment ended at the school, the physical education teachers released heights, weights, and body mass indices they recently collected to the investigator in order to calculate body mass indices. The second group of children in the after school programs were approached once parental consents were received by the after school directors. The children were informed of their right to choose to participate or not as well as the lengthiness of the questionnaires. While answering the questionnaires healthy snacks of water, juice boxes and granola bars were offered to them. Participants had heights and weights attained upon completion of the questionnaires and appreciation gifts were given to the children before returning to the after school program.

Instruments

Threats to construct validity were reduced by using well established instruments to measure chronic stress, coping, and family connectedness. Five instruments were used for collecting data in this study: Feel Bad Scale (FBS), Schoolagers' Coping Strategies Inventory (SCSI), Family Connectedness (FC) scale, body mass index (BMI), and a family

demographic questionnaire, in which items pertaining to parents weight, education, socioeconomic status (SES), number of people living in the home, number of dinners cooked at home, number of dinners eaten together, and hours of school night sleep the child receives, was also collected.

Feel Bad Scale (FBS)

Lewis, Siegel, and Lewis (1984) revealed that stress is a different experience for children than adults. In meetings with small groups of fifth and sixth grade students (n= 50-60) to discuss 'what makes them feel bad, nervous, or worry' researchers identified sources of stress. A tool was developed containing 22 items regarding 'sources of stress' that was reached by group consensus. The tool was administered to two groups of 6th graders, with similar backgrounds, and 2 items were dropped resulting in a total of 20 items. This time, the items were scored once for the *perceived magnitude of the stress*, 5 point Likert scale with scores ranging from '1' = not bad to '5' = terrible, and again for *frequency of occurrence of the stress* with scores ranging from '1' = never to '5' = all the time. A third administration of the tool was given to test psychometric properties to more than 2,400 fifth grade students participating in a national controlled trial of a decision making curriculum. The rankings of the 'magnitude of badness' means (1.98- 4.09) and the 'frequency' means (1.7-2.96) were most meaningful when viewing the items at either ends of the range: i.e. four of the six highest 'badness' rankings involved interactions with one's parents whereas the highest 'frequency' rankings included feeling sick, having nothing to do, not having enough money to spend, pressure to get good grades, and feeling left out of a group.

The internal consistency of the 'perceived magnitude' rating was Cronbach's alpha of .82. Principal components factor analysis with varimax rotation revealed 4 factors with

eigenvalues >1.0, and a scree plot resulted in 3 factors. The first factor 'Child/parent relations and sources of anxiety' accounted for 62% variance, the second factor 'Child/peer relations and sources of depression' accounted for 23%, and the third factor 'change in living arrangements' accounted for 15% of the variance in total scores. Item scores can be reported separately as a weighted 'frequency' or 'badness' score or for single total score derived by multiplying the magnitude of badness score by the frequency for each item and summed for a total score. Total scores ranged from 20-500, mean scores = 135.1, s.d. = 46.7, with females having higher total scores than males when data were analyzed by gender.

FBS validity was evaluated in age related groups of children following a discussion of what stress meant to them. Using adjectives such as 'bad', 'nervous', and 'worry' to generate items they described as sources of stress, the students supported the FBS as a measure for the construct 'chronic stress'. These items indicated to Lewis et al., (1984) that sources of stress to children were not discrete life events but rather "problems of an enduring nature" (p. 120). The authors suggested a comparison of their scale to measures of 'anxiety and /or depression' as 'feeling bad' does not differentiate between distress and depression.

Sharrer and Ryan-Wenger (1995) used the FBS to quantify the differences in stressors assessed by age and gender and used single scores for stressor severity and frequency with significant interaction effects between sex, age, and time of measure (F= 3.09, p = .03). In a study exploring the relationship between eating behaviors and perceptions of stress in 1,026 fourth through sixth grade adolescents, Jenkins, Rew, and Sternglanz (2005) reported an alpha of .85 for the FBS. In a multi-ethnic group of elementary school children, Taxis, Rew, Jackson, and Kouzekanani (2004) used the FBS to

assess perceptions of stress and coping strategies and reported their sample mean was 134.89 (vs. Lewis et al., mean of 135.1, s.d. 46.7) and had the same four of five top stress items as reported by Lewis et al (1984).

Schoolagers' Coping Strategies Inventory (SCSI)

Coping responses have been described as learned and purposeful (emotional or behavioral) responses to stressors according to Sharrer and Ryan-Wenger (1995; Ryan-Wenger, 2004). The SCSI contains 30 coping strategies children reported using to relieve stress. Each item asks, how often do you use this strategy and secondly, how much does it help you. The Likert scale for frequency of strategy use ('0 = never' to '3 = most of the time') and effectiveness of strategy ('0 = not helpful' to '3 = always helps') can be summed to provide subscales each ranging from 0- 90. Frequency scale coefficients ranged from Cronbach's alpha 0.7 – 0.85 and effectiveness scale coefficients ranged from Cronbach's alpha 0.73 – 0.89. While a total score was not recommended by the developer (email correspondence from Ryan-Wenger, September, 2010), the number of strategies used can be counted for an unweighted value. This scale has been used in white and black children with ages ranging from 8- 12 years.

Family Connectedness (FC)

Items from the FC instrument were used to quantify children's reports of their connectedness within their family. Seven items were scored utilizing a response scale of '1 = Yes/ Most of the time' to '4 = My mother/ father is not around or Not at all. This instrument described the child's sense that they can communicate with their mother/ father, asked how much they feel their mother/ father cares about them, cares about their feelings, and cares about their privacy. Eisenberg, Ackard, and Resnick (2007) reported Cronbach's

alpha 0.87 for the items on family connectedness. Strong family connectedness has been associated with reducing the risk of suicide in sexually abused adolescents.

Family Demographic Questionnaire

The parent respondent provided consent and completed the demographic questionnaire containing information regarding: parents' educational level, occupations, weight category (underweight, normal weight, overweight, or obese), and descriptive information about the family such as: number of people living in the home, dinners cooked at home, how often family eats dinner together, if child eats breakfast (and where), and the number of hours the child sleeps on a school night (See Appendix A).

Body Mass Index (BMI)

BMI was calculated as: *weight in pounds /divided by height in inches x 703 = BMI* or *weight in kilograms divided by height in meters squared* For this study the Children's Hospital of Philadelphia website, http://stokes.chop.edu/web/zscore/, was utilized to input participants' data resulting in BMI, BMI percentiles, and zBMI scores. Obesity is defined as a BMI ≥ 95% for age and gender, risk for overweight as BMI ≥ 85th to < 95th percentile, normal weight defined as BMI ≥ 5th to < 85th percentile and underweight as < 5th percentile (see Center for Disease Control website: http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi).

Hollingshead Index of Social Status

Hollingshead (1975) devised an algorithm to determine SES based on upon four factors: sex, marital status, education, and occupation. It is described that a person's gender assists their role in society, marital status defines relationships in family systems and can influence occupations outside the home, educational status ranged from less than a seventh grade education through gaining professional graduation degrees (scored 1-7), and

finally occupations ranged from untrained position such as newspaper boys and farm hands (scored as 1) to higher executives such as astronauts and lawyers (scored as 9). Each of the parents' occupation score was multiplied by five and each education score was multiplied by three and summed for each parent. These sums were added together and divided by two to produce the SES score. If a parent was widowed, retired, or the second parent was not involved with the child, the single parent's scores were used.

Data Analysis

The PASW GradPack 18 (SPSS, 2009) statistical program was use to analyze data. Data were assigned study numbers; assents were removed from questionnaires and attached to parent consents. The consents/ assents were filed separate from the questionnaires. The data was entered into the computer database. Data was verified a second time to reduce typing or entry error. A codebook was created to track original and recoded variables (i.e. the FC so higher scores meant higher family connectedness). Frequencies and histograms were run on the data to determine the amount of missing data and the distributions of the variables. Imputed mean scores were calculated for the small amount of missing data (less than 5%) on the independent variables.

Descriptive statistics and histograms were run to determine measures of central tendency, skewness, kurtosis, range, and variance of the data. Skewness was determined by dividing the skew by the standard error of the skewness and kurtosis by the standard error of the kurtosis. Values greater than +/- 1.96 standard deviations were considered extreme and required transformation. The distribution of BMI scores was positively skewed therefore transforming BMI into z-scores corrected for the skewness first observed. The z-BMI scores were used as the outcome variable in this study.

As there were two methods of recruitment for the children, a one way analysis of variance (ANOVA) was run to see if the zBMI mean scores for the groups were significantly different. [One assumption for ANOVA is the variances of groups are equivalent and essential to determine before running correlations and presuming the presence of significant relationships between independent variables.] ANOVA and Levene's testing showed there were no significant differences between zBMI scores based upon location of recruitment. (Nonsignificant Levene's test indicated zBMI scores were homogeneous and did not vary based upon recruitment methods).

Levene's testing for homogeneity of the independent variables showed the scores on the FBS, SCSI, and reverse scored FC were not significantly different across recruitment locations. Significant correlations between variables will therefore not be due to differences within the recruitment locations. To answer research questions, first correlations were run between the independent variables and dependent variable and later regression analyses for a significant correlation between variables and zBMI

Data Analysis per Research Question

All effects will be reported at a .05 level of significance. The following statistical analyses were performed to answer the research questions:

1) Are there relationships between perceived chronic stress, coping strategies, family connectedness, and weight in fourth and fifth grade children?

Pearson's Product Moment Correlation was performed to determine if significant relationships exist between the variables.

2) To what extent do chronic stress, coping strategies, family connectedness, meals eaten together, and children's school night sleep add to the variance in children's weight?

A r*egression model was run after a significant correlation was found between the number of times/ week the family sat together at dinner and the child's zBMI score in order to determine the variance accounted for in zBMI by family sitting together at dinner.*

3) Are there significant relationships between: parent's marital status, number of people in the home, parent's educational level, parent's weight, child's sleep on school nights, breakfast eaten at home, number of times family cooks dinner per week, and number of times family eats dinner together per week, family connectedness, and weight in fourth and fifth graders?

A correlation matrix was set up to determine significant relationships between the above items (found on the family questionnaire).

Summary

This was a cross-sectional correlational study with a convenience sample of fourth and fifth grade children. While the results are only generalizable to the sampled population they may provide insight into relationships between variables that have not been previously explored in relation to obesity in children. The literature suggests the path towards obesity includes eating behaviors related to the regulation of emotional states. Family connectedness is important in learning how to regulate emotions and aids the development of healthy stress management through learned coping strategies. Family connectedness can also provide a protective buffer to the perception of stress. Living with chronic stress can disrupt neuroendocrine systems influencing weight and metabolism. Acquisition of healthy behaviors to buffer or relieve stress perceptions can influence weight in children. This study will advance knowledge on the phenomenon of childhood obesity.

Chapter 4

Results

This chapter is organized in three sections. The first section contains characteristics of the study participants. Descriptive statistics of the major variables are presented in the second section. Data analysis addressing the research questions is detailed in the third section.

Demographic Characteristics of Participants

Fifty 4^{th} and 5^{th} grade children participated in the study. Girls made up 56.1% of the population, 58.8% were fifth graders; the mean age for the children was 10.47 years with a range of 9.5 to 11.7 years of age. Thirty nine percent of the children described themselves as 'white', 31.4% described themselves as Mexican American or Hispanic, and 7.8% reported being 'black'. The socioeconomic status of the children's families resulted in M of 44.45, SD = 10.15 with 44% of the children coming from homes with married parents. Based on the Centers for Disease Control (CDC) website, BMI categories are defined as: 'underweight' is BMI < 5^{th} percentile, 'normal weight' is BMI ≥ 5th to < 85^{th} percentile, 'risk for overweight' is BMI ≥ 85^{th} to < 95^{th} percentile and 'obesity' is a BMI ≥ 95% for age and gender. Utilizing this description, 2% of the children in this study were classified as underweight, 74% were normal weight, 14% were overweight, and 10% were obese (See Table 3 for children's demographic characteristics). The mothers' mean age was 41 (SD = 6.4) and the fathers' mean age was 43.9 (SD= 7.47). The consent and family demographic tool was completed by mothers in 88.2% of the cases. The family questionnaire described home routines such as cooking their evening meals, sitting down to eat dinner as a family, average amount of sleep child receives on school nights,

Table 3

Demographic Characteristics of Participants

	N /%	M	*SD*	Range
Gender				
Boys	22/ 43.1			
Girls	28/ 56.1			
Ages		10.47	0.57	9.5-11.7
Grades				
Fourth	21/ 41.2			
Fifth	23/ 58.8			
Ethnicity				
Black	4/ 7.8			
Hispanic	5/ 9.8			
Mexican-American	11/ 21.6			
White	20/ 39.2			
Other	10/ 19.6			
Family SES		44.45	10.2	14-63

N= count

% = percentage

M = mean of sample

SD = standard deviation of sample

and if the child ate breakfast on school mornings (See Table 4).

Descriptive Statistics for the Study Variables

The *body mass index (BMI)* was calculated utilizing the child's age, gender, height, and weight. BMI, BMI percentages, and zBMI scores were examined to discern the ranges in weight. Seventy four percent of the sample was normal weight (i.e. their weights fell between ≥ 5 to < 85% BMI for age and gender). One child was underweight, <5%, and 12 children (24%) made up the overweight population defined as, ≥ 85% BMI for age and gender. Five children with BMI ≥ 95% met the definition for obesity. Frequencies run on BMI were found to be positively skewed [Skew of .860 ÷ Standard error of Skewness (.337) = 2.55: greater than 1.96 standard deviation units]. BMI percentages were found to be platykuric with greater than 1.96 standard deviation spread (-2.05). Standardized zBMI scores had an acceptable skew (0.10) and kurtosis (-1.24) and were used as the outcome variable for correlational analyses (See Table 5 for scale variables). The sample in this study had BMIs ranging from 14.2 – 25.2 that resulted in a range in BMI percentiles of 4- 98%. Standardized zBMI scores ranged from -1.73 – 2.12 with a mean of 0.13, SD = 1.0.

The *Feel Bad Scale (FBS)* measuring chronic stress resulted in a total score based upon 20 items. Total scores were calculated by multiplying the child's answer to 'severity of stress' to an item by the 'frequency of the stress' to that same item. All answers were summed to provide the total score. In the raw data, 2-3 responses to the frequency and severity scales were missing so mean scores were imputed to reserve all

Table 4

Parent Weights and Family Routines

	N	%	M	*SD*	Range
Marital					
Married	22	44			
Other (i.e. single, divorced, widowed, etc.)	28	56			
Mothers					
Age			41	6.4	27-55
Weight:					
Underweight	2	3.9			
Normal weight	28	28			
Overweight	19	37.3			
Obese	2	3.9			
Fathers					
Age			43.9	7.47	29-61
Weight:					
Underweight	1	2			
Normal weight	27	52.9			
Overweight	9	17.6			
Obese	7	13.7			
Family characteristics					
people living in home			3.9	1.36	2-7
dinners cooked/wk			5.1	1.24	2-7
dinners eaten as a family/wk			5.4	1.45	2-7
hours child sleeps/school night			9	0.8	7.5-11
eats breakfast:					
Yes	40	80			
No	2	4			
At School	8	16			

N= count

% = percentage

M = mean of sample

SD = standard deviation of sample

[self reports by consenting parent]

Table 5

Scale Variables' measures of central tendency

Variables	N/ %	M	*SD*	Range	α (*)
Body Mass Indices					
BMI		18.01	2.93	14.2-25.2	
BMI percentile		53.36	30.3	4-98	
zBMI		0.13	1	- 1.73 to 2.12	
Weight categories					
Underweight	1/ 2				
Normal Weight	37/ 74				
Overweight	7/ 14				
Obese	5/ 10				
Feel Bad Scale					
Frequency subscale		41.16	9	21-62	0.77
Severity subscale		49.4	16	21-86	0.89
Total		106.36	48.7	24-261	
Schoolagers' Coping Strategies Inventory					
Frequency subscale		34.8	10.9	13-64	0.84
Helpfulness subscale		33.16	11.14	9-73	0.8
Family Connectedness		22.5	3.4	2-7	0.66

* 95% CI

N= count

% = percentage

M = mean of sample

SD = standard deviation of sample

α = Cronbach's alpha

fifty participants' data for use in the calculations. In this study, the 'magnitude of badness' means ranged from 1.8 – 3.3 and the items ranked most severe ('terrible') were: parents separate, try new things, parents argue, not finishing homework, and being left out of a group. The 'frequency' of the 'badness' means ranged from 1.4 – 2.74 and the items occurring most frequently were: being bored, feeling sick, pressure for good grades, parents arguing, and being late to school. Using both subscales to create the Total FBS score for this study, M = 106 (range 24- 261), SD = 48.7. Frequency of stress scores ranged from 21-62 (potential range was 20-100), M= 41.2, SD= 9.0. Severity of stress scores ranged from 21-86 (potential range was 20-100), M=49.4, SD= 16.

Schoolagers' Coping Strategies Inventory (SCSI) measured the 'frequency of use' and 'helpfulness' of 30 coping strategies. Each subcategory score was determined by adding together the weighted score per item and per category. This tool provides 2 subscales but is not intended for use as a total score. Responses were missing from the raw data (< 5%) so mean scores were imputed in order to preserve the input from all participants. Ratings for each item ranged from 0-3 (possible range 0-90). In this study, the means for 'frequency' of coping strategies ranged from M = 34.8 (range 13-63), SD = 10.9 and the strategies used most often were: tell the truth, relax, play, do something fun, and say I am sorry. The means for 'helpfulness' of coping strategies ranged from M = 33.2 (range 9-73), SD = 11.1 and the most helpful strategies being: telling the truth, relaxing, doing something fun, playing, and solving problems.

Family connectedness measured the child's report of how connected they felt to their family and how involved their family was with them. The 7 items were scored 1-4 for a possible range of scores of 7- 28. Skew and kurtosis calculations deemed the distribution of family connectedness scores as normal. Reverse scoring was performed on

the items so higher total scores would reflect higher levels of family connectedness. In this study total FC scores ranged from 15-28, M = 22.5, SD = 3.4.

Data Analysis Answering Research Questions

Research Question 1: Are there relationships between perceived chronic stress, coping strategies, family connectedness, and weight in fourth and fifth grade children?

Correlations were run to determine significant relationships between the variables and weight. The 'frequency' of coping strategies was related to the 'helpfulness' of the strategy, Pearson's r is 0.762, $p < 0.01$. Increased family connectedness was associated with 'helpfulness' of coping strategies, Pearson's r .284, $p < 0.05$. However, chronic stress, coping strategies, and family connectedness were not significantly related to weight in this sample of fourth and fifth grade students (See Table 6).

Research Question 2: To what extent do chronic stress, coping strategies, family connectedness, meals eaten together, children's school night sleep add to the variance in children's weight?

Bivariate correlations were run to identify significant relationships before determining if regression analysis could be run and used as predictors for children's weight. A significant inverse relationship was present between the frequency of the family sitting together for dinner and zBMI scores, Pearson's r -.384, $p < .01$. More dinners eaten together as a family were related to lower zBMI scores in children. Chronic stress scores, coping strategies, family connectedness, and children's school night sleep did not reveal any significant relationships; therefore only 'frequency of the family sitting together for dinner' was put into a regression model. The regression model utilizes the method of ordinary least squares and calculates the differences between observed and predicted values as well as amount of residual variance not explained by the model. Regression

Table 6
Correlation Matrix

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1) zBMI	*1.00*														
2) Feel Bad Scale	-.09	*1.00*													
3) 'Freq' Coping	.11	.06	*1.00*												
4) 'Helpfulness' of Coping	.18	-.25	***.76**	*1.00*											
5) Family Connectedness	.12	-.24	.18	***.28**	*1.00*										
6) Married	-.20	-.13	-.01	.08	.18	*1.00*									
7) # living in home	-.16	-.06	.07	.26	.19	***.49**	*1.00*								
8) Mother- Educ.	-.26	.13	-.03	-.10	.08	.15	.04	*1.00*							
9) Father- Educ.	***-.29**	.03	-.19	-.13	.10	.20	.15	***.49**	*1.00*						
10) Mother- Weight	.13	-.19	.12	.21	-.03	.18	.13	-.05	.07	*1.00*					
11) Father- Weight	.12	-.03	-.13	-.01	.23	***.42**	***.47**	.11	.10	.10	*1.00*				
12) Child- Sleep on school night	-.17	***.28**	.05	.00	.05	.01	-.09	***.38**	***.28**	-.02	.07	*1.00*			
13) Eats breakfast	.13	.15	.01	.03	.09	-.03	-.15	.09	-.08	-.03	-.01	***.32**	*1.00*		
14) 'Freq' of cooking dinner	-.13	.13	-.08	-.23	.02	***.36**	.21	-.04	.21	-.02	.05	-.16	.23	*1.00*	
15) 'Freq' of family sitting together for dinner	****-.38**	-.10	-.23	***-.28**	-.18	.10	.06	.21	.21	.01	-.30	-.14	.23	****.46**	*1*

*Significance *< .05,, **< .01, **<.001, two-tailed*

assumptions were evaluated prior to analyses and assessed normality, linearity, homoscedasticity, residuals, and independence of variables. A scatter plot was attained looking for outliers that could influence the findings and none were found. Checking the normal distribution of the dependent variable resulting in using z BMI scores, providing a normal distribution without extreme skewness or kurtosis. Histograms were attained and indicated a linear relationship between 'frequency of family sitting at dinner together' per week and zBMI scores. There was only one predictor variable to enter into the regression equation so multicollinearity between variables was not a concern in this study. In the model summary, the strength of the relationship between 'frequency of family sitting together' and zBMI was $r = .384$ and $R^2 = .147$. The frequency of the family sitting together at dinner every week explains 14.7% variance in zBMI scores. ANOVA table F (1, 48) = 8.3, $p = .006$ representing model improvement when adding in frequency of family sitting at dinner per week to predict zBMI. There was no influence of outliers as assessed by Cook's distance, M=.022, SD = .033 (> 1.0 indicates outliers may be a problem). The scatter plots of the residuals assessed for variance (homoscedasticity) of the predictors by plotting studentized residuals against the predicted values of the zBMI scores. The distribution of the standardized residuals appeared to have a normal distribution and the P-P plot of the regression standardized residuals appeared close to the plot line. The observations appeared to be independent and were tested using Durbin-Watson test (normal range 1-3), 2.556 for negative correlation residuals.

Research Question 3: Are there significant relationships between: parent's marital status, number of people in the home, parent's educational level, parent's weight, child's sleep on school nights, breakfast eaten at home, number of times family cooks dinner per week, and

number of times family eats dinner together per week, family connectedness, and weight in fourth and fifth graders?

The zBMI scores were significantly correlated with dad's educational level, $r = -.285$, $p < .05$, indicating children's zBMI scores were lower with an increase in dad's educational level. The family eating dinner together revealed an inverse relationship to zBMI scores in children, $r = -.384$, $p = .006$ suggesting lower zBMI scores in children whose families sit and eat dinner together. The marital variable contained subcategories (married, single, divorced, widowed, etc.) and was dummy coded to represent a categorical variable, i.e. '1' for married and '0' for all other responses. 'Marital status' was significantly related to the 'number of people living in the home', $r = 0.491$, $p < .001$, 'father's weight' $r = 0.491$, $p < .001$, and 'frequency of cooking dinner/ week' $r = 0.355$, $p = .011$. Several variables had significant correlations to each other, though not zBMI scores (See Table7). The 'frequency of cooking dinner' per week was significant with 'frequency of family sitting together to eat dinner', $r = 0.463$, $p = .001$. Parent's educational level was positively related to the child sleeping more hours on a school night: 'mom's education' resulted in $r = .377$, $p = .007$, 'dad's education' $r = .279$, $p = .049$. So that hours of school night sleep increased with higher parental educational status.

In summary, total scores on chronic stress did not correlate with zBMI scores in children. Increased frequency of family sitting together for meals did correlate directly with lower zBMI scores. This study found support for family supervision and family routines evidenced by: being married positively associated with frequency of cooking dinner, frequency of cooking dinner was statistically significant with frequency the family sat together for meals, and longer sleep on school nights related to higher parent education. As the literature suggested, the time children have with their families allows for communication, monitoring, and supervision.

Chapter 5

Discussion and Conclusions

The purpose of this cross-sectional exploratory study was to explore correlations between chronic stress, coping, family connectedness, family characteristics, and weight in fourth and fifth grade children. Guiding this study was the Bio-Psycho-Social Model of Health, used to conceptualize the interrelatedness of the biological, sociological, and psychological dimensions. A nonprobability sample of 50 children was recruited to participate in this survey study.

Discussion of the Findings

Research Question 1: Are there relationships between perceived chronic stress, coping strategies, family connectedness (FC), and weight in fourth and fifth grade children?

There were no statistically significant correlations between scores on chronic stress, coping, family connectedness and zBMI scores in the children. 'Helpfulness' and 'frequency' of coping strategies were found to be significantly related to each other but not significantly related to zBMI. In addition, an inverse relationship was found between lower zBMI scores and higher perceived chronic stress scores (Feel Bad Scale- FBS) although this was not statistically significant. These findings are contrary to what was expected as chronic stress has been associated with extended cortisol release that is believed to promote visceral obesity and diabetes (Dimitriou, Maser-Gluth, & Remer, 2003; Masuzaki, Paterson, Shinyama, Morton, & Mullins, 2001; Mc Ewen, 2007; Torres & Nowson, 2007), whereas acute stress has been found to be related to weight loss and reduced appetite secondary to adrenalin release. The children with the lowest zBMIs appear to have higher stress scores but, again, these findings were not statistically significant.

Research Question 2: To what extent do chronic stress, coping strategies, family connectedness, meals eaten together, children's school night sleep add to the variance in children's weight?

Correlations were run and the frequency of family sitting together at dinner was correlated to zBMI scores and thus placed in a regression model. The frequency of family sitting together at dinner accounted for 14.7% of the variance in zBMI scores in children. Frequency of the family sitting together at dinner each week was inversely related to both 'helpfulness' and 'frequency' of coping strategies. A possible explanation for these inverse relationships is the reduced need for coping strategies when the family spends time together. Furthermore, family connectedness was shown to be significantly related to the helpfulness of coping: future studies should consider structural equation modeling to determine if a moderator, such as chronic stress, influences this relationship. Eisenberg, Ackard, and Resnick (2007) described the protective nature of having a caring adult present for a child and their influence on promoting a sense of connectedness in the family. The child feels connected when they can talk to their parent(s), feel they are respected in the family, feel their privacy is valued, and that their parent(s) value them (Elliot & Reis, 2003). Family connectedness can assist the child in how they perceive stress and how they cope with stress (Cohen, 2004).

Higher chronic stress scores on the FBS were related to lower 'helpfulness' of coping strategies and lower family connectedness (FC) scores though neither reached the level of significance. It is possible the higher FBS scores was actually measuring an acute stress experience, as this sample was overhead discussing current parental separations and one parent's drug use. While the constructs being measured appear to be separate, variations in the relationships between the coping strategies' subscales, chronic stress, and family connectedness

indicate a moderator or mediator effect may be present. Statistically significant correlations link higher FC to greater 'helpfulness' of coping strategies, yet time with the family during mealtime had an inverse relationship to coping 'helpfulness' suggesting an interaction effect not possible to discern in this small sample of children. Lewis, Siegel, and Lewis (1984) identified the importance of children having time with their parents and the importance of a family routine to promote connectedness and aid in the adoption of healthy coping strategies (Repetti at al., 2002; Ryan- Wenger, 2000).

Increased sleep children receive on school nights was significantly related to higher FBS scores and showed a negative trend toward lower zBMI scores but this association was not statistically significance. Sleep is important to maintain circadian rhythm patterns which include the release of hormones regulating energy balance: satiety (leptin) and hunger (ghrelin). The findings of increased sleep trend with lower zBMI is a positive indicator, but having it relate significantly to higher stress scores suggests it may be a compensatory coping strategy. In this study the children with lower zBMI scores reported higher stress so sleep may be limiting exposure to stressful stimuli, i.e. in response to allostatic load (McEwen, 2003, 2007; Rice, 2000).

Research Question 3: Are there significant relationships between: parent's marital status, number of people in the home, parent's educational level, parent's weight, child's sleep on school nights, breakfast eaten at home, number of times family cooks dinner per week, and number of times family eats dinner together per week, family connectedness, and weight in fourth and fifth graders?

There were significant correlations between children's lower weights, increased frequency of family sitting at dinner, and higher education in the fathers. Mother's education

also had a negative correlation with zBMI scores, but these findings did not meet the level of statistical significance. (See Table 6 for all correlations of significance). Higher education in the mother and father were significantly and positively associated with the amount of sleep a child had on a school night. The association between sleep on a school night was significant and positively related to the children reporting they eat breakfast. These findings suggest higher parental education is associated with the establishment of family routines, possibly healthier meal plans, and an awareness of the importance of time together as a family.

Parental education is related to parent's income, occupation, and the family's socioeconomic status (SES). Strauss and Knight (1999) described lower SES and lower scores on cognitive stimulation in the home as significant risk factors for obesity in children. Beyond the discussion of foods present in the home is the potential presence of parenting stress as noted by Moens, Braet, Bosmans, and Rosseel (2009). They discussed parenting stress as associated with elevated BMI in both the parents and their children. Familial characteristics, such as maternal BMI, SES, marital status, number of children in the home, life events, and parental stress score, accounted for 26.5% variance in children's BMI. Changing family structure may contribute to parental stress secondary to single parent homes, parental working hours, variations in family composition, and actual time spend together as a family.

In this study, the frequency of cooking dinner per week was statistically and significantly related to being married, and with the frequency of the family sitting together at meals. These findings suggest family routines provide for stability in families. Evening meals taken together as a family, as described by Kime (2008), are important in establishing traditions and supports family cohesion and communication.

Conclusions

This study used the interrelated dimensions of the Bio-Psycho-Social Model of Health to build a framework for obesity in children. Dietary intake and activity expenditure is irrefutably related to children's weight, yet energy balance signals can be dysregulated by chronic stress and unhealthy coping mechanisms. The ability to manage stress is a dynamic process with origins in early childhood. The lived experiences of the child drive their physiological and emotional development. The home environment, parent/ child relationship, and presence of the parents influence how the child perceives and copes with stress. Children's reports of stress include not having time with their parents, fear of being late, not having enough time to finish homework, and witnessing conflict between their parents (Brobeck et al., 2007; Lewis et al., 1984; Ryan-Wenger, Sharrer, & Campbell, 2005).

The present study did not find relationships between chronic stress and obesity in this sample of 4th and 5th grade children. The correlation between zBMI scores and frequency of eating dinner together suggests a mechanism may be occurring that was not measured in this study. Children desire face time with their parents and family. Conversations during mealtimes can promote a environment of learning and sharing between family members. Learning about each other's emotions and ways of coping with stressors provides children with strategies to manage their own emotional upsets (McKelvey, Fitzgerald, Schiffman, & Von Eye, 2002; Strauss & Knight, 1999).

Consistent family routines such as cooking meals, eating dinner together, more sleep on school nights, and eating breakfast are healthy behaviors that promote optimal health (Ievers-Landis et al., 2008). This study's findings suggest the importance of these family routines, and while not directly correlated with weight, are indicators of positive family patterns. The higher

the frequency of family sitting together at dinner is related to lower zBMI in children. Lower children's zBMI is associated with having parents who have more education. Higher education in parents is related to children sleeping longer on school nights and the increased likelihood to eat breakfast. Previous studies identify the importance of supervising and monitoring children's activities which can be inconsistent with divorced, single, blended families (Moens, Braet, Bosmans, & Rosseel, 2009; Yannakoulia, et al., 2008). Being married is correlated with the higher frequency of cooking dinner, which is also related to the higher frequency of eating meals together. Parental monitoring and supervision of children's routines sets the boundaries for acceptable behaviors and promotes a secure home environment and in turn healthy coping strategies. Franko et al. (2008) found that good eating behaviors were linked with greater family cohesion and emotional connectedness. As changes in the family network have taken place, so have traditional meal time practices changed. Kime (2008) interviewed families with three generations and discerned meal time differences between families with a normal weight child and ones with an obese child. The home with the obese child had more disorganized meal times that included eating different foods and at different times, rarely eating together. The homes with the normal weight children tended to have routine mealtimes, eating together, and eating the same foods. The grandparent generation described the ritual of the family returning at the end of the day to share a meal and socialize as an established pattern that promoted healthier eating environments. Having dinner together as a family can promote cohesion and family connectedness and implies parental monitoring and supervision takes place. Yannakoulia et al., (2008) described correlations between divorced families and increased BMI in 5th and 6th grade children. The authors suggested these correlations may be related to less available parent

supervision and changes in dietary habits that include not eating meals together, not eating at a table, and eating while watching television.

When considered together, the significant correlations lead one to consider that family routines provide structure and boundaries to the children. These boundaries can provide security to the children. Repetti et al. (2003) reported chaotic homes, those lacking supervision by the parents, had a dysregulation effect on the children and their ability to cope with stress. Secondly, fathers are important to the family- their presence in the family, and their level of completed education, correlated with healthier behaviors in the child.

While the hypothesis that higher chronic stress scores would have a significant influence on higher BMI in children was not supported, this study did provide support for the importance of the family sitting together for dinner and BMI in children. Theoretical support exists for the importance of family to the evolution of children's neuroendocrine system. Chronic stress, children's coping, family connectedness, and family routines should be considered in future childhood obesity research.

Strauss and Knight (1999) discussed the potential to change obesity rates if changes in the child's environment were to take place. They reported environmental risk factors for obesity in children as the mother's BMI, lower child cognitive scores, low SES, single mothers lacking a professional occupation, and mothers with less than a high school education. As chronic stress can physically and emotionally dysregulate children, it can also affect parents. The presence of overweight in single mothers and lower SES of families should not immediately lead one to assume poor nutrition. Living with chronic stress can drive behaviors related to craving energy dense foods and the desire to withdraw from social relationships. In this study, seeing the importance of sitting down together for dinner relate to lower zBMI scores in children lends

support for future research to explore bio-psycho-social relations as they pertain to obesity in children.

Limitations

An early power analysis that was run on variables that included a physiological measure suggested a one tailed test, powered at .80, alpha set at 0.05, and medium effect size would require a sample of 68 participants. The decision to select other variables should have led to another power analysis. Specifically a two tailed test should have been considered; therefore because of the small sample obtained this study was underpowered. Post hoc power analysis based on a two tailed test suggested a sample size of 84 participants. Despite recruitment of 414 families, challenges occurred with recruitment in the elementary school, and getting parents to return the packets further affected this sample size.

A potential threat to internal validity occurred secondary to nonrandom procedures for sample selection. Locations for recruitment were not assigned: principal and directors provided authorization upon multiple phone conversations and emails discussing recruitment of their population of children. Potential threats to external validity include the current social concern for childhood obesity. Media attention highlighting the prevalence of adult and childhood obesity may have overwhelmed potential participants and influenced their decision not to participate. The instruments used were self report surveys with inherent risks for response bias and memory recall. And finally, this sample is small and may not be representative of the general population so making generalizations should be done with caution.

Lessons learned in this study were (a) the importance of adequate sample size to support power of the study and (b) future studies need to implement a series of correspondence letters to

potential participants (i.e. ‘an invitation to participate letter’ and a follow up ‘thank you/ reminder letter’) in order to promote better response rate among potential participants.

Implications and Recommendations

Nursing Practice

Childhood obesity is multi-dimensional and should be studied holistically from a bio-psycho-social perspective. Nursing practice concerned with weight in children should assess the family unit as well as the dynamics in the family. Implementation of programs designed to maintain or reduce weight in children should include scheduling family meals together as often as possible throughout the week. Carving out leisure time for the family can promote conversations and will aid the child’s processing of novelty even the parent is not around. As nurses have better access to children and their families, education on the relationships between hormonal influence on appetite and food choices would be beneficial. Programs for weight management should request a diary of foods eaten and a listing of emotional states during a designated week

Nursing Education

Nurses can affect change in overweight and obese children by considering more than diet and exercise in the treatment of unhealthy weights in children. Healthy behaviors require education of children and their parents on the influence stress has on food choices, coping strategies, and relaxation techniques. Seeking family and social support is a healthy coping strategy. Promoting regular meal times, quality family time, stress relieving activities such as playing board games/ riding bicycle/ going for a walk, and early bedtimes facilitate good health

and optimally influence body mass index. Education for parents should include the importance of having time daily to sit down as a family.

Nursing Research

Future research on childhood obesity should continue to explore family routines, family connectedness, and associations between coping and weight status looking beyond diet and activity. A replication of this study with a larger sample size would be valuable to see if significant relationships exist between BMIs and the constructs of chronic stress, coping and family connectedness. This study highlighted the importance of the frequency that the family sits together for dinner and lower zBMI scores in children. At a later date, subsets of this study's sample will be analyzed for differences on coping strategies, chronic stress, and family connectedness between the obese and normal weight children by use of t-tests.

Future directions for childhood obesity research should include early attachment to mothers because dysfunctional coping in children can be traced back to early attachment problems (Elliot & Reis, 2003). Also, as family units have changed so have children's early environments (e.g. working single parent, day care, ability to breastfeed, etc.) therefore monitoring children's physical and psychological development would contribute to the knowledge regarding childhood obesity. In addition, future studies measuring biomarkers such as salivary cortisol would add to the knowledge about chronic stress and obesity in children.

Summary

Obesity in children *may* result from chronic stress and inadequate coping strategies as the literature suggests however the findings in this study suggest the importance of the frequency the family sits together for a meal is related to children's weight. Children learn how to judge

chronic stress and develop coping strategies from time with their parents. Family relationships and a stable home environment are important contributors promoting the child's emotional development, which can buffer the perception of chronic stress as well as prepare the child to cope with stress. Unhealthy coping strategies can include distracting one's self with food, alcohol, substance use or avoidant behaviors such as being alone and excessive use of television or computers. Exploring the bio-psycho-social dimensions of the child will promote success with childhood obesity interventions.

Appendix A- Instruments

FQ- Family Questionnaire

FBS- Feel Bad Scale

SCSI- Schoolagers' Coping Strategies Inventory

FC- Family Connectedness

Child's Data sheet

Child's BMI form

Family Questionnaire All questions refer to your fourth/ fifth grade child's family

1) *Who* is filling out this form? _____ (mother, father, grandparent, other)

2) Has your fourth or fifth grade child been **hospitalized** in the past *two weeks*? _____

3) ***Parents*** are:

_____married _____widowed _____separated

_____remarried _____divorced _____single

4) **MOTHER**

Age_____

Highest grade level completed _____

Occupation or work_____

Mom is: ___underweight ___healthy weight ___overweight ___obese

5) **FATHER**

Age_____

Highest grade level completed _____

Occupation or work_____

Dad is: ___underweight ___healthy weight ___over weight ___obese

6) **HOME INFORMATION**

Number of people living in the home: _____

Does your child eat breakfast at home? _____ yes _____no

If *'no'*, do they eat at school?_____

How many times a week does the family cook dinner? _____

How many times a week does the family eat dinner together? _____

How many hours does your child sleep on a school night? _____

ID#_____			1					2			
FEEL BAD SCALE		**How Bad** is it?					**How Often** does it happen?				
1) Having parents separate	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
2) Pressure to try something new, like smoking, that you do not want to try	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
3) Having your parents argue in front of you	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
4) Not spending enough time with Mom or Dad	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
5) Feeling sick	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
6) Fighting with your parents about house rules	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
7) Not having homework done on time	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
8) Moving from one place to another	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
9) Not getting along with your teacher	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
10) Being overweight or bigger than others your age	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
11) Changing schools	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
12) Not having enough money to spend	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
13) Not being able to dress the way you want to	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
14) Feeling left out of the group	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
15) Having nothing to do	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
16) Being pressured to get good grades	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
17) Not being good enough at sports	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
18) Being late for school	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
19) Feeling like your body is changing	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time
20) Being smaller than others your age	not bad	a little bad	pretty bad	real bad	terrible	never	1 or 2 times	sometimes	often	all the time

SCHOOLAGERS' COPING STRATEGIES INVENTORY- II © N. Ryan-Wenger, 2004 SCSI-II

Some kids do these things when they are *experiencing* something <u>stressful</u> or <u>feeling</u> stressed.	**When you are stressed *how often* do you do these things?**				**How *helpful* is this for you when you are stressed?**			
	0	**1**	**2**	**3**	**0**	**1**	**2**	**3**
Ask questions about it	**Never**	**Once in a while**	**A lot**	**Most of the time**	**not helpful**	**Sometimes**	**Most of the time**	**Always helps**
Be alone	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Bite my nails	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Control myself	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Crack my knuckles	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Daydream	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Do something fun	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Do something about it	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Eat something	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Find out more about it	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Fight with someone	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Figure it out	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Forget about it	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Get away from it	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps

Give up	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Hit, throw, or break things	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Hope for the best	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Hug something	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Pick on someone	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Play	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Pray	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Relax	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Say I'm sorry	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Sleep	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Solve the problem	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Stop thinking about it	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Tell myself it's ok	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Tell the truth	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Think about it	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps
Yell	Never	Once in a while	A lot	Most of the time	not helpful	Sometimes	Most of the time	Always helps

ID# _____

Family Connectedness Scale (Circle the response that describes how you feel)

1) Can you talk to your father about problems you are having?	Yes, most of the time	Sometimes	Not very often	My father is not around
2) Can you talk to your mother about problems you are having?	Yes, most of the time	Sometimes	Not very often	My mother is not around
3) How much do you feel your parents care about you?	Most of the time	A lot	Once in a while	Not at all
4) How much do you feel your family cares about your feelings?	Most of the time	A lot	Once in a while	Not at all
5) How much do you feel your family understands you?	Most of the time	A lot	Once in a while	Not at all
6) How much do you feel your family has lots of fun together?	Most of the time	A lot	Once in a while	Not at all
7) How much do you feel your family respects your privacy?	Most of the time	A lot	Once in a while	Not at all

Children's Data:

I am a: _____boy ____girl.

My age is: _____

My birthdate is: _____ _____
Month Year

If someone asks me my ***race***, I call myself:
__ American Indian or Alaska Native
__ Asian
__ Black or African American
__ Native Hawaiian or Pacific Islander
__ White
__ Mexican American
__ Hispanic
__ Middle Eastern
__ Other

Are you a fourth or fifth grader? _____ _____
fourth fifth

Child's BMI data

Study ID #_____ School/ After-school _____

Parental *consent signed*: _____

Family questionnaire completed: _____

Student *assent signed*: _____ Student demographic sheet: _____

Student questionnaires completed: ___FBS ___SCSI-2 ___FCS ___CSS

Date of Measurement: _____

Height: _____

Weight: _____

BMI: _____

BMI %tile: _____

BMI z-score: _____

Appendix B – Consent Form (English/ Spanish)

CONSENT FORM

Study Title: ***Chronic Stress and Obesity in Children***

Principal Investigator: Mari-Ann Ferran Alexander, R.N., Doctoral Candidate in Nursing, University of Texas at Austin
Contact Information: (512) 563-5560, mafalexander@sbcglobal.net
Faculty Advisor: Sharon D. Horner, Ph.D., R.N., Professor of Nursing, UT at Austin

You are being asked to allow your child to participate in a research study. This form provides you with information about the study. After reading the information below, *please contact the principal investigator with any questions you might have about taking part in the study (phone number and email address above).* Your participation is entirely voluntary. You can refuse to participate without penalty or loss of benefits to which you are otherwise entitled. You can stop your participation at any time and your refusal will not impact current or future relationships with University of Texas at Austin or participating sites. To do so simply tell the researcher you wish to stop participation. The researcher will provide you with a copy of the consent for your records.

The **purpose of this study** is to see if relationships exist between the children's reports of chronic stress, their ways of coping with stress, and their weight status.

If you agree that your child may be in this study, we will ask you and your child to do the following things: ***Parent*** will fill out *family questionnaire/demographic form* and the ***child*** will fill out the *questionnaires* on things they find stressful and ways of coping, have their height and weight attained, and provide their date of birth in order to accurately calculate their body mass index.

Total estimated time to participate in the study is approximately 30 minutes**.**

Risks of being in the study are no greater than ordinary life or life events. The questions involve events or activities that they might discuss in their everyday lives, for example: 'How stressful is it to feel sick?', 'How stressful is it to have your parents argue in front of you?', 'How much do you feel your family understand you?', and 'How stressful is it to have a family member sick or hurt?' If you wish to discuss the information above or about any other risks your child may experience, you may ask questions now or call the Principal Investigator listed on the front page of this form.

Benefits of being in the study are broad in that nurses or other people who care for children may learn about the effects of stress and coping on children's weight and this information may provide direction for future activities to help children.

Compensation: No one will receive payment for participating in this study, but a $5 grocery gift card and a University of Texas spiral notebook will be given to your child as a way of thanking them for taking part in this study.

Confidentiality and Privacy Protections: Your child's name will only be on the parent consent form (this form) and the assent form she/he signs to indicate they are willing to be in the study. The questionnaires will not have the child's name on them and will be kept separate from the consent forms and assent forms. Only those children who have parent permission will be asked to participate in the study. No names will be written on the parent/child surveys to assure confidentiality of the child's information.

The **records** of this study will be stored securely and kept confidential. Authorized persons from the University of Texas at Austin and members of the Institutional Review Board (IRB) are the only persons with the legal right to review the child's research records and will protect the confidentiality of those records to the extent permitted by law. The **data** resulting from your child's participation *may* be made available to other researchers in the future for research purposes not detailed within this consent form. In these cases, the data will contain no identifying information (other than date of birth) that could associate your child with it or participation in the study.

All publications will exclude any information that will make it possible to identify your child as a subject. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

Contacts and Questions

If you have any questions about the study, please ask now. If you have questions later, want additional information, or wish to withdraw your child's participation call the researchers conducting the study. Their names, phone numbers, and email addresses are at the top of the form. If you have questions about your child's rights as a research participant, complaints, concerns, or questions about the research please contact **Jody Jensen, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects** at (512) 232-2685 or the Office of Research Support at (512)471-8871 or email: orsc@uts.cc.utexas.edu.

You may keep *the copy* of this consent form.

_____ _____

Print name of your child (fourth or fifth grader)

_____

Home address

_____ _____

Signature of Parent(s) or Legal Guardian **Date**

_____ _____

Signature of Investigator **Date**

Mari-Ann Ferran Alexander, R.N.

FORMA DE CONSENTIMIENTO

Título del Estudio: ***El Estrés Crónico y la Obesidad en los Niños***

Investigador Principal: Mari-Ann Ferran Alexander, R.N., Candidata Doctorado en Enfermeria, Universidad de Tejas en Austin
Información de Contacto: (512) 563-5560, mafalexander@sbcglobal.net
Faculty Advisor: Sharon D. Horner, Ph.D., R.N., Professora de Enfermeria, UT en Austin

Se le pide que permite a su hijo participar en un estudio de investigación Esta forma le da información sobre el estudio. La persona encargada de esta investigación también explicará este estudio y responderá a todas sus preguntas. Por favor, lea la siguiente información y haga cualquier pregunta que pueda tener antes de decidir si desea o no participar. Su participación es totalmente voluntaria. Puede negarse a participar sin sanción o pérdida de beneficios a los que tiene derecho. Usted puede detener su participación en cualquier momento y no tendrá impacto en las relaciones actuales o futuras con la Universidad de Texas en Austin o en los sitios participantes. Simplemente dile al investigador si ya no desea participar. El investigador le dará una copia de este consentimiento para su archivo.

El propósito de este estudio es ver si existen relaciones entre los informes de los niños de estrés crónico, sus formas de lidiar con el estrés, y su estado de peso.

Si usted acepta que su hijo puede estar en este estudio, vamos a pedir a su hijo lo siguiente: a) Tus padres complete cuestionario de la familia, y b) los niños llenar cuestionarios sobre las cosas que le produzca estrés y los modos de afrontamiento; tener su altura y el peso medido, y dar su fecha de nacimiento con el fin de calcular con precisión el indice de masa corporal (IMC).

Total tiempo estimado para participar en el estudio es aproximadamente 30 minutos.

Los **riesgos** de estar en el estudio no mayor que vida ordinaria. Las preguntas implican actos o actividades que puedan discutir diariamente, example**:** ¿Qué estresante es sentirse enfermo?, ¿Qué estresante es tener a tus padres pelear en frente de ti?, ¿Cuánto sientes que tu familia te entiende?, y ¿Qué estresante es tener un familiar enfermo o lastimado? . Si usted desea hablar de la información anterior o sobre cualquier otro riesgo de que su hijo puede suceder, usted puede hacer preguntas ahora o llama al investigador principal que aparece en frente de esta forma.

Beneficios de participar en el estudio son amplios en que las enfermeras y otras personas que cuidan a los niños pueden aprender sobre los efectos del estrés y afrontamiento en el peso de los niño. Esta información puede proporcionar una orientación para futuras actividades que puedán ayudar a los niños.

Retribución: Nadie va a recibir pago por participar en este estudio, pero una tarjeta de regalo de $5 de comestibles se le dará a su hijo como una forma de darle las gracias por haber participado en este estudio.

Confidencialidad y Protección de Privacidad: El nombre de su hijo sólo estara escrito en la forma de consentimiento de los padres (esta forma) y la forma de aceptación que él/ella signo para indicar que está dispuesto a participar en el estudio. Los cuestionarios no tienen el nombre del hijo/a en ellos y se mantienen separados de las formas de consentimiento y asentimiento. Sólo los niños que tengan permiso de los padres se les pedirá que participen en el estudio. Despues le vamos a dar a su hijo el cuestionario para que lo complete. Ningún nombre será escrito en las encuestas de padre/niño para asegurar la confidencialidad de la información del niño.

Los **registros** de este estudio se guardarán de forma segura y confidencial. Las personas autorizadas por la Universidad de Texas en Austin y miembros de la Junta de Revisión Institucional (JRI) son las únicas personas con derecho legal de revisar los registros de la investigación del niño y protegerán la confidencialidad de los registros en la medida permitida por la ley. Los datos resultantes de la participación de su hijo pueden ser disponibles a otros investigadores en el futuro con proposito de investigación que no se detallan en este forma de consentimiento. En estos casos, los datos no contienen información de identificación (distinta de la fecha de nacimiento) que pudieran asociarse a su hijo o con la participación en el estudio.

Todas las publicaciones se excluya cualquier información que permita identificar a su hijo como un sujeto. Durante el estudio, los investigadores le notificará de nueva información que pudiera afectar su decisión de participar en el estudio.

Contactos y Preguntas

Si usted tiene alguna pregunta sobre el estudio, por favor pregunte ahora. Si usted tiene preguntas más adelante, desea información adicional o desea retirar la participación de su niño llame a los investigadores del estudio. Sus nombres, números de teléfono y direcciones de correo electrónico se encuentran en frente de esta forma. Si usted tiene preguntas sobre los derechos de su hijo como un participante en la investigación, quejas, inquietudes o preguntas sobre la investigación por favor comuníquese con **Jody Jensen, Ph.D., Presidente de la Universidad de Texas en Austin Junta de Revisión Institucional para la Protección de Sujetos Humanos:** (512) 232-2685 or the Office of Research Support at (512)471-8871 o correo electrónico: orsc@uts.cc.utexas.edu.

Usted puede guardar esta copia de la forma de consentimiento.

_____	_____
Escriba el nombre de su hijo (cuarto o quinto grado)	_____
	¿Cuál es su domicilio?
_____	_____
Firma del padre (s) o tutor legal	**Fecha**
_____	_____
Firma del Investigador	**Fecha**
Mari-Ann Ferran Alexander, R.N.	

Appendix C – Child Assent Form (English only)

ASSENT FORM

Chronic Stress and Obesity in Children

I agree to be in a study about chronic stress and weight. This study was explained to my parent(s). My parent(s) said I could be in the study. The only people who will know about what I say and do in the study will be the people in charge of the study.

In this study I will answer questions about what things are stressful to me and what things help me cope. Then I will have my height and weight measured.

Writing my name on this page means that the page was read by me (or to me) and that I agree to be in the study. I know what will happen to me. If I decide to quit the study, all I have to do is tell the person in charge.

_____ _____

Child's Signature **Date**

_____ _____

Signature of Investigator **Date**

Appendix D – Parent Recruitment letter

Elementary school parent letter

After-school parent letter

Spanish after-school parent letter

4th and 5th graders needed

Participate in a research study on **Chronic Stress and Weight** in 4th and 5th graders and receive:
$5 grocery gift card *and* a **University of Texas spiral notebook.**

I would like to invite you and your child to participate in a study on stress and possible effects on weight in children. Healthy fourth & fifth grade students are needed to answer questions on stress and coping and provide their height and weight.

Parents are asked to sign a consent form and fill out a 1-page questionnaire on your family. The children will be asked to complete questionnaires on stress, coping, and family connectedness and get weighed and height measured. All information provided will be kept **confidential** *and* **anonymous** (no names on the questionnaires). Appreciation gifts will be sent to the address you provide on the consent form.

Packet items:

a) Parent

Sign consent form
Fill out 'Family questionnaire'
An additional consent will be sent home for you to keep

b) 4th or 5th grade child

Chronic stress questionnaires (2)
Family connectedness questionnaire
Coping questionnaire

For questions or concerns, I encourage you to contact me via the email address and/or phone number listed below *and* on the consent.

Mari-Ann Ferran Alexander, R.N.
Doctoral Candidate in Parent-Child Health
School of Nursing, University of Texas at Austin
mafalexander@sbcglobal.net
512-563-5560

4th and 5th grade families

ticipate in a research study: **Chronic Stress and Weight** in **4th & 5th graders**
and receive:
$5 grocery gift card *and* a **University of Texas spiral notebook.**

I would like to invite you and your child to participate in a study on stress and possible effects on weight in children. Healthy fourth & fifth grade students are needed to answer questions on stress and coping and allow their height and weight to be measured.

Parents are asked to sign and return a consent form and fill out a 1-page questionnaire on your family. ***ONLY*** those children whose parents give consent will be asked to complete questionnaires on stress, coping, and family connectedness and have their height and weight measured by a registered nurse. The child(ren) will work in a quiet hall or classroom, on site, to provide the child with privacy while answering questionnaires and getting their heights and weights measured. The investigator and a research team will assure the safety of your child.

When data are collected, the children will be returned to the care of the after school team. All information provided will be kept **confidential** *and* **anonymous** (no names on the questionnaires**)**. Appreciation gifts will be given to your children upon completing the questionnaires- so check their backpacks!

Packet items:

a) Parent -Sign consent form (an additional consent will be given to you to keep)
-Fill out 'Family questionnaire'

For questions or concerns, I encourage you to contact me via the email address and/or phone number listed below *and* on the consent.

Mari-Ann Ferran Alexander, R.N.
Doctoral Candidate in Parent-Child Health
School of Nursing, University of Texas at Austin
mafalexander@sbcglobal.net
(512) 563-5560

Familias de 4 y 5 grado

Participen en un estudio de investigación: estrés crónico y peso en 4 & 5 grado y recibirán: una tarjeta de regalo **para comida de $5** y un **cuaderno de la Universidad de Texas.**

Me gustaría invitarte a ti y a tus hijos a participar en un estudio basado en el estrés y efectos posibles acorde el peso en los niños. Necesitamos niños de cuarto y quinto ano escolar que estén saludables para que respondan preguntas sobre estrés y desarrollo y dejar que si peso y estatura sean medidas.

Se les pregunta a los padres que llenen el cuestionario de una página sobre la familia y que firmen un consentimiento para que su hijo o hija pueda participar. SOLAMENTE los niños que tengan el consentimiento firmado por sus padres son lo que recibirán el cuestionario sobre estrés, desarrollo y conexión familiar y tendrán su estatura y peso medido por una enfermera certificada. Los niños estarán en un salón tranquilo, en el sitio, para darles privacidad mientras responden los cuestionarios y so medidos y pesados. El investigador y el equipo del estudio se encargaran de la seguridad de su hijo(a).

Cuando la información sea obtenida, los niños regresaran al cuidado del equipo después de escuela. Toda la información se mantendrá **confidencial** *y* **anónima** (sin nombres en los cuestionarios) daremos regalos de apreciación a sus hijos por completar los cuestionarios- ¡Así que chequén sus mochilas!

El paquete requiere.

a) Padres -firmen el consentimiento (obtendrá una copia adicional para que usted se la quede)
-llene el "cuestionario de familia"

Para preguntas o reclamos, me gustaría que me escriba a mi correo electrónico o a mi teléfono que se encuentran escritos aquí abajo o en el paquete de consentimiento.

Mari-Ann F. Alexander

Mari-Ann Ferran Alexander, R.N.
Doctoral Candidate in Parent-Child Health
School of Nursing, University of Texas at Austin
email: mafalexander@sbcglobal.net **or** telephone (512) 563-5560

Appendix E – Approval Letters

AISD

Principals Agreement

Extend-A-Care After-school program

UTIRB letter

Permission Letter for use of Table 1

AUSTIN INDEPENDENT SCHOOL DISTRICT

Office of Accountability

Department of Program Evaluation

August 11, 2010

Mari Ann Ferran Alexander
1700 Red River St.
Austin, TX 78701

Research Project: R11.20

Dear Ms. Ferran Alexander,

This letter is to let you know that I have received all necessary forms and to notify you of the conditional final approval of your research project entitled, "Chronic Stress and Obesity in Children." Please revise your consent form to include examples of sensitive items from the survey to provide parents more information regarding the study. The questionnaires do ask about risky behaviors and their feelings toward and behaviors of their family members. Student surveys are to be conducted at home and not during school time. Please submit the final consent form to the Department of Program Evaluation prior to contacting principals to recruit schools for your study.

Please remember to submit a 1-2 page executive summary of your results and an electronic link to the full report (if possible) for inclusion in our AISD internal research library. As specified in our Access to Confidential Data Agreement, it is imperative that the anonymity of staff and students be maintained in your final report. Please feel free to contact me if you have any questions. For prompt service, please refer to the research project number above.

Sincerely,

Josie Brunner

Josie Brunner
External Research Coordinator

1111 West Sixth Street • Suite D-350 • Austin • TX 78703
512-414-9566 / fax: 512-414-1707
e-mail: josie.brunner@austinisd.org

Mari-Ann Farran Alexander, R.N.
mafa7227-UTSID
"Chronic Stress & Obesity in Children" - AISD R11.20

(B)

PRINCIPAL AGREEMENT TO PARTICIPATE FORM

Once your project has been recommended for implementation, please obtain principals' signatures and return to: Cathy Malcrba in the Department of Program Evaluation.

I have reviewed the Application for Research Project # R11.20 entitled

_____

and agree that our school will participate, subject to the researcher's compliance with District policies.

Date	Principal		School
9/2/10	Patty Martin	Patty Martin	Casis
9/2/10	Shirlene Justice		ACE Austin 21st CCLC
9/3/10	[illegible]		AISD SAFE THIRD BASE AFTER SCHOOL

Extend-A-Care for Kids

The Bridge Between School and Home Since 1969!

September 11, 2010

Ms. Alexander,

This document is to state that you have been granted permission to try to recruit families from a couple of Extend-A-Care for Kids' after-school programs.

Please make sure you include in your release that when a child is participating in the study, the child will not be in EAC supervision; therefore, the program is not responsible for the supervision of their child. If you want to stay inside the cafeteria where the program is, then you can state that you will remain in the cafeteria to stay close to the program staff.

We look forward to working with you on your study.

Sincerely,

Jaime Garcia
Operations Director

OFFICE OF RESEARCH SUPPORT

THE UNIVERSITY OF TEXAS AT AUSTIN

P.O. Box 7426, Austin, Texas 78713 (512) 471-8871 -FAX (512 471-8873)
North Office Building A, Suite 5.200 (Mail code A3200)

FWA # 00002030

Date: **10/14/10**

PI(s): **Mari-Ann Ferran Alexander** Department & Mail Code: **Nursing**

Title: **Chronic Stress and Obesity in Children**

IRB EXPEDITED APPROVAL: IRB Protocol # **2010-09-0079**

Dear: **Mari-Ann Ferran Alexander**

In accordance with the Federal Regulations the Institutional Review Board (IRB) reviewed the above referenced research study and found it met the requirements for approval under the Expedited category noted below for the following period of time: **10/13/2010 - 10/12/2011**. *Expires 12 a.m. [midnight] of this date.*

Expedited category of approval:

☐ **(1)** Clinical studies of drugs and medical devices only when condition (a) or (b) is met. (a) Research on drugs for which an investigational new drug application (21 CFR Part 312) is not required. (Note: Research on marketed drugs that significantly increases the risks or decreases the acceptability of the risks associated with the use of the product is not eligible for expedited review). (b) Research on medical devices for which (i) an investigational device exemption application (21 CFR Part 812) is not required; or (ii) the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling.

☐ **(2)** Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture as follows: (a) from healthy, non-pregnant adults who weigh at least 110 pounds. For these subjects, the amounts drawn may not exceed 550 ml in an 8 week period and collection may not occur more frequently than 2 times per week; or (b) from other adults and children2, considering the age, weight, and health of the subjects, the collection procedure, the amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 50 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.

☐ **(3)** Prospective collection of biological specimens for research purposes by Non-invasive means. Examples:
(a) hair and nail clippings in a non-disfiguring manner;
(b) deciduous teeth at time of exfoliation or if routine patient care indicates a need for extraction;
(c) permanent teeth if routine patient care indicates a need for extraction;
(d) excreta and external secretions (including sweat);

(e) uncannulated saliva collected either in an un-stimulated fashion or stimulated by chewing gumbase or wax or by applying a dilute citric solution to the tongue;
(f) placenta removed at delivery;
(g) amniotic fluid obtained at the time of rupture of the membrane prior to or during labor;
(h) supra- and subgingival dental plaque and calculus, provided the collection procedure is not more invasive than routine prophylactic scaling of the teeth and the Process is accomplished in accordance with accepted prophylactic techniques;
(i) mucosal and skin cells collected by buccal scraping or swab, skin swab, or mouth washings;
(j) sputum collected after saline mist nebulization.

☒ **(4)** Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing. (Studies intended to evaluate the safety and effectiveness of the medical device are not generally eligible for expedited review, including studies of cleared medical devices for new indications).
Examples:
(a) physical sensors that are applied either to the surface of the body or at a distance and do not involve input of significant amounts of energy into the subject or an invasion of the subject's privacy;
(b) weighing or testing sensory acuity;
(c) magnetic resonance imaging;
(d) electrocardiography, electroencephalography, thermography, detection of naturally occurring radioactivity, electroretinography, ultrasound, diagnostic infrared imaging, doppler blood flow, and echocardiography;
(e) moderate exercise, muscular strength testing, body composition assessment, and flexibility testing where appropriate given the age, weight, and health of the individual.

☒ **(5)** Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for non-research purposes (such as medical treatment or diagnosis). (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(4). This listing refers only to research that is not exempt).

☐ **(6)** Collection of data from voice, video, digital, or image recordings made for research purposes.

☒ **(7)** Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt).

☒ Use the attached approved informed consent.

☐ You have been granted a Waiver of Documentation of Consent according to 45 CFR 46.117 and/or 21 CFR 56.109(c)(1).

☐ You have been granted a Waiver of Informed Consent according to 45 CFR 46.116(d).

Responsibilities of the Principal Investigator:

1. Report immediately to the IRB any unanticipated problems.

2. Ensure the proposed changes in the approved research during the IRB approval period will not be applied without IRB review and approval, except when necessary to eliminate apparent immediate hazards to the subject. Changes in approved research implemented without IRB review and approval initiated to eliminate apparent immediate hazards to the subject must be promptly reported to the IRB, and will be reviewed under the unanticipated problems policy to determine whether the change was consistent with ensuring the subjects continued welfare.

3. Report any significant findings that become known in the course of the research that might affect the willingness of subjects to continue to participate.

4. Ensure that only persons formally approved by the IRB enroll subjects.

5. Use only a currently approved consent form (remember that approval periods are for 12 months or less).

6. Protect the confidentiality of all persons and personally identifiable data, and train your staff and collaborators on policies and procedures for ensuring the privacy and confidentiality of subjects and their information.

7. Submit for review and approval by the IRB all modifications to the protocol or consent form(s) prior to the implementation of the change.

8. Submit a Continuing Review Application for continuing review by the IRB. Federal regulations require IRB review of on-going projects no less than once a year (a Continuing Review Application and a reminder letter will be sent to you two months before your expiration date). If a reminder is not received from Office of Research Support (ORS) about your upcoming continuing review, it is still the primary responsibility of the Principal Investigator not to conduct research activities on or after the expiration date. The Continuing Review Application must be submitted, reviewed and approved, before the expiration date.

9. Upon completion of the research study, a Closure Report must be submitted to the ORS.

10. Include the IRB study number on all future correspondence relating to this protocol.

If you have any questions call or contact the ORS (Mail Code A3200) or via e-mail at orsc@uts.cc.utexas.edu.

Sincerely,

Jody L. Jensen, Ph.D.
Professor
Chair, Institutional Review Board

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May 13, 2010

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Licensed content author	S R Bornstein, A Schuppenies, M-L Wong, J Licinio
Volume number	
Issue number	
Pages	
Year of publication	2006
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Number of figures / tables	1
Requestor type	Student
Type of Use	Thesis / Dissertation
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Reference List

Allan, J.D. (1998). New directions for the study of overweight: weight research across the life span. *Western Journal of Nursing Research, 20,* 7-11.

Alwin, D.F., Converse, P.E., & Martin, S.S. (1985). Living arrangements and social integration. *Journal of Marriage and the Family, 47,* 319-334.

American Academy of Pediatrics (Committee on Nutrition). (2003). Prevention of pediatric overweight and obesity: Policy Statement. *Pediatrics, 112,* 424-430.

Appleyard, K., Egeland, B., van Dulmen, M., & Sroufe, L. (2005). When more is not better: the role of cumulative risk in child behavior outcomes. *Journal of Child Psychology and Psychiatry, 46,* 235-245.

Arafah, B.A. (2006). REVIEW: Hypothalamic pituitary adrenal function during critical illness: Limitations of current assessment methods. *Journal of Clinical Endocrinology & Metabolism, 91,* 3725-3745.

Bacal, H.A. (1990). John Bowlby. In H.A. Bacal & K.M. Newman (Eds.), *Theories of Object Relations: Bridge to Self Psychology.* (pp. 207-222). New York, New York: Columbia University.

Belsky, J., & Pluess, M. (2009). The nature (and nurture?) of plasticity in early human development. *Perspectives on Psychological Science, 4,* 345-351.

Block, J.P., He, Y., Zaslavsky, A.M., Ding, L., & Ayanian, J.Z. (2009). Psychosocial stress and change in weight among US adults. *American Journal of*

Epidemiology, 170, 181-192.

Bornstein, S.R., Schuppenies, A., Wong, M.L., & Licinio, J. (2006). Approaching the shared biology of obesity and depression: the stress axis as the locus of gene-environment interactions. *Molecular Psychiatry, 11,* 892-902.

Borrell-Carrio, F., Suchman, A.L., & Epstein, R.M. (2004). The biopsychosocial model 25 years later: Principles, practice, and scientific inquiry. *Annals of Family Medicine, 2,* 576-582.

Bose, M., Olivan, B., & Laferrere, B. (2009). Stress and obesity: the role of the hypothalamic-pituitary-adrenal axis in metabolic disease. *Current Opinion in Endocrinology, Diabetes, & Obesity, 16,*

Bowlby, J. (1982). *Attachment and Loss: Attachment.* New York: Basic Books, Inc., Publishers.

Bricker, J.T., & Blumenschein, S.D. (1990). Systemic hypertension and preventive cardiology. In A. Garson, J.T. Bricker, & D.G. McNamara (Eds.), *The Science and Practice of Pediatric Cardiology.* (pp. 1987-1995). Malvern, Pennsylvania: Lea & Febiger.

Brobeck, E., Marklund, B., Haraldsson, K., & Berntsson, L. (2007). Stress in children: How fifth-year pupils experience stress in everyday life. *Scandinavian Journal of Caring Science, 21,* 3-9.

Brower, S., & Ruggles, S. (2006). Living arrangements of children, by age and race:

1850 - 1990. In Anonymous, *Historical Statistics of the United States, Earliest Times to the Present: Millennial Edition.* (pp. Ae 128-190). New York, New York: Cambridge University Press.

Brower, S., & Ruggles, S. (2006). Living arrangements of unmarried mothers with children by race: 1850-1990. In Anonymous, *Historical Statistics of the United States, Earliest Times to the Present: Millennial Edition.* (pp. Ae 191-220). New York, New York: Cambridge University Press.

Cacioppo, J.T., Amaral, D.G., Blanchard, J.J., Cameron, J.L., Carter, C.S., Crews, D., & Quinn, K.J. (2007). Social Neuroscience: Progress and implications for mental health. *Perspectives on Psychological Science, 2,* 99-123.

Cartwright, M., Wardle, J., Steggles, N., Simon, A.E., Croker, H., & Jarvis, M.J. (2003). Stress and dietary practices in adolescents. *Health Psychology, 22,* 362-369.

Caspi, A., Sugden, K., Moffitt, T., Taylor, A., Craig, I., Harrington, H., & McClay, J. (2003). Influence of life stress on depression: Moderation by a polymorphism in the 5-HTT gene. *Science, 301,* 386-389.

Centers for Disease Control. (2005) Prevalence of overweight among children and adolescents: United States, 1999- 2002. Accessed: September 2, 2009 from http://www.cdc.gov/print.

Centers for Disease Control. (2007) Obesity Prevalence. Accessed: January 20, 2009 from http://www.cdc.gov/print.

Center for Disease Control. Body Mass Index (BMI) for Children and Teens. 2003. Accessed: September 2, 2009 from http://www.cdc.gov/print.

Charmandari, E., Kino, T., Souvatzoglou, E., & Chrousos, G.P. (2003). Pediatric Stress: Hormonal mediators and human development. *Hormone Research, 59,* 161-179.

Charmandari, E., Tsigos, C., & Chrousos, G. (2005). Endocrinology of the stress response. *Annual Review of Physiology, 67,* 259-284.

Chen, E., Cohen, S., & Miller, G.E. (2010). How low socioeconomic status affects 2-year hormonal trajectories in children. *Psychological science, 21,* 31-37.

Chrousos, G.P., & Gold, P.W. (1992). The concepts of stress and stress system disorders. *Journal of the American Medical Association, 267,* 1244-1252.

Cohen, S. (2004). Social relationships and health. *American Psychologist, 59,* 676-684.

Compas, B.E. (1987). Stress and life events during childhood and adolescence. *Clinical Psychology Review, 7,* 275-302.

Cooper, M.L., Shaver, P.R., & Collins, N.L. (1998). Attachment styles, emotion regulation, and adjustment in adolescence. *Journal of Personality and Social Psychology, 74,* 1380-1397.

Cooper, C.E., McLanahan, S.S., Meadows, S.O., & Brooks-Gunn, J. (2009). Family structure transitions and maternal parenting stress. *Journal of Marriage and Family, 71,* 448-574.

Currie, A., & Cappuccio, F. (2007). Sleep in children and adolescents: A worrying scenario- "Can we understand the sleep deprivation-obesity epidemic?" *Nutrition, Metabolism and Cardiovascular Diseases, 17,* 230-232.

Dallman, M.F., Pecoraro, N., Akana, S.F., laFleur, S.E., Gomes, F., Houshayar, H., Mell, M.E., Bhatnagar, S., Laugero, K.D., & Manalo, S. (2003). Chronic stress and obesity: A new view of "comfort food". *Proceedings of the National Academy of Science of the U.S.A., 100,* 11696-11701.

Davis, M., Gance-Cleveland, B., Hassink, S., Johnson, R., Paradis, G., & Resnicow, K. (2007). Recommendations for prevention of childhood obesity. *Pediatrics, 120,* S229- S253

de Kloet, E.R. (2008). About stress hormones and resilience to psychopathology. *Journal of Neuroendocrinology, 20,* 885-892.

Dietz, W. (1998). Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatrics, 101,* 518-526.

Dietz, W.H., & Robinson, T.N. (2005). Overweight children and adolescents. *New England Journal of Medicine, 352,* 2100-2109.

Dimitriou, T., Maser-Gluth, C., & Remer, T. (2003). Adrenocortical activity in healthy children is associated with fat mass. *American Journal of Clinical Nutrition, 77,* 731-736.

Dunn, J. (2002). The adjustment of children in stepfamilies: Lessons from community

studies. *Child and Adolescent Mental Health, 7,* 154-161.

Ebbeling, C., & Ludwig, D. (2008). Tracking Pediatric Obesity. *Journal of the American Medical Association, 299,* 2442-2443.

Eisenberg, M.E., Ackard, D.M., & Resnick, M.D. (2007). Protective factors and suicide risk in adolescents with a history of sexual abuse. *Journal of Pediatrics, 151,* 482-487.

Elliot, A.J., & Reis, H.T. (2003). Attachment and exploration in adulthood. *Journal of Personality and Social Psychology, 85,* 317-331.

Engel, G. The clinical application of the biopsychosocial model. *American Journal of Psychiatry, 137,* 535-544.

Engel, G. (1977). The need for a new medical model: A challenge for biomedicine. *Science, 196,* 129-136.

Evans, G., Kim, P., Ting, A., Tesher, H., & Shannis, D. (2007). Cumulative risk, maternal responsiveness, and allostatic load among young adolescents. *Developmental Psychology, 43,* 341-351.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41,* 1149-1160.

Franko, D.L., Thompson, D., Bauserman, R., Affenito, S.G., & Striegel-Moore, R.H.

(2008). What's love got to do with it? Family cohesion and healthy eating behaviors in adolescent girls. *International Journal of eating disorders, 41,* 360-367.

Fredriksen, K., Rhodes, J., Reddy, R., & Way, N. (2004). Sleepless in Chicago: Tracking the Effects of Adolescent Sleep Loss During the Middle School Years. *Child Development, 75,* 84-95.

Friedman, M., & Brownell, K. (1995). Psychological correlates of obesity: moving to the next research generation. *Psychological Bulletin, 117,* 3-20.

Garbarino, J., Kostelny, K., & Dubrow, N. (1991). What Children Can Tell Us About Living in Danger. *American Psychologist, 46,* 376-383.

Garson, A., Bricker, J.T., & McNamara, D.G. (1990). The Science and Practice of Pediatric Cardiology. In J.T. Bricker & S. Blumenschein (Eds.), *Systemic hypertension and preventive cardiology*. (pp. 1987-1995). Malvern, Pennsylvania: Lea & Febiger.

George, J. (2002). *Nursing Theories: The Base for Professional Nursing Practice.* Upper Saddle River, New Jersey: Prentice Hall.

Goldbacher, E., Matthews, K., & Salomon, K. (2005). Central adiposity is associated with cardiovascular reactivity to stress in adolescents. *Health Psychology, 24,* 375-384.

G*Power 3.1.2 Statistical Power Analysis. *See* Faul, Erdfelder, Buchner, & Lang (2009).

Greeno, C., & Wing, R. (1994). Stress-induced eating. *Psychological Bulletin, 115,* 444-464.

Gunnar, M., & Quevedo, K. (2007). The neurobiology of stress and development. *Annual Review of Psychology, 58,* 145-173.

Gunnar, M.R., Frenn, K., Wewerka, S.S., & Van Ryzin, M.J. (2009). Moderate versus severe early life stress: associations with stress reactivity and regulation in 10-12 year old children. *Psychoneuroendocrinology, 34,* 62-75.

Gunstad, J., Paul, R.H., Spitznagel, M.B., Cohen, R.A., Williams, L.M., Kohn, M., & Gordon, E. (2006). Exposure to early life trauma is associated with adult obesity. *Psychiatry Research, 142,* 31-37.

Hasler, G., Gergen, P.J., Ajdacic, V., Gamma, A., Eich, D., Rossler, W., & Angst, J. (2004). The associations between psychopathology and being overweight: a 20 year prospective study. *Psychological Medicine, 34,* 1047-1057.

Hoelscher, D.M., Mitchell, P., Dwyer, J., Elder, J., Clesi, A., & Snyder, P. (2003). How the CATCH eat smart program helps implement the USDA regulation in school cafeterias. *Health Education & Behavior, 30,* 434-445.

Hollingshead, A. B. (1975). Four factor index of social status. Department of Sociology, Yale University. Received from S. Horner on October 2, 2010.

Ievers-Landis, C.E., Storfer-Isser, A., Rosen, C., Johnson, N.L., & Redline, S. (2008). Relationship of sleep parameters, child psychological functioning, and parenting

stress to obesity status among preadolescent children. *Journal of Developmental and Behavioral Pediatrics, 29,* 243-252.

Jackson, Y., Sifers, S., Warren, J., & Velasquez, D. (2003). Family protective factors and behavioral outcome: The role of appraisal in family life events. *Journal of Emotional and Behavioral Disorders, 11,* 103-111.

Jayson, S. (2005). Divorce is declining, but so is marriage. *USA Today,* Accessed February 2, 2008 via http://www.usatoday.com/news/nation/2005-07-18-cohabit-divorce_x.htm

Jenkins, S., & Rew, L. (2005). Eating behaviors among school-age children associated with perceptions of stress. *Issues in Comprehensive Pediatric Nursing, 28,* 175-191.

Jones, A., Godfrey, K.M., Wood, P., Osmond, P., Goulden, P., & Phillips, D. (2006). Fetal growth and the adrenocortical response to psychological stress. *Journal of Clinical Endocrinology & Metabolism, 91,* 1868-1871.

Keen-Rhinehart, E., Michopoulos, V., Toufexis, D.J., Martin, E.L., Nair, H., Ressler, K.J., & Wilson, M.E. (2008). Continuous expression of corticotropin-releasing factor in the central nucleus of the amygdala emulates the dysregulation of the stress and reproductive axes. *Molecular Psychiatry,* 1-14.

Keith, S.W., Redden, D.T., Katzmarzky, P.T., Boggiano, M.M., Hanlon, E.C., Benca, R.M., & et al. (2006). Putative contributors to the secular increase in obesity:

exploring the roads less traveled. *International Journal of Obesity, 30,* 1585-1594.

Kime, N. (2008). Children's eating behaviors: the importance of the family setting. *Area, 40,* 315-322.

Kochanska, G., Philibert, R.A., & Barry, R.A. (2009). Interplay of genes and early mother-child relationship in the development of self-regulation from toddler to preschool age. *Journal of Child Psychology and Psychiatry, 50,* 1331-1338.

Kuo, L., Kitlinska, J., Tilan, J., Li, L., Baker, S., Johnson, M., Lee, E., & Burnett, M. (2007). Neuropeptide Y acts directly in the periphery on fat tissue and mediates stress-induced obesity and metabolic syndrome. *Nature Medicine, 13,* 803-811.

Kyrou, I., Chrousos, G.P., & Tsigos, C. (2006). Stress, visceral obesity, and metabolic complications. *Annals of the New York Academy of Sciences, 1083,* 77-110.

Landis, A.M., Parker, K.P., & Dunbar, S.B. (2009). Sleep, hunger, satiety, food cravings, and caloric intake in adolescents. *Journal of Nursing Scholarship, 41,* 115-123.

Lansford, J.E. (2009). Parental divorce and children's adjustment. *Perspectives on Psychological Science, 4,* 140-152.

Lazarus, R.S. (1991). Cognition and motivation in emotion. *American Psychologist, April,* 352-367.

Lazarus, R.S. (2000). Evolution of a model of stress, coping, and discrete emotions. In

V.H. Rice (Ed.), *Handbook of Stress, Coping, and Health: Implications for Nursing Research, Theory, and Practice.* Thousand Oaks, CA: Sage Publications, Inc.

Lazarus R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality, 1,* 141-169.

Lewis, C., Siegel, J., & Lewis, M. (1984). Feeling bad: Exploring sources of distress among pre-adolescent children. *American Journal of Public Health, 74,* 117-122.

Luepker, R.V., Perry, C.L., McKinlay, S.M., Nader, P.R., Parcel, G.S., Stone, E.J., & Webber, L.S. (1996). Outcomes of a field trial to improve children's dietary patterns and physical activity: the Child and Adolescent Trial for Cardiovascular Health (CATCH). *Journal of the American Medical Association, 275,* 768-776.

Lustig, R. (2001). The neuroendocrinology of childhood obesity. *Pediatric Clinics of North America, 48,* 909-925.

Lutgendorf, S., & Costanzo, E. (2003). Psychoneuroimmunology and health psychology: An integrative model. *Brain, Behavior, and Immunity, 17,* 225-232.

Luther, B. (2007). Looking at childhood obesity through the lens of Baumrinds's parenting typologies. *Orthopaedic Nursing, 26,* 270-278.

Maselko, J., Kubzansky, L., Lipsitt, L., & Buka, S.L. Mother's affection at 8 months predicts emotional distress in adulthood. *Journal of Epidemiology and Community Health,* Online First, published on July 26, 2010, 1-5.

Masuzaki, H., Paterson, J., Shinyama, H., Morton, N., Mullins, J., Seckl, J., & Flier, J. (2001). A transgenic model of visceral obesity and the metabolic syndrome. *Science, 294,* 2166-2170.

McEwen, B.S. (2003). Mood Disorders and Allostatic Load. *Biological Psychiatry, 54,* 200-207.

McEwen, B.S. (2007). Physiology and neurobiology of stress and adaptation: Central role of the brain. *Physiology Review, 87,* 873-904.

McEwen, B.S. (2000). Neuroendocrine interactions. *Back to Psychopharmacology- The fourth generation of progress.* New York: University Health Foundation.

McEwen, B.S. (2003). Early life influences on life-long patterns of behavior and health. *Mental Retardation and Developmental Disabilities Research Reviews, 9,* 149-154.

McEwen, B.S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine, 338,* 171-179.

McKelvey, L.M., Fitzgerald, H.E., Schiffman, R.F., & Von Eye, A. (2002). Family stress and parent-infant interaction: the mediating role of coping. *Infant Mental Health Journal, 23,* 164-181.

Mellbin, T., & Vuille, J.C. (1989). Rapidly developing overweight in school children as an indicator of psychosocial stress. *ACTA Paediatric Scandinavia, 78,* 568-575.

Mellin, A.E., Neumakr-Sztainer, D., Story, M., Ireland, M., & Resnick, M.D. (2001). Unhealthy behaviors and psychosocial difficulties among overweight adolescents: the potential impact of familial factors. *Journal of Adolescent Health, 31,* 145-153.

Mietus-Snyder, M.L., & Lustig, R.H. (2008). Childhood obesity: adrift in the limbic triangle. *Annual Review of Medicine, 59,* 147-62.

Miller, G., Chen, E., & Cole, S.W. (2009). Health psychology: developing biologically plausible models linking the social world and physical health. *Annual Review of Psychology, 60,* 501-524.

Moens, E., Braet, C., Bosmans, G., & Rosseel, Y. (2009). Unfavourable family characteristics and their associations with childhood obesity: A cross-sectional study. *European Eating Disorders Review, 17,* 315-323.

Munro, B. (2005). *Statistical Methods for Health Care Research.* New York: Lippincott, Williams, & Wilkins.

Nader, P., Stone, E., Lytle, L., Perry, C., Osganian, S., & Kelder, S. (1999). Three-Year maintenance of improved diet and physical activity: The CATCH cohort. *Archives of Pediatric Adolescent Medicine, 153,* 695-704.

National Conference of State Legislatures. (2006) Childhood obesity: update and overview of policy. Retrieved March 15, 2009 via http://www.ncsl.org.

National Conference for State Legislatures. (2008) Physical activity, nutrition & obesity.

Retrieved March 15, 2009 via http://www.ncsl.org.

Nelson, R. (2005). *An introduction to behavioral endocrinology.* Sunderland, Massachusetts: Sinauer Associates, Inc.

Nguyen-Rodriguez, S.T., Chou, C.P., Unger, J.B., & Spruigt-Metz, D. (2008). BMI as a moderator of perceived stress and emotional eating in adolescents. *Eating Behaviors, 9,* 238-246.

Ogden, C., Carroll, M., & Flegal, K. (2008). High body mass index for age among US children and adolescents, 2003-2006. *Journal of the American Medical Association, 299,* 2401-2405.

Ollendick, T., Langley, A., Jones, R., & Kephart, C. (2001). Fear in children and adolescents: Relations with negative life events, attributional style, and avoidant coping. *Journal of Child Psychology and Psychiatry, 42,* 1029-1034.

Ortolon, K. (2003). Fat Kids on the Block. *Texas Medicine, 99,* 26-31.

Pine, D.S., Goldstein, R.B., Wolk, S., & Weissman, M.M. (2001). The association between childhood depression and adulthood body mass index. *Pediatrics, 107,* 1049-1056.

Popenoe, D. and Whitehead, B. (2007). The state of our unions: The social health of marriage in America 2007. National Marriage Project: Rutgers State University, New Jersey.

Popkess-Vawter, S., Wendel, S., Schmoll, S., & O'Connell, K. (1998). Overeating,

reversal theory, and weight cycling. *Western Journal of Nursing Research, 20,* 67-84.

Putnam, J. (1995). Bowling Alone: America's Declining Social Capital. *Journal of Democracy,* 1995.

Repetti, R.L., Taylor, S.E., & Seeman, T.E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin, 128,* 330-366.

Rew, L. (2005). *Adolescent Health: A Multidisciplinary Approach to Theory, Research, and Intervention.* Thousand Oaks, California U.S.A.: Sage Publications, Inc.

Rice, V.H. (2000). *Handbook of Stress, Coping, and Health: Implications for Nursing Research, Theory, and Practice.* Thousand Oaks, CA: Sage Publications, Inc.

Romeo, R., & McEwen, B. (2006). Stress and the adolescent brain. *Annals of the New York Academy of Sciences, 1094,* 202-214.

Roth, J., Qiang, X., Marban, S.L., Redelt, H., & Lowell, B.C. (2004). The obesity pandemic: where have we been and where are we going? *Obesity Research, 12,* 88S-101S.

Ruggles, S. (2006). Family and household composition. In Anonymous, *Historical Statistics of the United States, Earliest Times to the Present: Millennial Edition.* (pp. 1-653 thru 1-659). New York, New York: Cambridge University Press.

Ruschena, E., Prior, M., Sanson, A., & Smart, D. (2005). A longitudinal study of adolescent adjustment following family transitions. *Journal of Child Psychology and Psychiatry, 46,* 353-363.

Ryan-Wenger, N., Sharrer, V., & Campbell, K. (2005). Changes in children's stressors over the past 30 years. *Pediatric Nursing, 31,* 282-289.

Ryan-Wenger, N.A., Sharrer, V.W., & Wynd, C.A. (2000). Stress, coping, and health in children. In V. Hill-Rice (Ed.), *Handbook of stress, coping, and health: Implications for nursing research, theory, and practice.* (pp. 265-293). Thousand Oaks, CA: Sage Publications, Inc.

Sahakian, B. (1982). Psychological factors in childhood obesity. *Journal of Obesity and Weight Regulation, 2,* 181-194.

Schore, A.N. (2003). *Affect Dysregulation and Disorders of the Self.* New York, New York: W.W. Norton & Company.

Schore, A.N. (2003). *Affect Regulation and the Repair of the Self.* New York, New York: W.W. Norton & Company.

Shalala, D. and Satcher, D. Healthy People 2010 Initiative to Guide Prevention: Agenda for next ten years "leading health indicators" unveiled. 2000.

Sharma, V., & McNeill, J.H. (2006). The etiology of hypertension in the metabolic syndrome part four: The systemic perspective- the role of the neuroendocrine and immune systems, and the challenge of integration. *Current Vascular*

Pharmacology, 4, 349-371.

Sharrer, V., & Ryan-Wenger, N. (1995). A longitudinal study of age and gender differences of stressors and coping: Strategies in school-aged children. *Journal of Pediatric Health Care, 9,* 123-130.

Sharrer, V., & Ryan-Wenger, N. (2002). School -age children's self reported stress symptoms. *Pediatric Nursing, 28,* 21-27.

Smart, J.L., Tolle, V., & Low, M.J. (2006). Glucocorticoids exacerbate obesity and insulin resistance in neuron-specific proopiomelanocortin-deficient mice. *Journal of Clinical Investigation, 116,* 495-505.

Soros, A., Zadik, Z., & Chalew, S. (2008). Adaptive and maladaptive cortisol responses to pediatric obesity. *Medical Hypotheses, 71,* 394-398.

Spiegel, K., Leproult, R., L'Hermite-Baleriaux, M., Copinschi, G., Penev, P.D., & Van Cauter, E. (2004). Leptin levels are dependent on sleep duration: relationships with sympathovagal balance, carbohydrate regulation, cortisol, and thyrotropin. *Journal of Clinical Endocrinology and Metabolism, 89,* 5762-5771.

Spiegel, K., Tasali, E., Penev, P., & Van Cauter, E. (2004). Brief Communication: Sleep curtailment in healthy young men is associated with decreased leptin levels, elevated ghrelin levels, and increased hunger and appetite. *Annals of Internal Medicine, 141,* 846-850.

Spieser, P., Rudolf, M., Anhalt, H., Camacho-Hubner, C., Chiarelli, F., & Eliakim. A.

(2005). Consensus statement: Childhood Obesity. *Journal of Clinical Endocrinology and Metabolism, 90,* 1871-1887.

PASW Statistics GradPack 18. SPSS. 2009. Fifth *ed.* Published by SPSS. See website: www.SPSS.com.

Stark, K., & Kaslow, N. (1993). The assessment of depression in children: are we assessing depression or the broad-band construct of negative affectivity? *Journal of Emotional and Behavioral Disorders, 1,* 149-155.

Strauss, R.S., & Knight, J. (1999). Influence of home environment on the development of obesity in children. *Pediatrics, 103, 6,* 85-93

Szabo, S. (1998). Hans Selye and the development of the stress concept: Special reference to gastroduodenal ulcerogenesis. *Annals of New York Academy of Science, 851,* 19-27.

Tanofsky-Krall, M., Cohen, M.L., Yanovski, S., Cox, C., Theim, K.R., Keil, M., Reynolds, J.C., & Yanovski, J.A. (2006). A prospective study of psychological predictors of body fat gain among children at high risk for adult obesity. *Pediatrics, 117,* 1203-1209.

Tarren-Sweeney, M. (2006). Patterns of aberrant eating among pre-adolescent children in foster care. *Journal of Abnormal Child Psychology, 34,* 623-634.

Taxis, J.C., & Rew, L. (2004). Protective resources and perceptions of stress in a multi-ethnic sample of school-age children. *Pediatric Nursing, 30,* 477-487.

Thienemann, M., & Steine, H. (1993). Family environment of eating disordered and depressed adolescents. *International Journal of Eating Disorders, 14,* 43-48.

Thoresen, C.E., & Eagleston, J.R. (1983). Chronic stress in children and adolescents. *Theory into Practice, 22,* 48-56.

Torres, S., & Nowson, C. (2007). Relationship between stress, eating behavior, and obesity. *Nutrition, 23,* 887-894.

Trochim, W.M.K. (2001). *The Research Methods Knowledge Base.* Cincinnati, OH: Atomic Dog Publishing.

Twenge, J.M. (2000). The Age of Anxiety? Birth Cohort Change in Anxiety and Neuroticism, 1952- 1993. *Journal of Personality and Social Psychology, 79,* 1007-1021.

United States Census Bureau (2009). Profile of General Demographic Characteristics: Percentage of children 0-17 years living in various living arrangements. Retrieved September 9, 2010 from http://www.childstats.gov/AMERICASCHILDREN/ .

United States Department of Health and Human Services Press Office (2007). HHS launches childhood overweight and obesity prevention initiative. Retrieved March 12, 2010 from http://www.hhs.gov/news/press/2007pres/11/.

Van den Bergh, B., Van Calster, B., Van Huffel, S., & Lagae, L. (2008). Antenatal maternal anxiety is related to HPA-axis dysregulation and self-reported

depressive symptoms in adolescence: a prospective study on the fetal origins of depressed mood. *Neuropsychopharmacology, 33,* 536-545.

Vazquez, D.M., Eskandari, R., Phelka, A., & Lopez, J.F. (2003). Impact of maternal deprivation on brain corticotropin-releasing hormone circuits: Prevention of CRH receptor-2 mRNA changes by desipramine treatment. *Neuropsychopharmacology, 28,* 898-909.

Vicennati, V., Pasqui, F., Cavazza, C., Pagotto, U., & Pasquali, R. (2009). Stress-related development of obesity and cortisol in women. *Obesity, 17,* 1678-1683.

Vidovic, V., Juresa, V., Begovac, I., Mahnik, M., & Tocilj, G. (2005). Perceived family cohesion, adaptability and communication in eating disorders. *European Eating Disorders Review, 13,* 19-28.

Volling, B.L., McElwain, N.L., Notaro, P.C., & Herrera, C. (2002). Parents' emotional availability and infant emotional competence: predictors of parent-infant attachment and emerging self-regulation. *Journal of Family Psychology, 16,* 447-465.

Walker, L.O., & Avant, K.C. (2005). *Strategies for Theory Construction in Nursing.* New Jersey: Pearson / Prentice Hall.

Walsh, R., & Ryan-Wenger, N. (1992). Sources of stress in children with asthma. *Journal of School Health, 62,* 459-463.

Wardle, J., & Cooke, L. (2005). The impact of obesity on psychological well-being.

Best Practice and Research Clinical Endocrinology and Metabolism, 19, 421-440.

Weaver, I.C.G., Cervoni, N., Champagne, F.A., D'Alessio, A.C., Sharma, S., Seckl, J.R., Dymov, S., Szyf, M., & Meaney, M.J. (2004). Epigenetic programming by maternal behavior. *Nature Neuroscience, 7,* 847-854.

Wood, J.J., Repetti, R.L., & Roesch, S.C. (2004). Divorce and children's adjustment problems at home and school: the role of depressive/withdrawn parenting. *Child Psychiatry and Human Development, 35,* 121-142.

Yacono- Freeman, L.M., & Gil, K.M. (2004). Daily stress, coping, and dietary restraint in binge eating. *International Journal of Eating Disorders, 36,* 204-212.

Yannakoulia, M., Papanikolaou, K., Hatzopoulou, I., Efstathiou, E., Papoutsakis, C., & Dedoussis, G.V. (2008). Association between family divorce and children's BMI and meal patterns: The GENDAI study. *Obesity, 16,* 1382-1387.

Young-Hyman, D., Tanofsky-Kraff, M., Yanovsky, S., Keil, M., Cohen, M., Peyrot, M., & Yanovski, J. (2006). Psychological Status and Weight-Related Distress in Overweight or At -Risk-for Overweight Children. *Obesity, 14,* 2249-2258.

Zahn-Waxler, C., Klimes-Dougan, B., & Slattery, M.J. (2000). Internalizing problems of childhood and adolescence: prospects, pitfalls, and progress in understanding the development of anxiety and depression. *Development and Psychopathology, 12,* 443-466.

Zannolli, R., & Morgese, G. (1996). Distribution of BMI in children: prevalence of wasting and fattening conditions. *Annals of Human Biology, 23,* 63-69.

Vita

Mari-Ann Ferran Alexander was born in Chicago, Illinois on December 20th, 1957, the oldest of six children born to Joseph and Joan Ferran. Upon graduation from high school in 1976 she became a licensed vocational nurse and began her career in pediatric nursing. In 1985 she received her Bachelor of Science in Nursing from the University of Texas and worked as a critical care nurse specializing in pediatric cardiology. Restricted visitation for parents, when children were admitted to the intensive care unit, directed Mari-Ann's interest in the psychosocial health of children and their families. This led to a year of post-baccalaureate studies in clinical psychology at the University of Houston. A move to Boston, Massachusetts put continued educational pursuits on hold to stay at home and care for her son. Upon returning to Texas, she entered the BSN to PhD program at the University of Texas, part time, and continued part time nursing at Dell Children's Medical Center. In 2009 Mari-Ann enrolled full time to design and conduct her research and complete the doctoral program in parent-child health nursing.

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