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The Influences of Caregiver-Child Interactions and Temperament on Cortisol Concentrations of Toddlers in Full-Day Childcare

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The Influences of Caregiver-Child Interactions and Temperament on Cortisol Concentrations of Toddlers in Full-Day Childcare

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by

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ABSTRACT

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The purpose of this study was to explore the influences of caregiver-child interaction and temperament on cortisol concentrations of toddlers in full-day childcare. Sensitive and responsive caregiving is critical to the quality of children's early experiences. Caregivers who are attuned to unique needs of young children can support and guide child growth and development. In the context of relationships the child grows, develops, and learns to biologically respond to events in his or her world that he or she may perceive as threatening, with the production of cortisol. Studies show that regulation of cortisol release later in life may be shaped by social experiences during early development.

This exploratory study investigated the influences of caregiver-child interaction and temperament as measured by the *Early Childhood Behavior Questionnaire* (ECBQ) on cortisol concentrations in toddlers in full-day childcare. Seventy-three (31female, 42 male) toddlers, in 11 full-day childcare classrooms in communities in southern Appalachia participated. Classrooms were evaluated using the toddler *Classroom Assessment Scoring System* (CLASS) and an adapted version of the *Engagement Check II*. Morning and afternoon cortisol concentration was measured in enzymeimmunoassays of saliva.

Findings indicated that as years of teacher experience increased, cortisol concentrations decreased. Likewise, as the percentage of time toddlers were engaged in developmentally appropriate activities increased, cortisol concentration decreased. Mean cortisol concentrations decreased from mid-morning to mid-afternoon. Findings of individual cortisol concentrations were mixed. Temperament data showed a relationship between management of arousal or impulse control (surgency) and cortisol concentration. No statistically significant correlation was found between cortisol concentration and the dimensions of the toddler *CLASS.* Regression analysis of the 3 dimensions of temperament (negative affect, effortful control, surgency) showed surgency to be related to cortisol concentration.

The study adds to the body of research on very young children in full-day childcare and elevated cortisol concentrations by including children in communities in southern Appalachia as well as measuring teacher-child interaction in childcare using the newly released toddler *CLASS*. Future research is needed to delineate the developmental outcomes and long-term impact of excess stress in this population.

DEDICATION

This dissertation is dedicated to my family who supported and encouraged me during this study. They have been my inspiration and guides. To my husband Terry, and our family, created and sustained by his love: Amy, Ellen, Hardy, Franklin, Nathan, and Lacy and their families. They define the power of love and illuminate the value of having each other for every pursuit in life.

This research, which was conducted in southern Appalachia, is also dedicated to my east Tennessee "kin" in whom I first observed the love and nurturing of young children. Long before Bronfenbrenner's bioecological theory of child development, "my people" were in these mountains raising children who knew they were loved. My grandmother was the person in the life of this child who embodied Bronfenbrenner's admonition that every child should have at least one person in their life who is crazy about them.

Our son Nathan has been my constant companion as I worked at home. He contentedly sat in the wingback chair in the computer room with his legs propped on the adjoining footstool. There he serenaded me with background music from *Twinkle, Twinkle, Little Star* to *If You're Happy and You Know It*. When his internal clock said we had been at this long enough he approached the computer, put his hands on top of mine on the keys, and announced, "Don't, don't." Taking my hands and guiding me away from the computer he demanded, "Rest, rest!"

Molly was the sentry at my feet as I compiled this research. Oblivious to papers scattered over the floor she was good for as many all-nighters as this worked required. Never critical of verbal outbursts she was the quintessential never wavering companion of this work supporting Dave Barry's observation that, "You can say anything to a dog and the dog will give you a look that says, *My God you're right! I never would have thought of that!*" Thank you, Molly.

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CHAPTER 1

INTRODUCTION

This study reviewed research and literature related to the status of early childcare for infants and toddlers, caregiver-child interaction in the context of full-day care, and the role of relationship-building and temperament in the development of young children. It explored the physiological response to stress evidenced by cortisol concentrations in young children and how the ability to develop strategies to recognize and respond to stress early in life, in the context of relationships, may impact the developmental trajectory.

Overview

The early years of child development are filled with growth and the acquisition of skills at a rate unprecedented at any other time during human development (Berk, 2008). Both how the skills and accomplishments of early development are acquired and how to optimize developmental progress during the early years have been the focus of theory and research in early childhood development. Research in child development, brain development, attachment, emotion regulation, and neurobiology has shown the importance of relationships in the early years. Research shows that these relationships can either enhance or inhibit the social and biological potential of the child (Thompson, 2001).

Likewise, numerous studies have documented that infants develop attachments to caregivers other than their mothers (Lamb, Thompson, Gardner, & Charnov, 1985; Sroufe & Waters, 1977), and that these attachments influence the child's social-emotional development (Carlson, Sampson, & Sroufe, 2003; Matas, Arend, & Sroufe, 1978; Oppenheim, Sagi, & Lamb, 1988; Schore, 2001). Data from this study were used to assess the quality of the child's relationship to the teacher or caregiver in full-day childcare and how that quality impacted the

child's stress response. Data were also used to examine temperament and its relationship to the stress response. A review of research supports that healthy development is dependent on reliable and quality relationships with significant others and that the benefits of such relationships are sustained throughout a lifetime. In this context the child learns, through interactions with others, to interpret his or her behavior, the emotions of others, and to develop a sense of self.

Statement of Purpose

The purpose of this study was to explore the influences of caregiver-child interaction and temperament on cortisol concentrations of toddlers in full-day childcare. A 1997 study by the National Institute of Child Health and Human Development reported that infants are enrolled in childcare before the age of 1 by the majority of parents in the United States. Seventy-two percent of infants receive nonparental care during the first year, with an average age of entry into care of 3.31 months, according to the NICHD study (National Institute of Child Health and Human Development: Early Child Care Research Network, 1997). The study was conducted as a result of national concerns regarding nonparental care of infants and young children. It is in this setting that a significant portion of the child's early years of discovery, development, and relationship building occur.

In the United States, six million infants and toddlers spend some or all of their day being cared for by someone other than their parents. For more than 40% of those infants and toddlers the provision of care takes place in childcare centers of poor quality (Zero to Three, 2009). Directly related to quality of care is continuity of providers of care. For childcare settings, the annual job turnover rate is between 25% and 40% (Sper, 2012). Mims, Scott-Little, Lower, Cassidy, and Hestenes (2008) documented the relationship between turnover rates for teachers in early childhood programs and its association with levels of quality. One result of high turnover is

the lack of opportunity for infants and toddlers in full-day care to form secure nurturing relationships with their caregiver. High turnover and its resulting inconsistent care is a typical finding in childcare settings, which increases the risk of poor quality attachment and its influence on social-emotional development. This has created concern for families, childcare programs, health care providers, policy makers, and communities (Belsky et al., 2007; NICHD Early Child Care Research Network, 1997; Shonkoff, 2008).

Poor quality and high turnover in childcare settings have created a lack of opportunity for the most important component of early childcare: the relationship between the child and caregiver. The development of close early relationships impacts the young child's ability to regulate emotions and is the context in which all learning and patterning of children takes place. The result of deficits in the building of these early competencies and the physiological response to unavailable relationships is manifested in altered brain circuitry (Dawson, Ashman, & Carver, 2000; Fox & Rutter, 2010; McEwen, 1999). Growth and development is dependent on relationships with parents, teachers, and caregivers. As early experiences and interactions with others build, the child is influenced by signals and interaction from caregivers. The quality of these early bonding experiences serves to create secure or insecure attachments (Ahnert, Pinquart, & Lamb, 2006). During the dynamic process of interaction with the environment and significant personal interactions and experiences in early childhood the architecture of the brain develops (Rice & Baron, 2000; Shonkoff, 2008; Tierney & Nelson, 2009). How neural circuitries and connections are made and sustained and how social-emotional development proceeds are impacted by early environments and experiences. A physiological response to unpredictable and unavailable caregiving is elevated cortisol concentration. Although the stress response which results in the release of cortisol can act to protect the body and prepare it for action, the long-

term effect of the activation of this physiological system has been associated with detrimental physical and psychological outcomes in children (Black, 1994; Ising & Holsboer, 2006; McEwen, 1998; Shonkoff, 2008; Taylor, Lerner, Sage, Lehmen, & Seeman, 2004). Research has shown that unavailable and poor early relationships are associated with altered rhythms in the pattern of cortisol concentrations (Roisman et al., 2009)

Cortisol concentrations in young children in full-day childcare have been shown to be related to age, temperament, and relationships (Dettling, Gunnar, & Donzella, 1999; Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Lisonbee, Mize, Lapp-Payne, & Granger, 2008). Infants in full-day childcare show a rise in cortisol concentrations over the course of the day compared to infants cared for at home, whose cortisol concentrations decrease over the day (Watamura, Donzella, Alwin, & Gunnar, 2003). Likewise, studies have shown how experiences in the first years of life affect brain plasticity (Joseph, 1998; National Research Council and Institute of Medicine, 2000; Tierney & Nelson, 2009), how rich and meaningful experiences early in life can influence the architecture of the brain, as well as social-emotional development (Fox, Levitt, & Nelson, 2010; Shonkoff, 2008), and how the physiological response to poor or unavailable relationships early in life can permanently alter the brain's circuitry (Knudsen, 2004; Ladd et al., 2000; Perry, Pollard, Blakley, Baker, & Vigilante, 1995; Schore, 2001; Shonkoff, 2008; Weaver et al., 2001). Research studies have supported the finding that children in full-day childcare experience higher levels of stress than those who do not attend childcare, and that stress is directly related to the quality of the caregiver-child relationship (Gunnar, 1998; Gunnar, Kryzer, VanRyzin, & Phillips, 2010; Lisonbee et al., 2008; Palmer, 2001; Sims, Guilfoyle, & Parry, 2005). Children who attend full-day childcare, however, in environments with opportunities for available, responsive, and nurturing attachment relationships with their caregivers experience

less stress and are able to calm more quickly than children in settings in which caregiver relationships are of poor quality (Gunnar, Brodersen, Nachmias, Buss, & Rigatuso, 1996; Gunnar, 1998).

The child's early experience and brain development form the structure that will set the stage for his or her successful developmental progress and long-term physical and psychological well-being. The foundation for growth and development in infants and young children is dependent on relationships with parents, caregivers, and people close to the child. Social and emotional behavior as well as cognition form in the context of early relationships. In the early years a child learns to interpret his or her behavioral effect on others through interactions and responses to significant caregivers in his or her environment. He or she develops sensitivity to emotions expressed by others and to his or her understanding of him or herself (Kelly, Zuckerman, & Rosenblatt, 2008). The quality of early relationships as they are developed in the context of full-day childcare settings has implications for later social-emotional competencies and relationship building.

The quality of care provided for young children in full-day childcare has implications for the long-term physical and psychological health of the nation's children (Black, 1994; Ising & Holsboer, 2006; McEwen, 1998; Taylor et al., 2004). Therefore, this study sought to examine the quality of early relationships by assessing caregiver-child interaction and its relation to the stress response, as well as the correlation of caregiver-child interaction with temperament and the stress response. This type of research has been conducted with urban populations (Dettling et al., 1999; Dettling et al., 2000; Groeneveld, Vermeer, van Ijzendoorn, & Linting, 2010; Gunnar & Donzella, 2002; Watamura et al., 2003; Watamura, Kryzer, & Robertson, 2009). Those studies showed that young children may frequently experience elevations in cortisol concentrations as

the day progresses in group childcare, and that those elevations may be more likely under conditions of less than high quality care. The toddler *Classroom Assessment Scoring* System (*CLASS*) (LaParo, Hamre, & Pianta, 2011) is a new assessment tool (see Appendix A) that is sensitive to the quality of caregiver-child interaction that this study examined, rating eight dimensions including positive climate, negative climate, teacher sensitivity, regard for child perspectives, behavior guidance, facilitation of learning and development, quality of feedback, and language modeling.

Significance of Study

As the young child experiences and interacts with the world, he or she is influenced by environmental encounters which include objects and people. In infancy perceptions regarding environmental influences are based on cues, signals and interactions with caregivers. The quality of these interactions and early bonding experiences and their categorization as either secure or insecure has been examined by researchers (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969; Goossens & van Ijzendoorn, 1990; Gunnar et al., 1996; Schore, 2001; Thompson, 2000). Healthy growth across all domains of development is affected by the quality of these early interactions. They are primary among the external experiences that influence the brain's circuitry, the child's behavior, and his or her later ability to engage in healthy relationships (Fox & Rutter, 2010; Kelly et al., 2008; Nelson & Bloom, 1997; Reis, Collins, & Berscheid, 2000; Schore, 2001; Shonkoff, 2008; Thompson, 2000). The building of secure early relationships is linked in research to the child's later ability to negotiate conflict and establish cooperation (Thompson, 2000). A link has been established between the quality of attachment relationships and the quality of play and problem-solving behaviors in 2-year-olds (Matas, Arend, & Sroufe, 1978). Laible and Thompson (2000) found a relationship between the security of relationships

and early conscience development. Early relationships and interactions also provide cues that give the young child strategies for coping with the uncertainty of new situations and perceived threats to safety. For a significant population of young children in the United States the full-day childcare setting is the arena in which these early relationships promote or inhibit early development (Bronfenbrenner & Morris, 1998).

Cassidy et al. (2005) noted the need for the inclusion of the construct of caregiver-child interaction and relationship-building in the examination of program quality. This study was used to examine the quality of caregiver-child interaction using an instrument developed to assess this construct, the toddler *CLASS* (LaParo et al., 2011), that focuses on what is defined as process quality rather than structural quality in early childhood programs. This assessment instrument is designed to evaluate caregiver-child interaction and to provide input to facilitate effective interaction with children. This study was used to assess findings from the *CLASS* with cortisol concentrations and temperament in children.

Activation of the stress response, and its physiological manifestation, elevated cortisol, has been studied in young children in childcare settings (Ahnert, Gunnar, Lamb, & Barthel, 2004; Bowlby, 2007; Dettling et al., 2000; Geoffroy, Cote, Parent, & Seguin, 2006; Groeneveld, Vermeer, van Ijzendoorn, & Linting, 2010; Gunnar, Kryzer, Van Ryzin, & Phillips, 2010; Lisonbee et al., 2008; Sims, Guilfoyle, & Parry, 2005; Vermeer & van Ijzendoorn, 2006; Watamura et al., 2009; Watamura, Sebanc, & Gunnar, 2002). Responsive caregiving has been shown to act as a buffer to the stress system according to studies by Gunnar, Bruce, and Hickman (2001). This study was used to examine the stress response in infants and toddlers in full-day childcare in east Tennessee and associated those findings with child temperament and the quality of caregiver-child interactions.

The quality of early relationships has also been linked to brain development. Schore (2001) outlined the neurobiology and role of the caregiver in the psychobiological regulation of the brain's developing limbic system. The limbic system is the area of the brain that is signaled as the child responds to changes in his or her environment. Schore's (2001) work supports the connection between the attachment relationship and the child's developing ability to create strategies to cope with stressful events. The collaborative work of those in neurobiology, early brain development, psychological functioning, behavioral research, and physiological functioning such as the stress response have come to recognize that these processes are fueled by experiences that take place in the context of relationships in the early years (Tierney & Nelson, 2000). Additionally, the quality of these early relationships has an impact on how the neural circuitry of the brain is formed and on the future functional capabilities and competencies of the child, across cognitive, behavioral, social, emotional, and physical development for a lifetime (Wisconsin Council on Children and Families, 2007).

Early brain development is characterized by the production of synapses, the creation of neural pathways, and the growth of dendrites and axons, influenced by both endogenous and exogenous signals. Endogenous conditions or biological responses occur naturally and are influenced by biological demands and genetic makeup. Exogenous signals come from outside the biological system, (e.g., from parents and teachers). Webb, Monk, and Nelson (2001) noted that while "the initiation of these events is influenced by endogenous signals, further neural maturation is primarily influenced by exogenous signals" (p. 147). Additional research that focuses on the expression of the human genome has moved from a focus on the nature-nurture debate to how environment and early experiences influence gene expression (Brown, 1999). Shonkoff (2008) reported that when a harmful level of stress compared to moderate stress, which

is short-lived and brief, is a component of early experience, the body's response to such stress can have adverse effects on the networking and circuitry of the developing brain.

The study of cortisol concentrations in young children in full-day childcare and its correlation with the quality of the caregiver-child relationship and temperament will provide support to existing research. It will also act as a resource for families regarding the importance of building a network of rich, nurturing, and sustainable relationships. Such supports will serve to enhance the child's social-emotional development in addition to creating a framework in which development can flourish across domains. Additionally, this work will support existing and evolving policies and best practices in the field of early childhood development. Policymakers and those who provide programs, 85% to 90% of which are not considered to be of high quality (Greenspan, 2003), for the care and education of young children will have additional research-based documentation as they continue the process toward mandating high quality childcare environments for all children and their families. Knowledge regarding the negative physiological, behavioral, and psychological aspects of stress on the development of the young child may lead to exploration of strategies for staff development focused on relationship building in the context of the full-time childcare setting. Growth-promoting caregiver-child relationships in full-day childcare settings provide a model for families and communities who depend on the resource and guidance of childcare to partner with them in the child rearing journey. Thompson (2001) cited the wisdom and vision of "a society that stands beside the families and caregivers who nurture young children, equipping them with knowledge and resources, and surrounding them with supportive workplaces, welfare policies, and childcare systems" (p. 21). Plato admonished families and communities to shelter the young child from distress during the early years of his or her life (Saunders & Stalley, 1970).

In summary, this study adds to the body of research focused on young children who attend full-day childcare, their relationships with their caregivers, and their stress level related to child temperament and caregiver-child interaction. It will add uniquely to the research by using an assessment instrument focused on the quality of interactions of caregivers and young children, the toddler *CLASS* (LaParo et al., 2011). Additionally, this study expands on earlier research by conducting investigations of stress, temperament, and the quality of caregiver-child interaction as they apply to a unique setting, a rural population, which has not been explored in earlier studies of children in full-day childcare.

Theoretical Framework

The theoretical framework in which this study is grounded is Bronfenbrenner and Morris's bioecological theory of development (1998). Bronfenbrenner and Morris, like Piaget (Piaget & Inhelder, 1969), theorized the course of human development to be a process influenced by the qualities of the mind and the adaptation of the human brain to the world. Piaget viewed those universal processes in the context of common biological processes, and he analyzed development with a focus on the individual child. Bronfenbrenner studied the developing child as he or she evolved through biological processes, but in addition he gave attention to the influence of the physical and social context in which the child develops. Bronfenbrenner concluded that the context and culture in which the child develops are not merely supportive of development, but they are the essence of the process (Thelen & Smith, 1998).

Bronfenbrenner and Morris's (1998) bioecological theory evolved from his earlier model of ecological systems theory (1979) in which he studied the environment in which humans live and grow. This expanded bioecological theory, which recognizes the interplay of biology and environment, proposes that from early development, and through the life course, human

development evolves through processes that include progressively more complex reciprocal interactions between the young child and the people and objects in his or her environment. Proposition one of Bronfenbrenner and Morris's theory, which emphasizes the role of the environment, states that in order for those interactions to have meaning and impact, they need to occur with regularity and be sustained over time. Enduring interactions in the immediate environment are defined as proximal processes. Patterns of parent-child, caregiver-child, and child-child interaction as well as solitary and group play, learning of new skills, and performance of complex tasks are all described as proximal processes. Proposition two, according to Bronfenbrenner (1999), teaches that the concept of proximal processes is embedded in a biological model in which these processes have distinctive characteristics and meaning and contain "form, power, content, and direction" (p. 5), which gives variance to them dependent on individual characteristics, the environment in which they occur, and the social climate in which the child lives. The following are features of the construct of proximal processes: 1) development occurs during active engagement, 2) activity must occur with regularity and must extend over time, 3) in order to be developmentally effective, activity must be sustained and increasingly complex, 4) to be developmentally effective, proximal processes must contain both initiation, response, and reciprocal elements, and 5) proximal processes may occur during interpersonal actions or interactions with objects and symbols in the environment (Bronfenbrenner, 1999).

In the bioecological model a distinction is made between environment and process. This model considers the characteristics of the developing child that are biologically based and how they impact proximal processes and developmental outcomes. The current model recognizes the role of biological factors, such as temperament, as well as environmental conditions and experiences, in the optimal development of the child. Bronfenbrenner and Morris's bioecological

theory lists three types of person characteristics that influence the trajectory of development through their ability to impact the direction and power of proximal processes. The first, dispositions, have the potential to initiate and sustain proximal processes in a given developmental domain. Second, resources, which may include innate ability, skill, knowledge, or experience, are necessary for the effective functioning of proximal processes. The third characteristic, demand, describes opportunities that can foster or discourage the function of proximal processes from the social environment. These three characteristics are components of Bronfenbrenner and Morris's microsystem and are used to describe the people who are consistently available and interactive in the child's life. These qualities or characteristics of person that shape development are the expansion of Bronfenbrenner's (1979) conceptualization of the environmental systems ranging from the microsystem to the macrosystem (Bronfenbrenner & Morris, 1998).

An additional component of the bioecological model, and the element that most distinguishes it from the earlier model, is the dimension of time. This element has a place in all three levels: the micro-, meso-, and macro-systems. Microtime defines continuity or discontinuity within ongoing activities, mesotime considers frequency over days and weeks, and macrotime refers to changing societal and cultural expectations over the life course (Bronfenbrenner & Morris, 1998).

The term "development" in this model refers to "stability and change in the biopsychological characteristics of human beings over the life course and across generations" (Bronfenbrenner & Morris, 1998, p. 995). Bronfenbrenner noted that the extent to which these factors are not maximized during development is the extent to which optimal developmental outcomes will not be realized.

This study relates to Bronfenbrenner and Morris's (1998) bioecological theory at the microsystem level, with interaction between the caregiver and child during proximal processes of development where assisted discovery and learning occur. As the caregiver responds to the child in the environment of childcare in the context of daily routines, the child comes to understand who he or she is and how the world works. In this immediate setting of reciprocal interactions, which occur over time, the child attunes behavioral and emotional responses that endure over time (Berk, 2008).

Research Questions

Optimal social-emotional development, which proceeds in the context of each developmental step of early childhood, is dependent on the rich and interactive experiences of each child with his or her caregiver. Requisites to social-emotional development involve the response to stress influenced by interaction with the environment (Ladd et al., 2000). These study data were used to examine the quality of early relationships in full-day childcare settings and used to correlate the young child's physiological response as measured by cortisol enzymeimmunoassays from saliva samples to the quality of caregiver-child interactions and to child temperament and the toddler *CLASS* (LaParo et al., 2011), as shown in Appendix B the *Early Childhood Behavior Questionnaire-Very Short Form (ECBQ-VSF)* (Rothbart, 2009). The study was used to answer these questions:

1. Is there a significant difference between individual child temperament of toddlers in full-day childcare assessed separately by parent and caregiver using the *ECBQ-VSF* (Rothbart, 2009)?

This study included collection of both teacher and parent reports because the behaviors, interactions, and perspectives of both parents and caregivers prepare the infant or toddler for relationships on which he or she is dependent for development.

2. Is there a difference between morning and afternoon cortisol concentrations of individual toddlers enrolled in full-day childcare?

The rationale for morning and afternoon collection was to determine if cortisol concentrations for toddlers in this study follow the predictable circadian rhythm of highest concentration shortly after the child awakens in the morning to a gradual decrease over the course of the day.

3. Is there a significant correlation between individual child temperament assessed by teachers using the *ECBQ-VSF* (Rothbart, 2009) and group salivary cortisol concentrations of toddlers in full-day childcare?

Because the dimensions of the *CLASS* focus on the quality of the caregiver-child relationship and the review of literature linked quality of care to cortisol concentrations, the two were analyzed to determine the correlation between each dimension of the *CLASS*, and cortisol concentrations in this study group.

4. Does quality of caregiver-child interaction as measured by the eight dimensions of the toddler *CLASS* (LaParo et al., 2011) and group engagement as measured by the researcher-adapted *EC II* (McWilliam, 1999) (and caregiver-child interaction and engagement) predict cortisol concentrations as measured by cortisol enzymeimmunoassays?

Definitions

To clarify the findings several key terms and concepts used during this study are defined here.

Attachment

For the purpose of this study *attachment* was defined as a relational construct that includes early experiences, particularly in the context of close relationships, that evolve over time, create meaning, affect the expression of temperament, emotional connections, emotion regulation, stress reactivity, social competence, behavior, and the quality of relationships throughout the life span.

Temperament

Temperament, for the purpose of this study, was defined as individual differences in reactivity to the environment and includes a biological and genetic component that can trace the relationship between children's early characteristics and their social and cognitive development.

Emotion Regulation

A definition of *emotion regulation* as the young child's efforts to develop internal and external control of emotions and behavior in response to both positive and negative environmental or social stimuli was used for this study. This definition allows for a focus on the neurobiological components of emotion regulation as well as the physiological processes involved when efforts to self-regulate result in the stress response, a process that underlies the regulation of emotions.

Early Relationships

Early relationships were defined for this study as sustained, repetitive, increasingly complex, and reciprocal interactions that occur over time between the child and caregiver, creating a bond and meaningful relationship.

Quality Childcare

For this study the definition of *high quality childcare* was care, "involving supportive interactions with caregivers, positive interactions with peers, and opportunities for cognitively stimulating play." Poor quality was defined as, "negative interactions with caregivers and peers and aimless wandering" (Vandell, 1996, p. 391).

Stress

For this study *stress* was defined as the body's response to potentially threatening or unfamiliar circumstances in the environment, resulting in elevated concentrations of cortisol.

Stress Response

Stress response is used in this study as a change in emotional, social, behavioral, cognitive, and physiological functioning that result when the young child perceives a threat to his or her safety or well-being in the context of social experiences.

Teacher-Caregiver

A *teacher-caregiver* in this study was defined as an individual or individuals who are available and responsive to nurture the physical, cognitive, socialemotional, and educational needs of the young child in a childcare setting.

Summary

This study, grounded in Bronfenbrenner and Morris's (1998) bioecological theory of early development, was used to examine the relationship between temperament and stress, through assessing cortisol concentrations of toddlers over the course of the day, and was used to study the relationship between the quality of caregiver-child interaction and stress as measured by cortisol concentrations and the toddler *CLASS* (LaParo et al., 2011). It contributed to the minimally researched studies of teacher-caregiver practices supportive of toddlers in childcare settings and the stress response. Because the caregiver in the childcare setting may act as the primary regulator of emotions, knowledge of early relationships and their potential to impact social emotional development, and ultimately developmental outcomes across domains, is of vital importance to providers of care for infants and toddlers in this setting. Studies support that children who build secure relationships early in life are better able to regulate their emotions and to calm more readily than children who have poor or insecure early relationships (Gunnar et al., 1996).

Recognizing that the context in which development occurs involves Bronfenbrenner and Morris's (1998) proximal processes that are embedded in meaningful, sustained, and increasingly intricate relationships, the setting, context, and quality of the child's early environment is of critical importance to his or her potential for optimal developmental outcomes. For a significant population of young children in the United States the full-day childcare setting is the environment in which these processes occur.

Chapter 2 provides a review of the literature related to early relationships, brain development, emotion regulation, attachment, temperament, stress, and the stress response in the context of early childhood development.

CHAPTER 2

REVIEW OF LITERATURE

Social and emotional development in infancy and toddlerhood are impacted by the child's sense of self and interactions with others (Berk, 2008). This review of literature includes research and discussion of young children and their social and emotional development in full-day childcare. The course and impact of development in the childcare environment including attachment, temperament, emotion regulation, early relationships, and stress is reviewed.

Attachment

Bowlby (2007) defined attachment as an enduring tie between the child and the caregiver. Schore (2000) included the regulatory component of attachment and defined attachment as "the interactive regulation of biological synchronicity between organisms" (p. 23). Thompson (2000) noted that attachment includes, "especially in the early years, influences from the stability, quality, and stresses of the child's living conditions, the consistency of the quality of the care provided by close relational partners, and the influence of multiple attachment relationships that sometimes overlap with and are sometimes independent from the mother-child relationship" (p. 151), a critical addition to the definition of attachment for the purpose of this study. Behavior and the young child's ability to regulate emotion were included as components of attachment by Carlson, Sampson, and Sroufe (2003). Field (1996) described a model of attachment as psychological attunement including physiological, biochemical, and behavioral responses and multiple attachments at different stages of life. An association between the strength of attachment and developmental level and the strength of attachment and amount of stimulation and support available were found by Caldwell, Wright, Honig, and Tannebaum (1970).

In their examination of the quality of early bonding experiences researchers have created categories of secure and insecure attachment. They define the four major types of infant-caregiver attachment as secure, insecure-avoidant, insecure-resistant and insecure-disorganized (Ahnert et al., 2006; Sroufe, 1985). Ainsworth (1978), who created a measure of attachment, the *Strange Situation*, described how infant behavior is patterned by the attachment system. In her original study infants and toddlers were exposed to a strange setting, the introduction of a female not known to them, and two brief separations from their parent. Their behavior after being reunited with the parent was classified into three attachment patterns: 1) secure in which the child responds with pleasure and settles if distressed, 2) insecure-avoidant in which the child seems unresponsive to the parent and displays a flat affect, and 3) insecure-resistant in which the child seeks then rejects contact from the parent and remains distressed. A fourth category, insecure-disorganized attachment, was added as the result of a 1986 study in which infants failed to meet the classifications of any of these three categories based on their attachment patterns. Those children who displayed a disordered sequence of behaviors, such as confusion, contradictory behavior patterns, and apprehension, were labeled as disorganized or disoriented (Main & Solomon, 1986). Attachment and its link to the stress response was researched using the *Strange Situation* in infants with disorganized or disoriented attachment behaviors by Hertsgaard, Gunnar, Erickson, and Nachmias (1995). In their study of 19-month-old children, those who were classified as having disorganized or disoriented attachment patterns also had higher cortisol concentrations than children in the other three attachment pattern classifications. In an additional study of 18-month-old children who were tested with the *Strange Situation*, attachment security was shown to moderate the physiological consequences of children classified as fearful and inhibited (Gunnar et al., 1996). Sroufe and Waters (1977) described a major

component of attachment as a difference in the security of attachment. A secure attachment is free of the negative patterns associated with forms of insure attachment.

Healthy growth across all domains of development is affected by the quality of early interactions. They are primary among the external experiences that influence the brain's circuitry and the child's behavior and later ability to engage in healthy relationships (Fox & Rutter, 2010; Kelly et al., 2008; Nelson & Bloom, 1997; Reis, Collins, & Berscheid, 2000; Schore, 2001; Shonkoff, 2008; Thompson, 2000). Bowlby (1969) theorized that behaviors such as smiling, crying, and clinging are related to the infant's effort to bring the caregiver into proximity not only as efforts to satisfy an early biological need for safety and survival but to create affective bonds as well. In a 1970 study of infant childcare and attachment, the environment in which secure attachments flourish was described as "an atmosphere in which people and objects give proper levels and quantities of stimulation to young children in the context of emotional warmth, trust, and enjoyment" (Caldwell et al., 1970, p. 403).

Numerous studies of young children known to have been neglected, maltreated, or abused exhibit attachment patterns that Main and Solomon (1986) described as insecure disorganized or disoriented attachment. These studies of early deprived, neglectful, or abusive interactions suggest subsequent development of maladaptive relationships, behavioral problems, and regulatory challenges (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Gunnar, Morison, Chisholm, & Schuder, 2001; Lyons-Ruth, 1996; van Ijzendoorn, Schuengel, & Bakermans-Kranebura, 1999).

The quality of early attachments may also be linked to brain development. Schore (2001) outlined the neurobiology and role of the caregiver in the psychobiological regulation of the brain's developing limbic system. The limbic system is the area of the brain that is signaled as

the child responds to changes in the environment. Schore's (2001) work supports the connection between the attachment relationship and the child's developing ability to create strategies to cope with stressful events. Gunnar, Mangelsdorf, Larson, and Hertsgaard (1989) documented the interaction of attachment and temperament and its effect on adrenocortical activity by demonstrating increased cortisol concentrations in children with insecure attachments.

Temperament

An important component of early relationships is temperament. Thomas and Chess (1977) defined temperament as behavioral style impacted by environmental factors and involving emotion, reactivity and self-regulation. They described three styles of temperament: 1) easy, 2) difficult, and 3) slow to warm up. Goldberg, Grusec, and Jenkins (1999) reported, succinctly, that temperament is simply "confidence in protection" (p. 475). Rothbart (1981) defined temperament as "individual differences in reactivity and self-regulation" (p. 569) that includes a constitutionally-based biological component and is influenced by heredity, maturation and life experience. Gartstein and Rothbart (2003) described temperament as differences in reactivity based on biological factors and self-regulation. Strelau (2008) stated that temperament "is about the formal traits of behavior and that these traits are expressed in the energy level and temporal characteristics of behavior" (p. 49). Earlier work (Strelau, 1987) described the relationship between temperament and emotion. His definition focused on the regulative aspect of temperament and its biological basis. Kagan, Reznick, and Snidman (2005) focused research on the reactivity component of temperament.

The environmental aspect of temperament was described by Brown (1999) in a discussion of the common human genome. In order for brain synapses to grow, neural stimulation must occur in the context of the biology of the cell and the biological and

psychological environment. In addition to genetics and behavior he noted that "how and when expression of the human genome is triggered and maintained" and what genes are expressed to produce a given behavior are all factors related to child development (Brown, 1999, p. 37).

While the constructs of attachment and temperament describe the expression of affect in the context of social engagement, the two are defined as separate entities in studies of the development of personality and behavioral traits. Temperament based in neural theories has been viewed historically as a predictor of attachment security. Vaughn, Bost, and van Ijzendoorn (2008), however, noted that developmental scientists now study "the complementary and interactive effects" of both attachment, based on social-emotional development, and temperament as "domains of influence on a range of social and developmental outcomes" (p. 192). According to these authors both construct domains "make legitimate claims that attachment security or temperament dimensions are antecedent to and underlie individual differences in behavior, cognition, and affect that together characterize personality and adjustment" (Vaughn et al., 2008, p. 203). Both conceptual frameworks are grounded in body and brain systems and both recognize that the processes of attachment and temperament development are influenced by these systems. The authors further noted that "both attachment and psychological mechanisms underlying temperamental differences are tuned by the social environment associated with the behavior patterns of significant caregivers" (Vaughn et al., 2008, p. 210). The caregiver and the child interact in the social environment. The caregiver or teacher brings his or her own temperament to the relationship and has a profound influence that can help or hinder development of the child's temperamental characteristics. As the caregiver and child interact repetitively over time, building an attachment relationship, the caregiver is helping the child regulate emotions and behaviors, thus tuning temperament, along with

biological influences, over time (Putnam, Rothbart, & Garstein, 2008). The caregiver is acting as an external regulator of the child's emotions and behaviors (Thompson, 2001). These repetitive interactions, when positive and growth promoting, impact social and emotional development and behavior (National Research Council, Institute of Medicine, 2000). These positive interactions have been defined by Thomas and Chess (1977) as *goodness of fit*.

The temperament of the young child impacts how he or she interacts and reacts to the world. Temperament in early childhood may range from adventurous and outgoing to extremely shy and prone to being easily upset (Gunnar, Sebanc, Tout, Donzella, & van Dulmen, 2003). Psychobiological predisposition is the likely root of temperamental ranges (Rothbart, Derryberry, & Posner, 1994). These dispositions create the framework for behavioral paths that children may follow in the course of emotional development and in individual efforts to control emotions and stress (National Scientific Council on the Developing Child, 2007; Rowe & Plomin, 1977; van Bakel & Riksen-Walraven, 2004; Webster-Stratton & Eyberg, 1982).

Young children vary in their response to the environment, including their caregiver as well as to their perception of events (Calkins & Fox, 2002). The young child's response to separation from a familiar caregiver or threats to well-being and the child's ability to cope with these changes are influenced by temperament. The quality of the relationship and the reciprocal interactions that go into the creation of early relationships are influenced by the temperament of the child. Research studies have examined temperament and its impact on the formation of early relationships. Gunnar et al. (2003) found that poor effortful control was associated with aggressive interactions with peers. Temperament has also been identified as one explanation for differences in such developmental tasks as social competence as well as physiological processes such as the stress reaction (Gunnar, Tout, de Haan, Pierce, & Stansberry, 1996).

Current models of temperament are based on the constructs of arousal, affect, and attention (Derryberry & Rothbart, 1988). Dimensions of temperament were studied and used to create a measurement of temperament in young children (Rothbart, 1981). Defined as constitutionally based, temperament includes differences in reactivity and self-regulation (Rothbart et al., 1994) that affect all domains of affect, activity, and attention. Temperament is assessed by measurements that employ parent or caregiver report and includes such dimensions as activity level, fear, soothability, distress to limitations, smiling and laughter, and duration of orientation (Rothbart, 1981). Temperament represents a key component of the developing personality. Its genetic basis helps determine developmental processes such as the growth of emotion regulation in the context of environment and experience.

Emotion Regulation

The young child's attentional network acts to establish emotion regulation. Kopp (1989) described emotion regulation as "the emerging ability to comply with caregivers' dictates and to monitor one's own behavior accordingly" (p. 199). She noted that cognitive awareness must occur before the initiation of the process of self-initiated emotion regulation. In an earlier work Kopp (1982) noted the role of the caregiver in the development of emotion regulation, describing a partnership between the caregiver and the young child in which both are involved in mutual regulation, the caregiver providing modeling and strategies to help the child control emotions and assure the child's well-being.

Emotion regulation as a scientific construct was examined by Cole, Martin, and Dennis (2004). They wrote about emotions and the development of emotion regulation as "powerful, elusive, dynamic processes that have the capacity to regulate other processes and to be regulated" (p. 330). In essence, emotions regulate and are regulated and may be viewed not as

two processes but “different facets of a single set of processes” (Campos, Frankel, & Camras, 2004, p. 391). While they reported challenges to the study of emotion regulation in early childhood, they also acknowledged that such empirical studies can enlighten the field of the science of early childhood development by showing how the child’s thinking, learning, relationships, and behaviors are affected by emotions and how those same factors facilitate the ability to regulate emotions. Self-regulated emotion regulation, according to Eisenberg and Spinrad (2004), is “the process of initiating, avoiding, inhibiting, maintaining, or modulating the occurrence, form, intensity, or duration of internal feeling states, emotion-regulated physiological, attentional processes, motivational states, or the behavioral concomitants of emotion in the service of accomplishing affect-related biological or social adaptation or achieving individual goals” (p. 338). Bridges, Denhan, and Ganiban (2004) focused their work on emotion regulation during the infant-toddler stage of development. They took into account the behavioral, cognitive, and physiological components that allow the child to monitor his or her experience and express positive or negative emotions. They stated that emotion regulation is adaptive, because emotions are regulated in order for the child to function in his environment. They contend that young children develop styles of emotion regulation which are “the product of interactions between biologically based constraints and characteristics of the social environment” (Bridges et al., 2004, p. 343). Attention and effortful control and the ability to regulate both may be related to social experience and genetic predisposition according to Posner and Rothbart (2000). They related the brain’s neural plasticity to the understanding of the mechanisms of voluntary control. Thompson (2001) included as components of emotion regulation maintenance and enhancement of emotional arousal, strategies of self-management and external influences, the temporal features of emotion, and the child’s goals for a particular situation. The relationship

among the organism, environment, and emotion regulation during the process of maintaining or disrupting that process is dependent on its significance to the individual and was defined by Campos, Campos, and Barrett (1989).

The growth of emotion regulation is the cornerstone of early childhood development that cuts across all domains of development (Bell & Wolfe, 2004; Langlois, 2004). Early childhood development can be seriously compromised by social, regulatory, and emotional impairments (Calkins & Fox, 2002; Posner & Rothbart, 2000). Regulation in early development is deeply embedded in the child's relationship with others (Hoeksma, Oosterlaan, & Schipper, 2004; National Research Council, Institute of Medicine, 2000; Perry, 2008). In the process of emotional development the young child learns to recognize, understand, and regulate emotions and behaviors, to understand and interpret the emotional expressions of others, to develop empathy, and to form meaningful relationships (Calkins & Johnson, 1998; Campos et al., 2004; Goldsmith & Davidson, 2004; Kopp, 1982, 1989; Lewis & Stieben, 2004; Posner & Rothbart, 2000; Raver, 2004; Ungerer et al., 1990). Emotional development occurs in the context of interactions with caregivers. During infancy positive emotions are associated with available and responsive caregiving. As the young child's brain develops he or she becomes better able to interpret experiences and to manage his or her emotions. The resulting emergence of additional capacities is contingent on maturation of neural circuitries that develop during these early interactions that then become emotional competencies. The development of emotion and cognition are based in an interrelated neural circuitry formed early in brain development (Lupien, McEwen, Gunnar, & Heim, 2009). Successful emotional development is tied to the quality of the emotional and social environment of the young child. The child's ability to manage emotions

provides the foundation for future success across developmental domains (National Scientific Council on the Developing Child, 2007).

Eisenberg and Spinrad (2004) defined emotion regulation as "the process of initiating, avoiding, inhibiting, maintaining, or modulating the occurrence, form, intensity, or duration of internal feeling states, emotion-related physiological, attentional processes, motivational states, and/or behavioral concomitants of emotion in the service of accomplishing affect-related biological or social adaptation or achieving individual goals" (p. 338). The key to competency of emotion regulation is growth-promoting relationships with a responsive caregiver. Such care, which is responsive, repetitive, and reciprocal, illuminates the caregiver as the "external regulator" for the child as he or she processes cues from the caregiver to develop his or her own self-regulating competencies (Thompson, 2000). Schore (2001) described the impact of the caregiver's "stress regulating and dysregulating psychobiological interactions on the infant's coping systems that are organizing in the limbic circuitries of the early developing right hemisphere" (p. 11). He noted that the limbic circuits, which are active in the right brain and connected with the neurochemical systems related to emotion, are intricately tied to attachment functions. His works suggested that social-emotional competence relies on right brain function, and that this capacity is the result of a secure attachment.

Emotional regulation developed in the context of social and environmental confines can be altered when deficits in these systems and networks of developmental support lead to atypical physiological and psychological patterns of response and interaction (Calkins & Johnson, 1998). Emotional development and its impact on cognitive processes and behavior has been the focus of extensive research. With the knowledge that infants and children may begin early in life to spend the majority of their day in childcare settings in the company of caregivers who, hopefully, will

provide nurturing, care, and early education, the childcare setting takes on significance as the environment in which the young child will begin the process of cognitive, social, and emotional development that might influence his or her well-being for a lifetime. Because inconsistent care is the typical finding in childcare settings, the risk of poor quality attachment and its influence on emotional development is a concern for families, childcare programs, health care providers, policy makers, and communities (Belsky et al., 2007; NICHD ECCRN, 1997; Shonkoff, 2008).

The term emotion regulation defines the process of coping with variance in emotions in responses that range from joy to fear and distress. Regulation is the attempt of the physiological and emotional repertoire of the child to adapt to the environment. Successful emotional regulation is tied to the child's relationships and social surroundings. Early in infancy natural biological processes allow for control of discomfort or stress when caregiver interaction is absent and the child is not cognitively aware of strategies he or she may employ to reduce stress. These are exhibited when the infant closes his or her eyes, averts his or her gaze, turns his or her head, or engages in nonnutritive sucking. As the infant develops he or she begins to engage in social interaction, such as crawling to the caregiver, fretting, and making eye contact to help regulate or control what he or she perceives as discomfort or distress (Perry, 2008). As development advances and recall memory and cognition increase, emotion regulation builds, and remains ingrained in the social and caregiver interaction context in which the child interacts (Kopp, 1989). As development advances and recall memory and cognition increase, emotion regulation builds and remains ingrained in the social and caregiver context in which the child interacts (Kopp, 1989).

Early Relationships

Healthy child development is dependent on reliable and quality relationships with significant others. Every aspect of early development is framed in a relationship nurtured by available and meaningful interaction. Such early and secure emotional attachments influence physical, cognitive, social, emotional, and behavioral growth. Research shows the benefits of such early relationships are sustained through a lifetime (National Scientific Council on the Developing Child, 2007). In their description of how social-emotional development typically progresses during the first 3 years of life, the Center on the Social and Emotional Foundations for Early Learning (CSEFEL) recognizes strong relationships as the foundation of concepts that impact social-emotional development in infants and toddlers (Office of Head Start, and Child Care Bureau, United States Department of Health and Human Services, 2003).

The child's early experience and brain development form the structure that will set the stage for successful developmental progress and long-term physical and psychological well-being. The foundation for growth and development in infants and young children is dependent on relationships with parents, caregivers, and people close to the child. Social and emotional development and behavior as well as cognition form in the context of early relationships. In the early years a child learns to interpret his or her behavioral effect on others through interactions and responses to significant caregivers in the environment. He or she develops sensitivity to emotions expressed by others and to his or her understanding of self (Kelly et al., 2008). Research has supported an additional positive outcome of the creation of nurturing attachment relationships with caregivers beyond those formed during maternal care as having the potential to reverse the effect of inadequate maternal care (Bredy, Humpartzoomian, Cain, & Meaney, 2003; Francis, Caldji, Champagne, Plotsky, & Meaney, 1999).

Early relationships that are respectful, reciprocal, and responsive foster positive developmental outcomes across domains, and during the toddler period guide the child in self-concept, emotional responses, his or her idea of behavioral standards, and cognitive skills. It is in the context of these relationships that the child's emotional regulation evolves, strategies to help control impulses and shift attention begins to grow and refine, and the ability to self-distract from frustrating events and become more cooperative emerges. The course of emotion regulation is based on cues from environment and supportive relationships with caregivers. Early relationships are the context in which all learning takes place, through building and patterning that occur during routines of care and interaction (Berk, 2008). Bronfenbrenner and Morris (1998) described these early relationships in the micro-system as proximal.

For past generations the understanding of the dynamics of child development was explored in the context of family function. Contemporary studies of the child's development include experiences that impact social, emotional, and cognitive development, as well as the childcare setting, because, for recent generations of children, early relationships and experiences are formed outside the context of the family in nonparental childcare settings. Caregivers in childcare who spend long days with infants and toddlers may act as supplementary attachment figures in the eyes of the child, offering warm, responsive, predictable care to children.

Each day in the United States 13 million preschoolers, including 6 million infants and toddlers, are in childcare (Children's Defense Fund, 2005). The transition from family care to nonparental care or "shared care" for infants and toddlers and its complex behavioral and psychobiological effects on the developing child was reviewed by Ahnert and Lamb (2003). They noted the challenges to supportive early relationships for the child and the family when care is shared. Attachment behaviors with parents and nonparental caregivers are formed in the

first year of life as the infant becomes increasingly competent in his or her ability to perceive and modulate stressors. Millions of infants and toddlers are building that repertoire for the management of stress while in the childcare setting. When the caregivers in the childcare setting support the development of early secure attachment relationships by providing responsive, reciprocal, predictable interactions with the infant or toddler, the child's attachment security remains stable.

When the child receives responsive, respectful care he or she is able to monitor the environment and experiences with the knowledge that the relationship with the caregiver will be a present and dependable source of information to help read situations and mediate social, emotional, behavioral, and physiological response related to whether those situations are meant to harm or stress. Ladd et al. (2000) stated that caregiver-child interaction is among the most important influences in early life. The long-lasting detrimental effects of impoverished or unavailable provision of supportive care, while social-emotional and self-regulating competencies are formed, are expanded in the sections on attachment and emotion regulation.

Bradley and Vandell (2007) in their review of childcare and the well-being of children reported that "children who began care early in life and were in care 30 or more hours a week were at increased risk for stress-related behavioral problems" (p. 669). Research has found that the absence of supportive early relationships with primary caregivers is associated with altered rhythms in the pattern of cortisol concentrations, which are typically higher in the morning and decrease over the course of the day (Roisman et al., 2009).

Stress

Black (1994) defined stress as "a state of disharmony or threatened homeostasis by a psychological, environmental, or physiologic stressor" (p. 1). Stress may generally refer to

"physical or psychological alternations capable of disrupting homeostasis (Cullinan, Herman, Helmreich, & Stanley, p. 3). In his work on stress and its pervasive physiological effect McEwen (1998) explained the concept of allostasis, the body's effort to remain stable or sustain homeostasis as it encounters stressful events.

The concept of stress refers to psychological and physiological changes that disrupt the normal functioning or homeostasis of the body's biological systems (McEwen, 1998). The body's reaction to threat, real or perceived, activates a range of responses that are identified as the stress response. The original function of the stress response was to initiate a series of behavioral and physiological responses that would improve the chances of survival (Cullinan, Herman, Helmreich, & Watson, 1995; Smith, Wylie, & Vale, 2006). The body's response to stress enlists activation of a number of processes that involve the nervous, endocrine, and immune systems in its effort to maintain homeostasis in the face of real or perceived threat. Young children's *normal stress* response allows them to problem-solve as well as to engage in novel experiences (Shonkoff, 2008). Shonkoff in a description of the three levels of stress noted that this positive level includes only a brief increase in heart rate and mild elevation in cortisol level. The second level, *tolerable stress*, is identified by a temporary stress response buffered by supportive relationships. Toxic stress involves prolonged activation of the stress response without the support of protective relationships. When the child's stress response becomes altered as result of adverse early experiences that impact the intensity or duration of physiological changes that occur during stress, a range of detrimental outcomes may be precipitated including changes in the way the developing brain constructs its neural circuitry (Bremner, 2006; Cashmore, 2001; Dawson, Ashman, & Carver, 2000; Gunnar & Cheatham, 2003; Kim, Foy, &

Thompson, 1996; McEwen, 2000; Rice & Barone, 2000; Schulkin, 2006; Tarullo & Gunnar, 2006; Tierney & Nelson, 2009; Vazquez, 1998).

The sense of control perceived by the young child in stress impacts both the behavioral and physiological response. Stable, predictable, and responsive interaction with the child's caregiver allows the child to assess and interpret potentially stressful situations. The proximity, availability, and responsivity of the caregiver allow the child to read and process information from the environment (Perry, 2008). Without caregiver support, stress reactions and the heightened feelings of anxiety caused by lack of coping strategies will result physiologically in elevated concentrations of cortisol. Like the stress response, many infant or toddler regulatory challenges, as well as child behavioral issues have their origin in the caregiving relationship (Bredy et al., 2003; Fox & Rutter, 2010; Loman & Gunnar, 2009; National Research Council and Institute of Medicine, 2000). The importance of meaningful, reciprocal, and invested relationships between young children and their caregivers, and the physiological and developmental detriments that result in deficits in those bonds has been the focus of various studies. Lisonbee et al. (2008) collected cortisol for 194 children before and after challenging tasks and a teacher-child interaction session. Teacher-reported relationship conflict predicted cortisol increases. The researcher's findings indicated that cortisol change across the day is influenced by teacher-child relationship characteristics. Palmer (2001) linked animal studies of mothers and biochemical changes in the brains of animals resulting from decreased stimulation and correlated those findings with human behavioral research and which events lead to chronic stress. Among them was not offering comfort when the child is disturbed or distressed as well as low levels of attention and stimulation. In findings of a third study related to relationships and physiological development, Sims et al. (2005) stated that high concentrations of stress in young

children are of concern because of the range of developing systems that are put at risk. They stated that in infants and toddlers, during the early years of development, minimal levels of stress can result in high concentrations of cortisol. When these children do not receive responsive care in quality care environments and their cortisol concentrations are not managed appropriately, they can experience chronic stress with biological, behavioral, and social-emotional consequences. The quality of the child-caregiver relationship has been identified with studies that link it to the stress response (Gunnar, Bruce, & Hickman, 2001; Gunnar, Larson, Hertsgaard, Harris, & Brodersen, 1992; Hertsgaard, Gunnar, Larson, Brodersen, & Lehman, 1992). Gunnar et al. (2001) described the physiological systems involved in the stress response and their implications in factors related to physical and psychological illness. Hertsgaard et al. (1992) looked at first-time experiences and their effect on adrenocortical activity. Their results, which measured no increase in cortisol between novice and experienced infants in a mother-infant swim class, supported emotions as a major pathway influencing adrenocortical activity. In the context of full-day childcare where turnover is 40% or higher in which staff or children may be rotated, opportunities for the development of responsive, stable, and sustained interactions between the care provider and the child presents a challenge.

Behavioral and physiological research has shown that full-day attendance in childcare is related to later behavior problems and may trigger physiologically undesired responses in young children (Langlois & Liben, 2003). Focused physiological studies of the adrenocortical response to stress have shown elevated levels of the stress hormone cortisol in children in childcare settings (Dettling, Gunnar, & Donzella, 1999; Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Gunnar, Kryzer, Van Ryzin, & Phillips, 2010; Schwartz, Granger, Susman, Gunnar, & Laird, 1998; Vermeer & van Ijzendoorn, 2006).

Cortisol

Cortisol is a hormone that is the product of a physiological process involving the hypothalamic-pituitary-adrenocortical (HPA) axis. The central and peripheral nervous system mediates the response to stress. Central to the stress response are effectors in the hypothalamus, the pituitary, and the adrenal gland that define the HPA axis (Smith & Vale, 2006). As a part of the body's normal regulatory function, cortisol shows its highest level about 30 minutes after morning awakening. A sharp decrease occurs within the next 1 to 2 hours, followed by a gradual decline over the course of the day (Bartels, Eco, Kirschbaum, & Boomsma, 2003; Gunnar, 1992). The rhythm of cortisol fluctuation is established as early as 3 months of age (Gunnar & Donzella, 2001). While cortisol levels generally follow this circadian rhythm, variations by individual and context are areas of ongoing study (Bartels et al., 2003). Under stressful conditions this basal rhythm can be overridden, and large increases of HPA (hypothalamic-pituitary-adrenocortical) activity can be observed (Gunnar, 1992). Slight increases in cortisol levels in young children do not appear to present a risk to development, but cortisol findings in children who attend full-day childcare do suggest a risk to the course of child development (Watamura et al., 2003; Watamura, Donzella, Kertes, & Gunnar, 2004). The stress response in young children creates a cascading physiological reaction that includes an elevation in the concentration of the stress hormone cortisol.

The human body responds to any challenge, including daily events, by releasing chemicals that support or mediate those challenges. This process that is the body's effort to maintain homeostasis is referred to as allostasis or "stability through change" (Sterling, 2004). In addition to daily challenges, other causes of stress during infancy have been researched (Bremner, 2006; Francis et al., 1999; Francis, Diorio, Plotsky, & Meaney, 2002; Gunnar, 2000;

Gunnar et al., 2001; Ladd et al., 2000; Liu, Caldji, Sharma, Plotsky, & Meaney, 2000). Pain from medical conditions, from sensitivity reactions to food or formula, neglect and physical abuse, and short-term separation from their mother can lead to the physiological response that produces increased concentrations of cortisol in infants and young children (Palmer, 2001). Maternal separation readily triggers an HPA response in infants (Francis et al. 2002). Increased cortisol concentrations are viewed physiologically as the child's effort to cope with situations that cause stress or fear. The systemic effect is a release of energy, suppression of inflammation, and alteration of the immune system. When large amounts of cortisol are released, the level of unbound cortisol increases and is found in the blood plasma, urine, and saliva. In studies cited by Gunnar (1992) smaller increases in cortisol concentration after separation appear to be linked to "the quality of care during separation" (p. 493). This study showed that the young child relies heavily on the sensitivity and availability of the caregiver to guide in the perception of a given situation and that such support can actually prevent elevated cortisol concentrations in threatening circumstances.

Stress Response

The stress response was described by Smith, Wylie, and Vale (2006) as a "wide array of behavioral and physiological responses" (p. 383) triggered by stress. The response induces central and peripheral activation of physiological processes that prepare the body to react to stress. According to Perry (2001) perceived threat causes the brain to "orchestrate a total-body mobilization to adapt to the challenge" (p. 5). The specific neural pathways that are involved and the peripheral changes that prepare the body to react to stress are discussed in detail in the review of literature related to the stress response.

From birth humans have a neurobiological ability to monitor their environment for potential threats to their safety. Biologically, HPA response triggers a cascading of neuroendocrinological events that allow the young child to respond to threats to safety and well-being. Early on such innocuous environmental input as loud noise or the appearance of a stranger may stimulate HPA response. As the child begins to engage in relationship building, he or she gains the capacity to moderate these signals, and to distinguish between threatening and nonthreatening events. Research has shown that postnatally even simple touch and handling serve to dampen HPA responsivity (Liu et al., 2000). Early life experiences including the frequency of events perceived by the young child as threatening and the availability of stable and responsive caregivers to support the young child's growing capacity to recognize and react to such events is critical to how the HPA system develops and functions (Taylor et al., 2004). Numerous research studies have now documented the impact of the physiological process of neuroendocrinological response to threatening events; the stress response in early development; and its powerful and long-term effects on the formation of brain circuitry and plasticity, behavior, social-emotional development, and physical and mental health (Black, 1994; Bremner, 2006; Coplan et al., 1996; Davis, 1996;Francis et al., 1999; Goodwin, Hoven, Murison, & Hotopf, 2003; Gunnar, 2000; Gunnar & Cheatham, 2003; Gunnar & Donzella, 2001; Kim et al., 1996; Loman & Gunnar, 2009; Maier, Amat, Baratta, Paul, & Watkins, 2006; McEwen, 1998, 2006; Patchev & Patchev, 2006; Perry, 2001; Rice & Barone, 2000;Schulkin, 2006; Taylor et al., 2004; Vasquez, 1998).

For the young child learning to navigate and respond to the physical and social environment, events that range from problem-solving challenges to the perception of imminent danger, may activate the neuroendocrinological mechanisms that prepare the human body to

protect itself from harm. Individual differences such as temperament, quality of relationships, attachment, and emotion regulation affect young children's perception of threats to their safety and well-being. Once the triggers that set the stress response in motion are activated, however, the cascading of physiological events that define the stress response, the biological, and the neuroendocrinological reactions are universally predictable.

The healthy function of the stress response allows the young child to react, regulate the response, and terminate it when the stress is over or the child has adapted to a new component of his or her environment. How the child evaluates the significance of circumstances and how he or she responds is determined by the self-regulatory mechanisms that he or she develops in the context of social interactions (Posner & Rothbart, 2000). In their discussion of factors that impact the development and regulation of the limbic-hypothalamic-pituitary-adrenocortical (LPHA) system, Gunnar, Bruce and Hickman (2001) listed quality of care and temperament as significant.

Gunnar and Cheatham (2003) stated that responsive and sensitive caregiving in the first year of life is a major contributor to the function of emotion regulation and neuroendocrine stress hormone activity during early development. Studies indicate that early experiences with stressors can bias the physiological response system such that it responds to later stressors as it did to stressors related to early experiences (Maier et al., 2006).

The stress response, which produces unbound cortisol in the bloodstream, is the result of the recognition of the strain put on a system and of its effort to restore control or homeostasis. Animal studies have shown that certain activation sequences occur depending on the intensity and duration of stressful events, but the stress reaction in general involves the entire physiological system. Behaviors linked to the stress response are based in the neurochemical

changes linked to stress. Defensive behaviors and aggression are among these, as well as the suppression of pain. Metabolic processes including the elevation of glucose in blood plasma result in response to acute stress (Patchev & Patchev, 2006). Meaney et al. (1994) found in animal studies that early experiences affect the level of responsivity of the HPA axis in such a way that the system either over-reacts in animals that are subject to early unpredictable stress or under-reacts in animals that are exposed to a neonatal handling procedure with a calming effect.

Effects of Stress

While the stress response acts to prepare the body for action and to protect it and finally restore it to its allostatic state, the long-term effects on this activation of physiologic systems have been associated with adverse psychological and physical health outcomes in children and adults (Black, 1994; Ising & Holsboer, 2006; McEwen, 1998; Shonkoff, 2008; Taylor et al., 2004). McEwen (1998) noted that because stress is a common experience its association with cause or exacerbation of many illnesses has been difficult to determine. Refined technologies and advanced understanding of the pervasive effects of the physiology of the stress response have led to strong evidence that while this response acts to protect the body from damage in the short term, its chronic and repeated activation early in development is associated with negative long-term mental and physical impairments. Smith et al. (2006) discussed inappropriate regulation of the stress response and its link to "a wide array of pathologies including autoimmune disease, hypertension, affective disorders, and major depression" (p. 390).

Brain development. The architecture of the brain is established early in development through a dynamic process of interaction with the environment and significant personal interactions and experiences. The building of advanced social, emotional, and cognitive skills is dependent on the architectural strength of the developing brain (Rice & Barone, 2000; Shonkoff,

2008; Tierney & Nelson, 2009). Early environments and experiences impact the development of neural circuitry including how connections are made and how they are sustained. While the brain retains a degree of plasticity throughout life, the developing brain goes through critical and sensitive periods during which the outcomes of social, emotional, and cognitive experiences have significant impact on the developing structure of the brain (Dawson, Ashman, & Carver, 2000; Fox & Rutter, 2010; McEwen, 1999) Sensitive periods allow neural circuitry an optimum period of formation. Positive, diverse, and socially and emotionally supported early experiences optimize this circuitry formation, while depraved or socially and emotionally damaging early experiences have long-term detrimental effects on the brain's architecture. Likewise, critical periods in child development are limited periods of time during which the young child is "biologically prepared to acquire certain adaptive behaviors but needs the support of an appropriately stimulating environment" (Berk, 2008, p. 23). The quality of relationships in the child's environment is critical to positive developmental outcomes across domains including the shaping of the brain's architecture (National Scientific Council on the Developing Child, 2007).

Brain development is impacted by the effects of stress to which it is exposed during the creation of its neural circuitry. The developing brain is in the process of creating life-sustaining and life-preserving systems that protect and help the young child deal with stress. Continued or sustained exposure to stress, however, can create deficiencies in the immune system, result in damage to the hippocampus of the brain, and alter the function of areas of the brain involved in learning and memory (National Scientific Council on the Developing Child, 2007). The reactivity of the young child to stressful circumstances in his or her environment is partially determined by the child's temperament. Kagan et al. (1987) found that children who are slow to

warm process sensory information more slowly than easier to warm children and may exhibit anxiety-like symptoms.

Immune system. Studies have indicated that cortisol, along with other mediators of stress, causes a down regulation of immune system function, resulting in immunosuppressive effects (Black, 1994). Stress physiology has been implicated in immune system functioning, with both immediate and long-term outcomes. Stress has an immediate or acute effect on the immune system by calling its resources into action, creating a short-term advantage of enhancing the body's immunological abilities. While acute stress activates the immune system, chronic stress suppresses it, eventually leading to a dampening of the system's ability to provide a short-term immune response. Chronic stress and the body's subsequent inability to shut off the stress response and return to its allostatic state leads to long-term suppression of the immune response and greater susceptibility to inflammatory and autoimmune disorders (McEwen, 1998).

The field of psychoneuroimmunology studies how thought and emotions affect immune function. This field of study has identified the immune system's ability to influence the central nervous system, connecting the brain to the immunological network. Studies show events that occur in the brain, specifically at the HPA axis, in response to stress are similar to those which occur when the immune system is activated. In both cases the effect of HPA activation is a down regulation of the function of the immune system (Black, 1994; McEwen, 2000).

Cognition. Repeated stress causes changes in the prefrontal cortex and amygdala of the brain. Chronic stress leads to impairment of hippocampal-dependent memory tasks (McEwen, 2008). Bremner (2006) described a broad range of effects on the brain's function and structure as a result of stress including the neuropsychological components of memory. According to Kim et al. (1996) detrimental effects of stress on cognitive function have been demonstrated in both

animal and human studies. They noted that changes in the plasticity of the hippocampus associated with stress contribute to impairments in memory and learning.

Stress-induced illness. McEwen (2008) stated that “stress begins in the brain and affects the brain, as well as the rest of the body” (p. 174). Although hormones related to the stress response are necessary in the process of adaptation to acute stress, if exposure to those stress mediators is persistent or chronic they can become a factor in pathogenic courses such as cardiovascular disorders including hypertension and coronary artery disease (Goodwin et al., 2003; Ising & Holsboer, 2006; Taylor et al., 2004).

Mental health disorders. The remodeling of neural circuitry and its relationship to psychiatric disorders was described by McEwen (2008). He reported that depression and anxiety disorders have been linked to the effects of stress. Ising and Holsboer (2006) reported the link between genetic factors, the stress response and bi-polar disorder. Prolonged stress and its effects on the hippocampus in animal models have led to studies of the hippocampus of humans related to disorders such as depression and schizophrenia. These studies have documented atrophy of the hippocampus, amygdala, and prefrontal cortex (McEwen, 2000).

These effects of stress have implications for children in full-day childcare as they build meaningful relationships, develop strategies to recognize and cope with stress in their environment, negotiate their needs and wants, learn to regulate their emotions, create neural circuitry that will endure a lifetime, and give meaning to themselves and the world hopefully in the context of respectful, reciprocal, and responsive relationships.

Quality Care

One question in research of childcare that has yielded extensive information is the effect of childcare quality on the child's developmental competencies. High quality has been defined as "involving supportive interactions with caregivers, positive interactions with peers, and opportunities for cognitively stimulating play." Poor quality has been described as "negative interactions with caregivers and peers and aimless wandering" (Vandell, 1996, p. 391). Negative interactions may be insensitive, critical, or scolding and may lack responsiveness, warmth, or reciprocity. Positive interactions, conversely, may be characterized by affection, warmth, praise, a calm voice, simple language, opportunities to interact, and a context of enjoyable daily routines (McCall, Groark, & Fish, 2010). The *Early Childhood Environmental Rating Scales (ECERS*) (Harms, Cryer, & Clifford, 1998) is the most commonly used early childhood measure of childcare quality. Each of its seven components is weighted equally to attain a quality score, resulting in the possibility of receiving a score of "inadequate" in the measure of teacher-child interaction while still obtaining an overall rating of "good" for the program (Graham, Hogan, White, & Chiricos 2003). Advising that the relationship between the child and caregiver is the most important component of early childcare, these researchers suggest a relationship-based definition of childcare quality. They recommend components of childcare quality guidelines that include, "primary caregiver and continuity of care, and active and responsive caregiving to support children's development give prominence to relationships and social-emotional development" (Graham et al., 2003, p. 14). Because early childhood is a period in which the child develops "autonomy, self-regulation, and language capabilities through interactions with significant adults in their lives" likely in the context of full-day childcare, the caregiver-child relationship is of critical importance in the establishment of childcare quality (Thomason &

LaParo, 2009, p. 285). Research supports the correlation between quality childcare based on caregiver characteristics and cortisol levels in children in full-day childcare (Dettling et al., 2000; Gallagher, 2005; Geoffroy et al., 2006; Gunnar, 1998; Gunnar et al., 1998; Gunnar et al., 2010), as well as the importance of early relationships as they support social-emotional development (Ahnert et al., 2006; Goldstein, Hamm, & Schumacher, 2007; Greenspan, 2003; de Kruif, McWilliam, & Maher Ridley, 2000; Howes, Hamilton, & Philipsen, 1998; Kelly et al., 2008; Knitzer, 2001; Langlois & Liben, 2003; Reis et al., 2000; Ridley, McWilliam, & Oates, 2000). Phillips, Mikos, and Scarr (2000) documented the association of high quality in childcare with teacher training and group size. Children who attend high quality childcare programs have been shown through research studies to be more likely to be "emotionally secure and self-confident, proficient in language, able to regulate impulsive and aggressive inclinations, and advanced in cognitive development" (Helburn & Howes, 1996, p. 62).

Descriptions of poor quality childcare are generally associated with high turnover, which researchers define as instability, and high caregiver-child ratios (Phillips et al., 2000; Schumacher & Hoffmann, 2008). Helburn (1995) reported that childcare in most centers in the United States is poor to mediocre, with almost half of infant or toddler rooms having poor quality, and only one in seven centers providing a level of quality that promotes healthy development. Based on her findings, Helburn (1995) made four recommendations to help assure and begin to implement high quality care: 1) educate parents to recognize high quality programs, 2) implement higher state standards, 3) increase investment in childcare staff (including compensation for level of training), and 4) secure adequate financing and support of childcare. Her study also noted a wide variance in childcare quality between and within states.

Tennessee has developed a star-quality system in which it assesses childcare settings statewide. *Tennessee's Star-Quality Child Care Program* is a voluntary program that recognizes childcare settings that exceed minimum licensing standards. Childcare settings may achieve a rating of zero, one, two, or three stars. A center must be opened at least 1 year before it is eligible to participate in the rating system. Centers are evaluated in seven categories: 1) director qualifications, 2) professional development, 3) developmental learning, 4) parent or family involvement, 5) ratio and group size, 6) staff compensation, and 7) program assessment.

Assessment of Quality in Early Childhood Care and Education Center-Based Settings

Burchinal (2010) reported on issues related to measures that assess quality in early childhood care and education settings. She noted that definitions of the basic characteristics of quality are not consistent across measures and reported the need to strictly define those characteristics. She reported, in her review of instruments, that observations of caregiver-child interaction are stronger predictors of child outcomes that process measures. Her review differentiated measures by: 1) structural and process measures, 2) classroom and caregiver background measures, 3) age and type of setting, and 4) observing all children or one child in process measures.

Quality measured by structural aspects included settings and physical features of the classroom, while quality in terms of process included characteristics such as caregiver-child interaction, according to her review. Structural variables included group size, ages of children served, child-caregiver ratios, training and background of caregivers, and safety elements of the environment. Process measures focused on the child's experience in the early childhood care and education setting such as caregiver responsiveness and sensitivity and classroom management. Caregiver-ratios and caregiver education were the most widely studied structural measures of

quality and were assessed in the *ECERS* (Harms, Cryer, & Clifford, 1998). While measures that included age and type of setting were specific to age and setting, two instruments were reportedly used across age and setting; the *Observational Record of the Caregiving Environment* (*ORCE*) (NICHD ECCRN, 2003) and the *Caregiver Interaction Scale* (*CIS*) as shown in Appendix C (Arnett, 1989).

Observing all children and the caregiver's interactions with them was the typical focus of assessment of quality care. Measures that focused on the caregiver and child in this context included: *CIS* (Arnett, 1989); *Early Childhood Environment Rating Scale-Revised* (*ECERS-R*) (Harms, Clifford, & Cryer, 2005); *Infant-Toddler Environment Rating Scale* (*ITERS*) (Harms, Cryer & Clifford, 1990); *Classroom Assessment Scoring System (CLASS*) (Pianta, LaParo, & Hamre, 2009); and the *Early Language and Literacy Classroom Observation (ELLCO)* (Smith & Dickinson, 2003). In contrast, measures that assessed individual experiences, based on the idea that two children may have different experiences in the same group setting, included the *ORCE* (NICHD ECCRN, 2003) and *Emerging Academic Snapshot* (*EA Snapshot*) (Ritchie, Howes, Kraft-Sayre, & Weiser, 2001) that described the experiences of individual children with individual caregivers.

Burchinal concluded that a wide range of measures designed to evaluate childcare quality is available and that selection of the instrument is dependent on the purpose for which the measure is selected. The *CLASS* was noted to "include combinations of multiple aspects of the caregiving environment, measuring both caregiver sensitivity and quality of instruction at the global level" (Burchinal, 2010, p. 6). Additionally, she encouraged the development of a uniform definition of quality in early childhood care and education settings and continued development of measures that assure a high degree of reliability and validity.

Summary

To summarize, this review of literature and the subsequent focus of this study of infants and toddlers in full-day childcare, their temperament, attachment, and their level of stress has as its basis the early caregiver-child relationship and its influence on the overall developmental trajectory of the young child. Data that support childcare as the context in which infants and toddlers form attachment relationships and well as research regarding the quality of those environments has been reviewed. Stress in children served in full-day childcare and its relationship to the quality of the caregiver-child interaction has been documented. Research studies have supported the finding that children in full-day childcare experience higher levels of stress than those who do not attend childcare, and that stress is directly related to the quality of the caregiver-child relationship (Gunnar, 1998, Gunnar et al., 2010; Lisonbee et al., 2008; Palmer, 2001; Sims et al., 2005). Children who attend full-day childcare in a high quality environment with available, responsive, and nurturing attachment relationships with their caregivers experience less stress and are able to calm more quickly than children in those settings for whom relationships with caregivers are of poor quality (Gunnar et al., 1996; Gunnar, 1998).

After a review of literature, this study includes data to explore: 1) what difference exists between individual child temperament of toddlers in full-day childcare, as assessed separately by parent and caregiver, using the *ECBQ-VSF* (Rothbart, 2009), 2) whether there is a change between morning and afternoon cortisol concentrations of toddlers enrolled in full-day childcare and the direction of that change, 3) whether there is a significant correlation between individual child temperament reported by teachers using the *ECBQ-VSF* (Rothbart, 2009)and group cortisol concentrations of toddlers in childcare, and 4) whether the quality of caregiver-child interaction as measured by the eight dimensions of the toddler *CLASS* (LaParo et al., 2011) and group

engagement as measured by the researcher-adapted *EC II* (McWilliam, 1999) (and caregiver-child interaction and engagement) predict cortisol concentration as measured by cortisol enzymeimmunoassays.

Chapter 3 covers the methodology for this study of caregiver-child interaction and the stress response, including temperament in toddlers in full-day childcare. It details the research design, procedures, participants, setting, data collection instruments, and researcher reliability as well as methods for data analysis.

CHAPTER 3

METHODOLOGY

This study was used to examine the relationship between child temperament and stress response in toddlers from 12- to 24-months of age in full-day childcare settings in Tennessee. It was also used to examine the quality of caregiver-child interaction and stress response. Mid-morning and mid-afternoon cortisol concentrations were compared to determine change in cortisol concentrations. The goal of this exploratory study was to answer questions regarding the relationship between child temperament and stress response and the quality of caregiver-child interaction.

Four instruments were chosen as measurements for data collection and a fifth for reliability. *ECBQ-VSF* (Rothbart, 2009) measured three dimensions of temperament (negative affect, surgency, and effortful control) that explain individual differences related to personality and social development. The inclusion of an assessment of temperament in this study was an effort to include both the biological (stress response) and behavioral (temperament) components of early childhood development and their unique effect and impact on relationship building. The toddler *CLASS* (LaParo et al., 2011), the newly released assessment of teacher-child interactions in toddler classrooms, was chosen for the study based on its eight dimensions that assess effective teacher-child interaction in group settings, the focus of this study. It was also chosen because other assessment instruments more often assess the physical environments and materials available in the classroom, but the toddler *CLASS* focuses on the quality of teacher-child interaction. The *CIS* (Arnett, 1989), which measures the quality of the caregiver-child relationship, was used as reliability for the toddler *CLASS.* A researcher-adapted version of the *EC II* (McWilliam, 1999) was used to measure the percentage of time children were engaged in

activities and interactions appropriate for age or stage and culture. High levels of engagement are indicative of increased opportunities for learning. Finally, to measure morning and afternoon cortisol concentration salivary enzymeimmunoassay, which has been shown to be a scientifically accurate and obtainable measure of the physiological response to stress in young children and adults was used to measure the level of the stress hormone cortisol. Cortisol is unbound in blood and can be measured through levels obtained from saliva. Additionally, salivary cortisol has been shown to be a reliable, noninvasive method of assessing plasma cortisol concentrations. It has the advantage of being less invasive than blood sampling and is also less expensive and less difficult to collect especially when obtaining multiple samples from participants. It has been used reliably in many studies of young children in childcare to assess stress children are experiencing and, therefore, was included in this study.

Design

This exploratory study was used to collect and analyze data to answer questions regarding the relationship between temperament and cortisol concentrations, the quality of caregiver-child interaction, and morning and afternoon cortisol concentrations. This explanatory research design is a correlational design that allows the researcher to explore the extent to which two or more variables covary. It consists of a simple association between variables (Creswell, 2005). This study contained characteristics of correlational research described by Creswell including the investigation of a specific group (infants and toddlers), the correlation of two or more variables, collection of at least two scores for each individual in a group (temperament and cortisol), use of scores on a continuum, and use of a correlational statistical test in data analysis. Finally, results from the research revealed information about the strength and direction of correlation data “in order to provide additional information,” and “participants are taken as they

are" without experimental intervention (p. 327). Results do not establish cause but explore relationships between and among variables. Quantitative data that were collected allowed variables to be defined and measured, to describe and interpret a relationship between variables, and to produce statistical information (Gall, Borg, & Gall, 1996; Witte & Witte, 2007). Computing pairs of scores on individuals in the sample allowed correlations to determine the extent of relationship (Krathwohl, 1998). Data analyzed were collected on young children age 12- to 24-months who attend full-day childcare and their teachers and parents in the form of observations, assessments, questionnaires, and cortisol enzymeimmunoassays to determine the strength of the above named relationships. The sample size, the number of infants and toddlers needed to predict outcomes for this study, was calculated predicting medium effect size. A statistical power analysis was estimated using Cohen's (1988) effect size formula in which the medium effect size of f2is .l5. Using G*Power 3 software with an estimated effect of .l5, α of .05 and power of .80 and two predictors, a sample size of 68 was established. To allow for errors in cortisol enzymeimmunoassays, Salimetrics Lab LLC, State College, Pennsylvania, recommends a 5% to 10% margin, bringing the sample size to 75.

Procedures

The procedures used in this study are outlined here.

Participants

Full-day childcare centers that hold a three-star rating in east Tennessee were solicited for participation in this study. Children ages 12 to 24 (n = 73) months who attended full-day childcare programs and their caregivers or teachers and parents were included. Childcare programs were invited to participate based on their star-quality rating in the state of Tennessee. Inviting participants from only three-star centers insured a level of quality across centers. A list

of childcare providers in Tennessee was created from the State Department of Human Services online list (http://www.tennessee.gov/humanserv/adfam/ccfcc.html). Childcare centers in the Tennessee counties of Carter, Greene, Hawkins, Johnson, Sullivan, Washington, and Unicoi were identified. Of the 338 centers listed on the Department of Human Services site 139 held a three-star rating. Of those 89 served young children between the ages of 12 to 24 months.

From the childcare centers that matched star rating and age criteria for the study a list of potential participants was created. Inclusive criteria for participation included: 1) a current three-star rating, 2) toddler classrooms in which teachers had been employed for a minimum of 3 months prior to the study, 3) children age 12 to 24 months enrolled in the classroom, 4) the provision of a full-day, 5 days a week program, 5) a similar weekly cost to attend the center, across centers to control for socioeconomic status.

Using the list of 89 potential centers meeting the geographic, star rating, and age criteria, the researcher contacted centers by phone. Details of the study and criteria for participation were reviewed with center personnel. Phone contact and conversations with directors or assistant directors generated interest in the study from 19 of the 89 centers.

From this list of 19 prospective centers visits were scheduled and made to each childcare setting. The researcher met with individual center directors and teachers when available to clarify the structure and components of the study, to answer questions, and to gain written permission for the research. At initial visits five centers did not meet the teacher-child ratio requirement and class size for participation. At visits with the remaining 14 centers the directors or assistant directors signed verification for participation in the study, which were provided to the East Tennessee State University Institutional Review Board. At the time of this visit teacher consents (see Appendix D) were obtained from teachers who were present and were left for those who

were not. Parents were given a copy of the Early Childhood Behavior Questionnaire (see Appendix B), a consent form (see Appendix E), a note with directions (see Appendix F), and a return envelope for returning the completed materials. The packets were left at each childcare center along with a legal-size manila envelope labeled “Consent Forms” for both teachers and parents.

In regard to consent forms elements required for approval by the East Tennessee State University Institutional Review Board guidelines were included in both teacher and parent forms (see Appendix G). The word *research* was present in the explanation of the study. Disclosure of the purpose, duration, and procedures, as well as acknowledgement of the experimental nature of the study was included. Risks or discomforts along with potential benefits were explained. Information regarding confidentially of records was shared in addition to assurance that participation was voluntary and that refusal to participate would involve no penalty. Participants were informed of their prerogative to discontinue as a member of the study at any time without penalty. Assurance that no cost to the participant would be incurred in the study was stated. Parental consent forms included the description of potential nonverbal communication from toddlers who participated in the study. If a toddler resisted collection of cortisol by pursing his or her lips and turning away from the researcher, a message of desire to forego participation in the study was assumed, and cortisol was not collected from the child. Likewise, if a parent did not want his or her child to participate in the study, no cortisol sample was taken.

Informed consent was obtained from parents or legal guardians and teachers or caregivers. No confidential or personally identifying information concerning research participants was disclosed. As required by the Institutional Review Board, data will be kept in locked storage identified by the study name only and destroyed after 5 years. The identity of

toddlers was disguised by using initials taped to their backs during observation. In the event that records or data pertaining to this study are transferred, assurances that the records and data will remain confidential will be obtained (Miller & Salkind, 2002).

For both teacher and parent consents a duplicate was provided. Directors or teachers were instructed to have parents return signed consent forms sealed in envelopes provided. Assurance of confidentiality for the center, parents, teachers, and children who consented to participate was given by the researcher. Childcare center demographic data were also gathered at this meeting.

Follow-up phone calls were made to each of the 14 participating centers to determine parent response. After 2 to 3 weeks four of the centers reported only one parent response and those centers were eliminated from the study. The researcher then collected consent forms that had been returned to childcare centers by parents in sealed legal-size envelopes and placed in a larger manila envelope provided by the researcher. Included in the study were 10 centers (11 classrooms), 73 (*n*=73) toddlers, 22 (*n*=22) teachers, and 66 (*n*=66) parents.

Demographics

The demographics for each section of the sample are outlined here.

Childcare center demographics.

Demographic data collected for childcare centers (see Table 1) included: 1) weekly cost of care, 2) number of teachers, and 3) number of children served.

Table 1.

Childcare Center Demographic Data

Classroom	Weekly Cost of Care	Number of Teachers	Number of Children Served
1	$152	12	56
2	$95	10	57
3	$171	36	110
4	$155	15	40
5	$156	7	96
6	$105	9	34
7	$136	18	84
8	$108	21	78
9	$137	10	48
10	$190	17	112
11	$190	17	112
Mean	$145	15.6	75

Teacher or caregiver demographics. Teacher or caregiver demographic data collection included information related to teacher or caregiver number of years of teaching experience with young children, with toddlers specifically, in the childcare classroom, in the center, and with the coteacher in the classroom participating in this study (see Table 2).

Table 2.

Teacher or Caregiver Demographic Data: Years of Experience

Classroom	Teacher	Teaching Young Children (years)	Teaching Toddlers (years)	In this Classroom (years)	At this Center (years)	With this Coteacher (years)
1	1	3	2	1.5	1.5	1
	2	8	4	1	3	1
2	1	5	5	5	-	2
	2	-	-	-	-	-
3	1	7	6	1	3	.5
	2	3.5	3.5	.5	3.5	.5
4	1	22	20	20	22	4
	2	23	23	4	4	4
5	1	22	22	9.5	9.5	.33
	2	6	6	.33	.33	.33
6	1	2	1.5	1.5	2	.5
	2	1	.5	.5	1	.5
7	1	24	20	6	7	5
	2	4	2	.5	4	5
8	1	24	2.5	2.5	3.5	2.5
	2	6	5	4.5	4.5	2.5
9	1	1.5	1	.66	1.5	.25
	2	1	1	.25	1	.25
10	1	8.5	5.5	1.5	8	3.5
	2	12	10	1.5	4.5	3.5
11	1	18	5	1.5	10	1.5
	2	7	7	.75	5.5	1.5
Mean (years)		9.9	7.3	3.1	5	2

Professional development data were also collected from each teacher, including highest level of education, major, and number of workshops or conferences on cognitive development and social emotional development attended. One teacher had a master's degree (MS) in Early Childhood Education, two had bachelor's degrees (BS), eight had associate degrees (AD), three had high school diplomas (HS), and two had general education diplomas (GED). Degrees being sought included Early Childhood, Nursing, and Child Development (CDA), an entry level credential required for licensing or to be a lead teacher that included 120 hours of formal childcare education. Table 3 illustrates education and professional development.

Table 3.

Teacher or Caregiver Demographic Data: Professional Development

Classroom	Teacher	Education	Major	Cognitive Workshop	Social Emotional Workshop	In School	Degree Seeking
1	1	AD	EC	9	9	N	
	2	HS		9	9	N	
2	1	GED		6	6	N	
	2	--	--	--	--	--	--
3	1	HS		3	3	Y	EC
	2	HS		18 hours	18 hours	N	
4	1	HS		5	5	N	
	2	AD	EC	5	5	N	
5	1	AD	Health	7	7	Y	CDA
	2	BS	Ecology	1	3	N	
6	1	GED		0	0	N	
	2	HS		0	0	N	
7	1	AD	EC	3	3	N	
	2	AD	Business	3	3	Y	CDA
8	1	GED		5	5	N	
	2	HS		5	5	N	
9	1	HS		0	0	Y	Nursing
	2	AD	EC	2	1	Y	EC
10	1	MS	EC	10	10	N	
	2	AD	EC	10	10	Y	EC
11	1	AD		2	1	N	
	2	BS	EC	6	4	N	

Note. MS = Master's Degree. BS = Bachelor's Degree. AD = Associate Degree. HS = High School Diploma. GED = General Education Diploma. CDA = Child Development Associate Credential. EC = Early Childhood

Child demographics. Child demographic data related to race or ethnicity and special needs were collected for children in each of the classrooms studied. Data included all children in the classroom whether or not they were participants in the study. Table 4 illustrates race or ethnicity that includes 100 Caucasian, 4 Hispanic, 2 Indian (India), 3 African-American or Asian children for a total of 109. The total of Hispanic, Indian, and African-American or Asian (9) is charted as a group (Other) in Table 4 to protect confidentiality. There were no children reported with special needs.

Table 4.

Child Demographic Data: Race or Ethnicity

Classroom	Number of Children in Classroom	Race or Ethnicity
1	8	100% Caucasian (8)
2	11	100% Caucasian (11)
3	9	100% Caucasian (9)
4	8	50% Caucasian (4) 50% Other (4)
5	12	100% Caucasian (12)
6	11	91% Caucasian (10) 9% Other (1)
7	9	89% Caucasian (8) 11% Other (1)
8	10	100% Caucasian (10)
9	8	88% Caucasian (7) 12% Other (1)
10	12	100% Caucasian (12)
11	11	82% Caucasian (9) 18% Other (2)

Note: Other includes Asian, African-American, Hispanic, and Indian.

Setting

The setting for this study was 11 childcare center classrooms, one each at nine centers and two classrooms in one center, in counties in Tennessee. The 3-star rated centers operated a full-day program, 5 days a week, and contained classrooms that served children from 12 to 24 months of age. Classroom teachers had been employed by the center and in the toddler classroom

for a minimum of 3 months prior to the study. The weekly cost of attendance range of $95 to $190 acted as a partial control of socioeconomic status of the families involved. Classroom size ranged from 8 to 12 children with two teachers or caregivers.

Measures

The measures used are outlined here.

Toddler classroom assessment scoring system

The toddler *CLASS* (LaParo et al., 2011) was used to measure the independent variable of *quality of caregiver-child interaction* as well as classroom environment. The toddler *CLASS* design assesses effective, teacher-child interactions in group setting, which was the focus of this study. It is a classroom level observation that reflects the experience of the average child within the classroom. The toddler *CLASS* (LaParo et al., 2011) is based on scales used by the National Institute of Child Health and Human Development (NICHD) Study of Early Care, Early Child Care Research Network (ECCRN) and the National Center for Early Development and Learning (NCEDL). The eight dimensions created and assessed by the toddler *CLASS* "were derived from a review of the constructs related to positive outcomes for children, parenting literature, observation instruments used in formal group settings for research, literature on effective teaching practices, expert review, and extensive piloting" (LaParo et al., 2011, p. 2). Dimensions used for the toddler *CLASS* are similar to those of preschool and early elementary *CLASS* instruments. Toddler dimensions, however, are specific to developmental levels and expectations for this age group, with acknowledgement that characteristics of effective teacher-child interactions remain constant across all domains of child development. The eight dimensions of the toddler *CLASS* are scored in 20-minute observation cycles based on the degree to which certain behavioral markers characterized the classroom during that cycle. During each 20-minute cycle the researcher observes and takes

notes. A rating of low (1 or 2), medium (3, 4, or 5), and high (6 or 7) is assessed for each of the eight dimensions: positive climate (PC), negative climate (NC), teacher sensitivity (TS), regard for child perspectives (RCP), behavior guidance (BC), facilitation of learning and development (FLD), quality of feedback (QF), and language modeling (LM). The toddle*r CLASS* design assesses effective teacher-child interactions in group settings, which was the focus of this study. Preliminary validation findings for teacher-child interactions in childcare ranging from .57 through .76 have been reported (Thomason & LaParo, 2009).

Researcher-adapted engagement check II. The researcher-adapted *EC II* (McWilliam, 1999) is designed to measure group child engagement (Raspa et al., 2001). Engagement is related to opportunities for learning and, therefore, classroom quality. Dunst, Trivette, Raab, and Masiello (2008) defined engagement as "the time spent involved in an activity or interactions with people or objects" (p. 2). Engagement is related to opportunities for learning and is essential to learning. When engagement is contextual and occurs in a developmentally appropriate manner between children, adults, or materials, the stage is set for learning to take place. In a setting that is appropriate for developmental age-stage and culture and where opportunities for children to interact are available, the percentage of time children are engaged and the likelihood that learning is taking place increases. McWilliam (1999) described engagement as the most undervalued construct in early childhood. The researcher-adapted *EC II* is designed to measure group child engagement. McWilliam (1999) defined engagement as active interaction in classroom activities in behavior that is developmentally and contextually appropriate, very similar to the definition of Dunst et al. (2008). Group engagement coding uses percentages and consists of counting the number of children who are engaged visible in one pass, and counting

the number nonengaged (i.e., crying, wandering, interacting inappropriately with materials) in the second pass. The percentage of children engaged is calculated and recorded for each interval.

$$E = \frac{\text{\# of children present - \# nonengaged}}{\text{\# present}} \times 100$$

Data are recorded on a coding form by interval, number present, number nonengaged, and percent engaged. The adapted version includes two additional columns to record activity and comments during data collection.

Salivary cortisol enzymeimmunoassay. To measure morning and afternoon cortisol concentrations, salivary enzymeimmunoassay was used. This immunoassay measures the level of the stress hormone cortisol and has been shown to be a scientifically accurate and obtainable measure of the physiological response to stress in young children as well as adults. Saliva is an ideal testing fluid because samples can be collected in a convenient, measureable, noninvasive, and repeatable manner to assess plasma cortisol concentrations. It has the advantage of being less invasive than blood sampling, which can itself lead to significant HPA axis activation. It is also less expensive and less difficult to collect, especially when obtaining multiple samples from participants before and after exposure to stressful situations (Kirschbaum & Hellhammer, 2000). In addition, salivary cortisol has the advantage of measuring plasma-free cortisol, the more biologically active form of plasma cortisol and a better measure of adrenal cortical function than serum cortisol. Linear correlations between “free” cortisol in saliva and blood are approximately .90 (Kirschbaum & Hellhammer, 1989). Furthermore, salivary cortisol is not affected by saliva flow rates (Kirschbaum & Hellhammer, 2000). The use of an absorbent device such as gauze for children under 6 years of age is recommended and immunoassays have the additional advantage of being designed to work with small sample volumes.

Early childhood behavior questionnaire-very short form. The *ECBQ-VSF* (Rothbart, 2009) provided a behavioral assessment of one independent variable, *temperament.* Temperament has been described as "the child's typical, presumably biologically-based tendency" to react in a particular way to the environment (Gunnar & Donzella, 2001, p. 204) and has impact on reactivity to stress or fearful situations by young children. The study of temperament in young children helps explain individual differences related to personality and social development. Temperamental predispositions identified in infancy and early childhood have been correlated with anxious responses to experiences (Kagan & Snidman, 1999). The inclusion of an assessment of temperament in this study is an effort to include both the biological (stress response) and behavioral (temperament) components of early childhood development and their unique effect and impact on relationship building. According to Kagan and Snidman (1999), "The combination of temperament and history (experience) determines the ease with which the event activates limbic structures (the stress response) and the subsequent emotional response" (p. 1540).

The *ECBQ-VCF* assesses temperament in young children using three dimensions: negative affect, effortful control, and surgency. Negative affect is defined by scales addressing sadness, discomfort, anger or frustration, fear, and reactivity or soothability. Effortful control evaluates low intensity pleasure, inhibitory control, attentional focusing, and perceptual sensitivity. Surgency or extroversion is defined by scales that evaluate impulsivity, high-intensity pleasure, activity level, shyness, positive anticipation, and smiling and laughter (Garstein & Rothbart, 2003). A total of 36 items, 12 for each dimension, are rated by caregivers or teachers using a Likert scale from one to seven based on how often the child engaged in a specific behavior in the last 2 weeks. Each item describes a behavior followed by numbers 1 to 7: (1)

never, (2) very rarely, (3) less than half the time, (4) about half the time, (5) more than half the time, (6) almost always, and (7) always. Final scores are calculated by determining the average of each set of 12 items related to the three assessed dimensions. Cronbach's alpha for the 18-24 month age range are from .57 (impulsivity) to .90 (perceptual sensitivity) (Putnam, Gartstein, & Rothbart, 2006).

Caregiver interaction scale. The *CIS* (Arnett, 1989) was used for reliability in this study to assess the quality of caregiver's interactions with children and their emotional tone and approach to engaging and disciplining children, evaluating the independent variable of *quality of caregiver-child interaction* along with the toddler *CLASS* (LaParo et al., 2011). Gunnar and Donzella (2001) cited studies that show the quality of the caregiver-child relationship affects the young child's ability to express his or her emotions and seek the help of the caregiver without stimulating increases in cortisol concentration. The *CIS*, which measures the quality of caregiver-child interaction, uses a 26-item Likert scale with responses labeled from 1 to 4, 1 indicating "not at all true" and 4, "very much true." Questions include, "speaks warmly to the children," "seems distant or detached from the children, " "speaks with irritation or hostility to the children," "finds fault easily with children," and "doesn't supervise the children very closely." Reliability among members of the researcher team ranges from .75 to .97 between certified observer and trainees. Concurrent validity has shown correlation coefficients of .43 to .67 between the *CIS* and the *Early Childhood Environment Rating Scale-ECERS* (Harms, Cryer, & Clifford, 1998). Reliability ratings range from .81 to .95 on different scales as reported by Arnett (1989). Reliability among researchers ranged from .75 to .97 between certified observer and trainees. Concurrent validity has shown correlation coefficients of .43 to .67 between the *CIS* and the *Early Childhood Rating Scale* (*ECERS*).

Reliability Among Members of the Research Team

Members of the research team included the principal investigator and three research assistants. All team members held a current certificate from the Institutional Review Board, Collaborative Institutional Training Institute (CITI) that is required for participation in the research process. One of the three assistants collected data at all sites and each of the remaining assistants acted as a possible substitute on each day of data collection. The use of one assistant added to the assurance of reliability as the sole collector of data along with the principal investigator.

Reliability among researchers was established for the *CIS* (Arnett, 1989) between the researcher and research assistant in field trials. Four, 45-minute sessions were conducted over 2 days by the researcher and research assistant. Jaeger and Funk (2001) recorded researcher reliability between .75 and .97 for two consecutive visits, with no recommended length of observation for the *CIS*. Ratings were determined by each observer in this study on a 4-point scale ranging from (1) not at all true to (4) very much true, describing the extent to which the caregiver exhibits the behavior described in the item. Averages were calculated for each subscale, and total averages for each session were then compared to determine reliability coefficients. Reliability coefficients of .80 and .84 were recorded.

Reliability for the researcher-adapted *EC II* (McWilliam, 1999) was established with the administration of the instrument first with an instructor with established reliability. Reliability among researchers was achieved with the researcher and research assistant over three observational sessions. Data were recorded in 5-minute intervals for 1 hour in sessions that occurred on 2 separate days. Engagement reliability coefficients for the researcher and research assistant for day 1 were .88 and .91 respectively. For day 2 coefficients of .84 and .86,

respectively, were achieved. For the *CLASS* (LaParo et al., 2011) a .81 coefficient was achieved with the master training model by the principal investigator.

Data Collection

Data collection at each classroom (see Table 5) was scheduled to occur for 2 consecutive days during the middle of the week to address the variable that cortisol concentration and teacher interaction may be affected by re-entry into the childcare environment from the weekend and that possible responses may vary related to the end of the week and the anticipation of the weekend. Two consecutive days, Tuesday to Wednesday or Wednesday to Thursday, were scheduled. For each childcare provider the researcher obtained permission and set the schedule to arrive between 8:00-8:30 of morning 1 and 2.

Table 5.

Sources of Data Collection

	Research Question 1 Is there a significant difference between individual child temperament of toddlers in full-day childcare assessed separately by parent and caregiver using the *ECBQ-VSF* (Rothbart, 2009)?	Research Question 2 Is there a difference between morning and afternoon cortisol concentrations of individual toddlers enrolled in full-day childcare?	Research Question 3 Is there a significant correlation between individual child temperament assessed by teachers using the *ECBQ-VSF* (Rothbart, 2009) and group salivary cortisol concentrations of toddlers in full-day childcare?	Research Question 4 Does quality of caregiver-child interaction as measured by the eight dimensions of the toddler *CLASS* (LaParo et al., 2011) and group engagement as measured by the researcher-adapted *EC II* (McWilliam, 1999) (and caregiver-child interaction and engagement) predict cortisol concentrations as measured by cortisol enzymeimmunoassays?
Early Childhood Behavior Questionnaire - Very Short Form *(ECBQ-VSF)*	X		X	
Classroom Assessment Scoring System *(CLASS)*				X
Caregiver Interaction Scale *(CIS)*				X
Engagement Check II *(EC II)*				X
Cortisol Enzymeimmunoassays		X	X	X

Day 1

On the morning of day 1, upon researcher and research assistant arrival at each center, children whose parents had consented to the study were identified by having the teacher or caregiver place duct tape on their back, on which the first and last initial of their name had been written. Day 1 was a morning session only which consisted of data collection by a research assistant using the *CIS* in two 45-minute sessions with a break between sessions for recording

and scoring. Concurrent with the *CIS*, the toddler *CLASS* was administered by the researcher in four 20-minute cycles with breaks between each cycle for scoring. Both researcher and research assistant also administered the researcher-adapted EC *II* in 10-minute cycles throughout the observation. Morning 1 additionally allowed the researchers to familiarize themselves with centers, collect teacher demographic information, and give toddlers an opportunity to accept researchers into their daily routine, possibly minimizing the developmental trait of stranger anxiety and its effect on data collection.

Day 2

Day 2 consisted of morning and afternoon data collection. The morning session, which included the presence of both researcher and research assistant, involved identification of participating children with their initials on their back by the teacher or caregiver. Data were collected using the toddler *CLASS, CIS,* and *EC II.* Additionally, saliva was collected at the mid-point of data collection for the toddler *CLASS* at the completion of cycle 2. The afternoon session involved the principal investigator only for data collection, which included the toddler *CLASS, EC II,* and collection of saliva samples on the same schedule as the morning (at the mid-point of data collection for the toddle*r CLASS).*

Toddler Classroom Assessment Scoring System

Each of the classrooms (*n*=11) in the study was observed using the toddler *CLASS* on three separate occasions; the morning of day 1, the morning of day 2, and the afternoon of day 2. Each classroom observation consisted of four 20-minute cycles. During each 20-minute cycle the researcher observed and took notes. At the end of each 20-minute cycle the researcher left the classroom for 10 minutes to review notes and score dimensions based on depth, frequency, and

duration of interactions during the observation. After four observations were completed scores were averaged across cycles to create domain scores.

Caregiver Interaction Scale

The *CIS* was collected by the research assistant in each classroom (*n*=11), concurrent with the toddler *CLASS* and the researcher-adapted *EC II* in two 45-minute cycles on the morning of day 1 and two 45-minute cycles on the morning of day 2. At the end of each cycle the research assistant left the classroom to review notes and score each of the 26 items rated from 1 to 4. After four cycles were completed scores were averaged for each classroom and a total mean score for each center was calculated.

Researcher-Adapted Engagement Check II

Researcher-adapted *EC II* data (see Appendix H) was collected from each of the childcare center classrooms studied (*n*=11) on three separate occasions: morning of day 1, morning of day 2, and afternoon of day 2. Time, number of children present, number of children engaged, nonengaged, activity, and comments were recorded in 10-minute intervals throughout each period of observation (between 9 and 12 10-minute intervals). Percentages of engagement were calculated, recorded, and averaged for each of the three observation periods. Data collection using this instrument was collected concurrently with the toddler *CLASS* and *CIS* during observational periods.

Saliva Sample Collection

While the research assistant continued to collect data for the *CIS* and researcher-adapted *EC II* on the morning of day 2, saliva samples were collected from toddlers by the researcher, with the assistance of the teacher or caregiver. In keeping with the study protocol, a miniature

marshmallow, as a saliva stimulant, was offered to the toddler before the introduction of a 2-centimeter (cm) cotton dental gauze tied with a 40 cm length of dental floss with a looped end. Individual children were identified as participants and offered a marshmallow followed by cotton dental gauze by the classroom teacher or caregiver. To encourage the child's participation, the teacher or caregiver demonstrated herself what she asked the child to do. Prior to offering the cotton dental gauze to the child, the loop in the attached dental floss was wrapped around the finger of the teacher or researcher and held until the cotton was no longer in the child's mouth to ensure that the child did not swallow the gauze. The child, either in front of the teacher or on the teacher's lap, was assisted in holding the cotton gauze in his or her mouth until it was saturated, about 10 seconds.

Attempted collection of saliva samples from toddlers at the first childcare center from which data were collected (Classroom #8) using the methodology described for collection, marshmallows and cotton dental gauze with interactive engagement from the researcher yielded no samples. In the course of data collection from the first center researchers discovered that children were less apprehensive and more cooperative for saliva collection using cotton gauze if the gauze was offered to the child directly by the teacher or caregiver and outside the child's visual awareness of the researcher. In the second setting from which data were collected, Classroom #4, children were taken outside the child's visual field of the researcher. Successful collection rate for saliva at Classroom #4 was 50% (6 of 12 attempts). For collection at the third center, Classroom #1, saliva collection by the teacher or caregiver in the context of classroom activities, with the researcher outside the child's visual field yielded a 92% (11 of 12 attempts) collection rate. While research indicates marshmallow is a viable option for saliva stimulation to determine toddler cortisol concentrations using enzymeimmunoassays (Clements, Parker, Dixon,

& Salley, 2007), toddlers in this study were willing to keep gauze in their mouths with teacher support and encouragement until the gauze was saturated. Therefore, the use of marshmallows was eliminated. The teacher or caregiver introduced the cotton gauze to the toddler in the context of classroom activities, and the researcher remained outside the child's visual field during collection. With one exception (Classroom # 9 at 45%) collection rates for the remaining centers ranged as follows: between 60% and 70% (Classrooms #3, #6, and #10), between 80% and 90% (Classroom #5), and between 90% and 100% (Classrooms #2, #7, and # 11). Saliva collection took place on two occasions: mid-observation and data collection of morning 2, and mid-observation and data collection of afternoon 2, in order to provide comparative samples for morning and afternoon of the same day.

The process of saliva collection was administered one-on-one with the teacher to assure that at no time did the child have the cotton swab in his or her mouth without the teacher's direct engagement. As individual saturated cotton gauze was removed from the child's mouth, the researcher placed the swab in an individually labeled storage tube, (Salimetrics Lab item # 5001.05) whose label was verified with the teacher and the initials on the child's back. The label further identified the number of the center and morning collection as "AM" and afternoon as "PM." The cap was replaced, sealed, and stored for later enzymeimmunoassay. Saliva samples collected from participants were stored after each collection cycle, until assayed, in a –40ºC research freezer. Samples were stored from November 2011 until they were assayed in Lab 1, at East Tennessee State University, on February 27, 2012. After thawing at room temperature samples were centrifuged at 3500 rpm (1500 x g) for approximately 10 minutes until there was clear separation between the supernatant and precipitant. Two 500 µl aliquots of supernatant for each sample (i.e., duplicates) were then pipetted into clean plastic vials for cortisol enzyme

analyses. Eighty-three single saliva samples were collected from participating children, 38 morning and 45 afternoon samples. There were 34 samples collected from the same participant both morning and afternoon.

A breakdown of saliva samples from 83 single samples, which included 34 AM and PM samples from the same children, is demonstrated in Tables 6-8. After centrifuge, the number of samples with saliva volume sufficient for enzymeimmunoassay was 40 (48%), which included 13 AM and PM samples from the same children (see Table 6). After 40 samples were prepared, excess saliva was refrozen and stored in the -40C research freezer. Immunoassays for the 40 samples in duplicate were run using Salimetrics expanded range, high sensitivity salivary cortisol enzyme immunoassay kits (Catalog no. 1-3002, Research Lot # 1201508).

Table 6.

Total Saliva Samples Collected by Center (n=83)

Center	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	Total
AM	6	5	2	0	5	4	8	0	2	2	4	38
PM	5	5	4	6	5	3	7	0	2	4	4	45
AM/PM	5	5	2	0	5	3	7	0	1	2	4	34

When these 40 samples were analyzed at Lab 1 (East Tennessee State University), results indicated cortisol enzymeimmunoassays much higher than expected levels, even on standards and controls. The principal investigator communicated with Salimetrics Labs, the source of enzymeimmunoassay testing kits used for this study, and data were shared with the lab for further analysis in an effort to explain the extremely high values and atypical results obtained in Lab 1. After Salimetrics Labs determined that cortisol enzymeimmunoassays results from the 40 samples analyzed in Lab 1 yielded no usable data (see Table 7), a decision was made to send the remaining vials of excess saliva to Salimetrics Lab for analysis.

Table 7.

Centrifuged Saliva Samples Sufficient for Enzymeimmunoassay (Lab 1) (n=40)

Center	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	Total
AM	1	3	2	0	1	1	8	0	1	1	4	22
PM	1	2	2	0	1	1	5	0	0	3	3	18
AM/PM	0	2	2	0	0	0	5	0	0	1	3	13

The 30 samples sent to Salimetrics Lab were assayed for salivary cortisol using highly sensitive enzymeimmunoassay. The test used 25 µL (micro liters) of saliva per determination, has a lower limit of sensitivity of 0.003 µg/dL (micrograms/deciliter), standard curve range from 0.012 µg/dL to 3.0 µg/dL, an average intra-assay coefficient of variation of 3.5% and an average interassay coefficient of variation of 5.1%. Method accuracy determined by spike and recovery averaged 100.8% and linearity determined by serial dilution averaged 91.7%. Values from matched serum and saliva samples showed the expected strong linear relationship, r (47) = 0.91, p< .0001.

Table 8 displays results from the remaining samples that contained saliva samples in excess of that used for analysis in Lab 1 that had been saved and stored in a -40C research freezer. These samples (30) were sent to Lab 2 (Salimetrics Lab). The results of that analysis yielded data for total (n=28). Two of the 30 samples contained insufficient volume for analysis. Morning (n=17), afternoon (n=11), and AM and PM samples from the same child (n=6) are reflected in the third chart of Table 6.

Table 8.

Centrifuged Saliva Samples Sufficient for Enzymeimmunoassay (Lab 2) (n=28)

Center	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	Total
AM	0	3	1	0	1	0	7	0	(1)	1	4	18
PM	0	0	1	0	1	1	3	0	(1)	3	2	12
AM/PM	0	0	1	0	0	0	2	0	0	1	3	6

Note: Total samples with excess saliva, *n*=30. Sample sufficient for assay, *n*=28 (36%)

Early Childhood Behavior Questionnaire-Very Short Form

At the conclusion of day 2 of data collection the researcher sent a second written communication to the parents through the classroom teacher, asking them to complete the *ECBQ-VSF*. The questionnaire was given to the parent in an envelope with a second envelope provided. Parents were instructed to complete the questionnaire, put it in the envelope provided, seal it, and return it to the child's classroom, where a large manila envelope marked *Parent Copies of Questionnaire* was kept during collection. Teachers and caregivers were given similar instructions and envelopes and directed to return their questionnaires to the classroom and put them in a large manila envelope marked *Teacher Copies of Questionnaire*. The researcher had identified responses from the teacher by a placing T in the upper left corner of teacher responses, and those from parents with a P in the upper left corner of parent responses. Each response was be labeled in the upper right corner with the letter identification for the individual child.

Completed teacher and parent responses to the *ECBQ-VSF* were collected from childcare centers using a follow-up protocol of weekly phone calls to centers for 3 weeks following the second day of data collection at each site. The researcher returned to each center to collect questionnaires from parents and teachers that were sealed in prelabeled individual legal-size envelopes and collected in a large manila envelope.

Collected data from the *ECBQ-VSF* included 66 teacher or caregiver responses and 58 parent responses for a total of 58 pairs (*n*=58) of teacher and parent responses. Data were recorded for three dimensions of temperament: 1) negative affect, 2) effortful control, and 3) surgency, and parent and teacher responses were analyzed to determine correlations.

Data Analysis by Research Question

Data analysis for this study examined the influences of caregiver-child interactions and temperament on cortisol concentrations in children in full-day childcare to determine what association existed between the quality of the caregiver-child interactions, temperament, and cortisol concentrations of toddlers in full-day childcare in Tennessee. Data were analyzed related to specific research questions.

Question 1

Is there a significant difference between individual child temperament of toddlers in full-day childcare assessed separately by parent and caregiver using the *ECBQ-VSF* (Rothbart, 2009)?

To examine the difference between individual child temperament of toddlers in full-day childcare, assessed by parents as well as teachers, *a paired t-test* was used.

Question 2

Is there a difference between morning and afternoon cortisol concentrations of individual toddlers enrolled in full-day childcare?

To examine the difference between morning and afternoon cortisol concentrations of individual toddlers *a non-directional paired t-test, using a .05 alpha level,* was used.

Question 3

Is there a significant correlation between individual child temperament assessed by teachers using the *ECBQ-VSF* (Rothbart, 2009) and group salivary cortisol concentrations of toddlers in full-day childcare?

To examine the correlation between child temperament, assessed by teachers, and salivary group cortisol concentrations a *bivariate correlation* was used.

Question 4

Does quality of caregiver-child interaction as measured by the eight dimensions of the toddler *CLASS* (LaParo et al., 2011) and group engagement as measured by the researcher-adapted *EC II* (McWilliam, 1999) (and caregiver-child interaction and engagement) predict cortisol concentrations as measured by cortisol enzymeimmunoassays?

To predict the relationship between group salivary cortisol concentrations, using the quality of caregiver-child interaction and engagement, and direct and indirect interaction effects, a *simultaneous regression analysis* was used.

Summary

Data gathered for this study included the quality of caregiver-child interactions, cortisol concentration, and temperament in infants and toddlers in full-day childcare settings. The hypothesis that elevated cortisol concentrations will correlate with the quality of caregiver-child interactions and temperament was tested. Concentration of cortisol, *the dependent variable*, was measured.

Temperament, an independent variable, has been described as “the child’s typical, presumably biologically-based tendency” (Gunnar & Donzella, 2001, p. 204) and has an impact

on reactivity to stress or fearful situations by young children. For this study temperament was evaluated using the *ECBQ-VSF* (Rothbart, 2009) and correlated with cortisol levels.

Gunnar and Donzella (2001) cited studies that show that the *independent variable, quality of caregiver-child interaction,* affects the young child's ability to express emotions and seek the help of the caregiver without stimulating increases in cortisol concentration. The toddler *CLASS* (LaParo et al., 2011) was used to assess the quality of caregiver-child interaction in the research settings.

This study is framed in Bronfenbrenner and Morris's (1998) bioecological systems theory, which focuses on both the child's biology and his or her environment and influence on human development. Bronfenbrenner and Morris's proximal processes and repetitive interactions and patterning of children and the importance of stable, meaningful, and interactive relationships was examined during the study (L. Gloeckler personal communication, February 18, 2010). The research was also related to the biology of the developing brain and the impact of chronic stress during critical periods of brain development, including the effects of stress on cognitive function. Watamura, Kryzer, and Robertson (2009) stated that "studies in non-human animals have shown that challenges imposed on these stress systems early in life may have important consequences for later behavior and long-term physical and psychological health" (p. 475).

CHAPTER 4

RESULTS

This study was used to examine the relationship between child temperament and stress response in toddlers from 12 to 24 months of age in full-day childcare settings in Tennessee. Study data included the quality of caregiver-child interaction and stress response. Mid-morning and mid-afternoon cortisol concentrations were compared to determine change in cortisol concentrations. Results revealed the quality of early relationships in full-day childcare settings and correlated the young child's physiological response as measured by cortisol concentrations to the quality of the relationships between the caregiver and young child and to temperament. The study results revealed the need for research regarding teacher practices in the natural environment of childcare where teacher patterns of interacting with children and stress levels related to those interactions can be addressed.

Goal

The goal of this study was to add to the body of research related to caregiver-child interaction in the context of full-day childcare and its relationship to children's cortisol concentrations and temperament. Unique to this study is participation from children in full-day childcare in communities in Tennessee and the use of the newly released toddler *CLASS* (LaParo et al., 2011). The toddler *CLASS* focuses on components that are associated with the elements of effective teacher-child interactions as well as developmental outcomes for toddlers, using dimensions specific to developmental levels and expectations for this age group.

Data Analysis

Data were collected and analyzed using the toddler *CLASS* to measure the quality of teacher-child interaction; the *ECBQ-VSF* to assess temperament; the researcher-adapted *EC II*, to calculate group engagement; and salivary enzymeimmunoassays to measure cortisol concentrations. The *CIS*, which assessed quality of teacher-child interaction, was administered and analyzed as an additional measure of reliability for the toddler *CLASS*.

Demographic data including childcare centers, classrooms, teacher or caregiver years of experience and professional development, and child cultural or racial demographics were analyzed. Salivary enzymeimmunoassays were completed and data were analyzed for individual saliva samples for morning and afternoon (if available) and by centers to answer research questions related to changes in cortisol concentrations from morning to afternoon. Concentrations were then correlated with temperament and teacher-child interaction data. Data from the toddler *CLASS* and researcher-adapted *EC II* were analyzed to answer research questions related to caregiver-child interaction and correlations to temperament and cortisol concentration. Data from the *CIS* (reliability instrument) were included in this analysis.

Toddler Classroom Assessment Scoring System Results

Scoring for the toddler *CLASS* resulted in a set of scores for each classroom (n=11), representing quality, as observed on each dimension during each observation cycle (three observation sessions x four cycles per session). The 12 cycles for each classroom were averaged. The following quality score range for Positive Climate represents the total of Positive Climate scores across the 11 childcare classrooms. The same procedure resulted in each of the eight subsequent domain average scores. The following scores, therefore, represent the range of all scores for each domain. Quality scores from 1-2 (low), 3-5 (middle), and 6-7 (high) for this

study, by domain, across classrooms varied as follows (see Figure 1 for individual classroom scores by dimension):

- Positive Climate (PC) – 3-5
- Negative Climate (NC) – 1-2
- Teacher Sensitivity (TS) – 3-5
- Regard for Child Perspectives (RCP) – 2-6
- Behavioral Guidance (BG) – 3-5
- Facilitation of Learning and Development (FLD) – 2-4
- Quality of Feedback (QF) – 2-4
- Language Modeling (LM) – 2-5

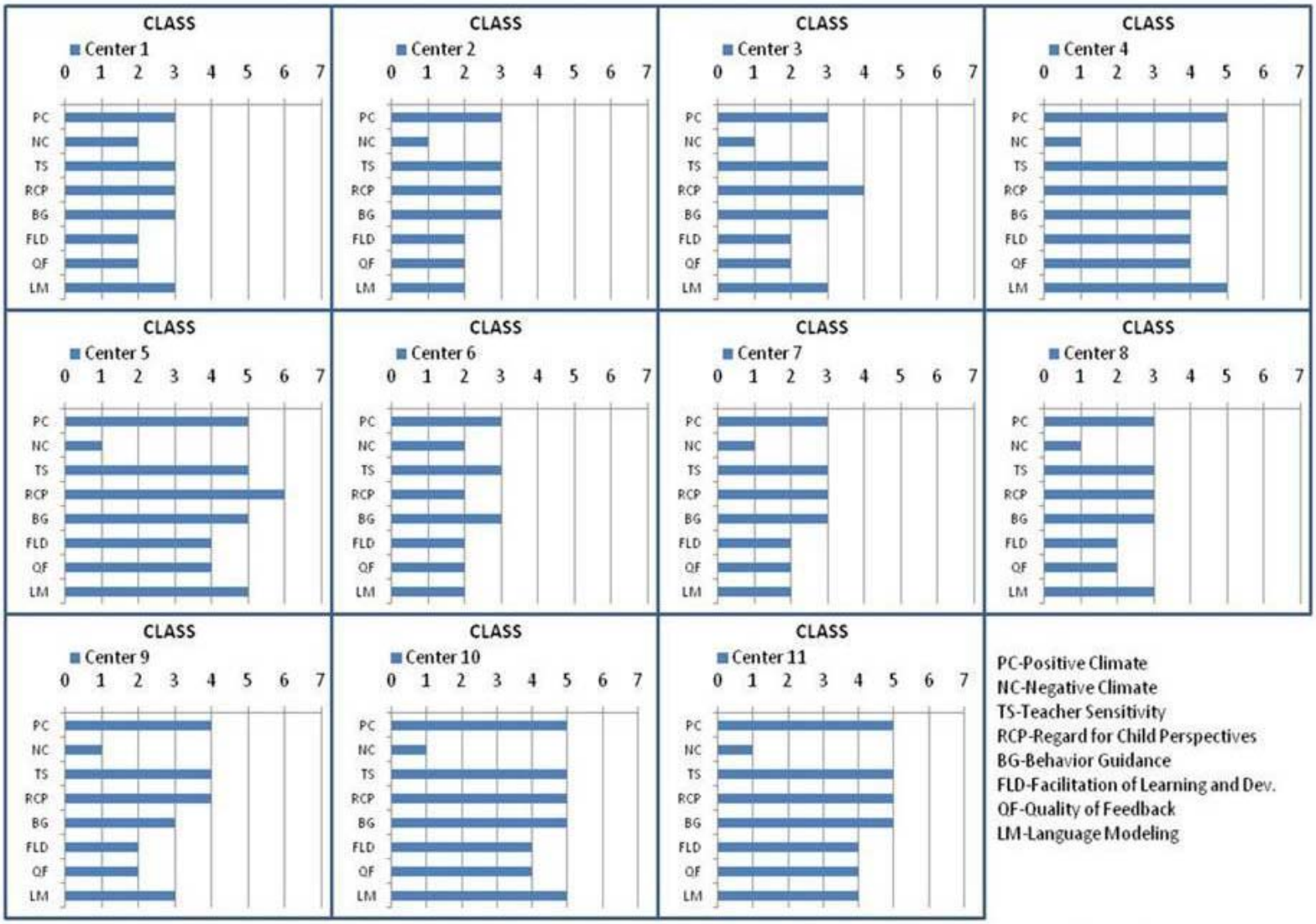

Figure 1. Results of three observation sessions of four 20-minute cycles per session (LaParo, Hamre, & Pianta, 2011). Scores for each classroom represent the median of 12 scores, one for each of the dimensions of the toddler class.

Researcher-Adapted Engagement Check II

Mean engagement across centers was 94.2%, with a slight mean increase from morning to afternoon on day 2 (94.5% to 95.7%). Means ranged from 88.6% (Center #7) to 100% (Center #4). Results are shown in Table 9.

Table 9.

Researcher-Adapted Engagement Check II: Mean Scores

Classroom	AM-Day 1 (%)	AM-Day 2 (%)	PM-Day 2 (%)	Center Mean (%)
1	96.5	93.8	97.7	96.0
2	90.0	95.1	99.0	94.7
3	92.1	98.1	88.4	92.9
4	100	100	100	100
5	97.2	97.5	100	98.2
6	86.8	98.2	90.5	91.8
7	89.1	83.5	93.1	88.6
8	85.5	100	98.1	94.4
9	95.4	83.5	94.6	91.2
10	94.8	93.4	91.2	93.1
11	90.4	96.9	100	95.8
Total Mean (%)	92.5	94.5	95.7	94.2

Caregiver Interaction Scale

The *CIS*, used for reliability with the toddler *CLASS*, was recorded in four cycles over two morning sessions. Mean scores were averaged for the four cycles at each childcare center (n=11) and ranged from 2.37 to 3.67 (see Table 10).

Table 10.

Caregiver Interaction Scale: Mean Scores

Classroom	Day 1		Day 2		Total Mean Score (Classroom)
	Cycle 1	Cycle 2	Cycle 3	Cycle 4	
1	3.12	3.19	2.92	3.08	3.08
2	3.19	3.12	3.00	3.00	3.01
3	3.35	3.12	2.81	2.81	3.02
4	3.81	2.88	3.77	3.50	3.50
5	3.34	3.27	3.53	3.42	3.39
6	2.38	2.46	2.27	2.38	2.37
7	3.31	3.37	2.88	2.96	3.11
8	3.12	3.15	3.31	3.54	3.28
9	3.00	2.81	3.00	2.24	2.77
10	3.83	3.35	3.73	3.77	3.67
11	3.11	3.5	3.38	3.27	3.32

Enzymeimmunoassays of Cortisol

Results of cortisol concentrations analyzed at Lab 1 indicated cortisol enzymeimmunoassays at much higher than expected levels, even on standards and controls. The principal investigator communicated with Salimetrics Labs, and data were shared with the lab for further analysis. It was determined that as a result of unusable standard curves the analysis could not provide any usable data. Salimetrics immunoassay kits were returned to the lab where quality control analysis of kits was completed. The cortisol kits passed all parameters of quality control. The decision was then made to send the remaining excess saliva (30 samples) to Salimetrics Testing Services (Lab 2) at State College, Pennsylvania, for analysis.

There were 83 saliva samples collected from 10 childcare classrooms and one center in which no saliva was collected. Thirty (36%) of 40 (48%) of the original saliva samples sufficient

for immunoassay produced usable data. Usable data were distributed across eight childcare classrooms and ranged from one sample taken in each of Classrooms #6 and #9 to 10 samples taken in Classroom #7. Individual morning and afternoon samples were analyzed from four Classrooms, #3, #7, #10, and #11. Mean cortisol concentrations decreased from .168 µg/dL (micrograms/deciliter) to .134 µg/dL from mid-morning to mid-afternoon according to the data. Individual comparisons of morning and afternoon cortisol concentrations were analyzed for five toddlers across three classrooms: (.093µg/dL, AM to .334 µg/dL, PM); (.103µg/dL, AM to .209 µg/dL, PM); (.200 µg/dL, AM to .191 µg/dL, PM); (.149 µg/dL, AM to .097 µg/dL, PM); (.095 µg/dL, AM to .093 µg/dL, PM). For two children, both in the same classroom, significant increases (+.239 and +.106 µg/dL) in cortisol concentration were recorded from morning to afternoon, compared to slight movement in values for children in whom a decrease from morning to afternoon was recorded (-.009, -.052, and -.002 µg/dL). These increases were recorded for the classroom that had one of the lowest scores on the eight dimensions of the *CLASS*, as well the lowest percentage of child engagement among childcare classrooms in the study.

Early Childhood Behavior Questionnaire-Very Short Form

Data analysis from sets of parent and teacher responses (n=58), determined the relationship between teacher and parent mean scores of three variables related to temperament; negative affect, effortful control, and surgency. For effortful control no significant correlation was calculated; for negative affect parent and teacher means were close, but parents and teachers did not rate children consistently by item. (Parents and teachers assigned similar scores, but not to the same children); for surgency, there was a significant difference between parents and teachers, with parents rating children significantly higher than teachers on this dimension of

temperament. Parent scores were nearly the opposite of teacher scores, which may suggest that management of arousal may be perceived differently by teachers who have a perspective of developmental expectation and comparison to an age group, while the parent may rate his or her child based on experience and expectation.

Data Analysis by Research Question

Data were analyzed using Statistical Package for the Social Sciences (SPSS) software. Each question was analyzed using data analysis specifically designed to answer the following research questions:

1. Is there a significant difference between individual child temperament of toddlers in full-day childcare assessed separately by parent and caregiver using the *ECBQ-VSF* (Rothbart, 2009)?

Data analysis using a 2-tailed t-test with paired samples of sets of parent and teacher responses (n=58) was conducted to determine the relationship between teacher and parent mean scores of three variables related to temperament; negative affect, effortful control, and surgency. For effortful control; r (57) = .160, p =. 230 and t (57) = .986, p = .328. No significant correlation was calculated, with parent M= 4.66 and SD= .726, and teacher M = 4.52 and SD = .893. For negative affect; r (57) =.021, p =. 875, and t (57) = .116, p = .908. While parent and teacher means for negative affect were close (parents M = 2.87 and SD = .748, and teachers M= 2.85 and SD = .885), they did not rate children consistently by item. (Parents and teachers assigned similar values but not to the same children; i.e. parents and teachers assigned a value of three the same number of times but not to the same children.) For surgency; r (57) = -.083, p = .538, and t (57) = 2.841, p = .006, (see Table 11). No significant correlation (-.083) was calculated for

surgency, indicating that parent scores were nearly the opposite of teacher scores. For parents *M* =5.51 and SD = .614, and for teachers *M* = 5.09 and SD = .865 (see Table 12).

Table 11.

Paired Sample Statistics for ECBQ-VSF Parent-Teacher Responses

	Negative Affect	Surgency	Effortful Control
Parent-Teacher (*n*=58)	*r*(57) = .021 *t*(57) = .116	*r*(57) = -.083 *t*(57) = 2.841*	*r*(57) = .160 *t*(57) = .986

Note: * $p < .05$

Table 12.

Means and Standard Deviations for ECBQ-VSF Parent-Teacher Responses

	ECBQ-NA		ECBQ-S		ECBQ-EC	
	Mean	*(SD)*	*Mean*	*(SD)*	*Mean*	*(SD)*
Parent	2.87	(7.48)	5.51	(.614)	4.66	(7.26)
Teacher	2.85	(8.85)	5.10	(.865)	4.52	(8.93)

Note: NA=Negative Affect. S=Surgency. EC=Effortful Control.

2. Is there a difference between morning and afternoon cortisol concentrations of individual toddlers enrolled in full-day childcare?

A 2-tailed, paired t-test was used to calculate the difference between morning and afternoon cortisol concentrations using data from morning (*n*=17) and afternoon (*n*=11) samples (total number of enzymeimmunoassays from Lab 2-Salimetrics). For morning *M* = .179 and *SD* = .083 and for afternoon *M* = .151 and SD = .072. For the independent samples test, *t* (26) = .901, *p* =.376. A not statistically significant, slight decrease in cortisol concentration from morning to afternoon was recorded.

3. Is there a significant correlation between individual child temperament assessed by teachers using the *ECBQ-VSF* (Rothbart, 2009) and group salivary cortisol concentrations of toddlers in full-day childcare?

A Pearson correlation was calculated to determine if there was a significant correlation between temperament, as assessed by three dimensions, effortful control, negative affect, and surgency and salivary cortisol concentrations of study participants using data from sets of *ECBQ-VSF* and cortisol enzymeimmunoassays (*n*=22). This is the number of cortisol samples for which there were parent-teacher *ECBQ-VSF* data. For effortful control (EC) $M = 4.52$, $SD = .825$, and cortisol concentration $M = .170$, and $SD = .0758$. No statistically significant difference, $r\ (20) = .312$, $p = .168$, was calculated between effortful control and cortisol concentration.

Table 13 shows results of the Pearson Correlations. For negative affect (NA), $M = 3.18$, $SD = 1.12$, and cortisol concentration $M = .170$, $SD = .0758$. No significant correlation, $r\ (20) = -.26$, $p = .911$, was calculated between negative affect and cortisol concentration. For surgency (S), $M = 5.53$, SD = .814, and cortisol concentration $M = .170$, $SD = .0758$. A significant correlation between surgency and cortisol concentration was calculated, $r\ (20) = .521$, $p = .015$, suggesting that management of arousal and impulse control (surgency) may contribute to cortisol concentrations.

Table 13.

Pearson Correlations between Cortisol and the Three Dimensions of the ECBQ-VSF

	ECBQ-NA		ECBQ-S		ECBQ-EC	
	Mean	*(SD)*	*Mean*	*(SD)*	*Mean*	*(SD)*
Cortisol	3.18	(1.12)	5.53	(.814)	4.45	(.825)

Note: NA=Negative Affect. S=Surgency. EC=Effortful Control.

4. Does quality of caregiver-child interaction as measured by the eight dimensions of the toddler *CLASS* (LaParo et al., 2011) and group engagement as measured by the researcher-adapted *EC II* (McWilliam, 1999) (and caregiver-child interaction and engagement) predict cortisol concentrations as measured by cortisol enzymeimmunoassays?

Simultaneous regression analyses were conducted. Centered variables were created using each of the eight dimensions of the toddler *CLASS*, group engagement, and cortisol enzymeimmunoassays. The eight analyzed dimensions of the toddler *CLASS* included: positive climate (PC), negative climate (NC), teacher sensitivity (TS), regard for child perspectives (RCP), behavioral guidance (BG), facilitation of learning and development (FLD), quality of feedback (QF), and language modeling (LM). Therefore, the first simultaneous regression analysis included positive climate (PC), engagement, and the interaction between PC and engagement to predict cortisol concentration. The second simultaneous regression analysis included negative climate (NC), engagement, and the interaction between NC and engagement to predict cortisol concentration. The third simultaneous regression analysis included teacher sensitivity (TS), engagement, and the interaction between TC and engagement to predict cortisol concentration. The fourth simultaneous regression analysis included regard for child perspectives (RCP), engagement, and the interaction between RCP and engagement to predict cortisol concentration. The fifth simultaneous regression analysis included behavioral guidance (BG), engagement, and the interaction between BG and engagement to predict cortisol concentration. The sixth simultaneous regression analysis included facilitation of learning and development (FLD), engagement, and the interaction between FLD and engagement to predict cortisol concentration. The seventh simultaneous regression analysis included quality of feedback (QF),

engagement, and the interaction between QF and engagement to predict cortisol concentration. The eighth simultaneous regression analysis included language modeling (LM), engagement, and the interaction between LM and engagement to predict cortisol concentration. None of the eight regression analyses revealed any direct effects that were statistically significant, nor were the interaction effects statistically significant. The R^2 for these eight models ranged from .070 to .339. The adjusted R^2 ranged from -.860 to .008

Summary

The influence of caregiver-child interactions and temperament on cortisol concentration of toddlers in full-day childcare was studied in 11 childcare classrooms in Tennessee. There were 73 toddlers and their teachers or caregivers (n = 22) included in the study. Classroom size ranged from 8 to 12 children with two teachers or caregivers in each classroom. Classrooms were evaluated using the newly released toddler *CLASS* (LaParo et al., 2011), which focuses on elements of early childhood development specific to toddlers, and components of teacher-child interaction and classroom environment that research has recognized lead to positive outcomes across domains of development. Also included in classroom assessments was the researcher-adapted *EC II* (McWilliam, 1999) and the *CIS* (Arnett, 1989). Parents and teachers completed the *ECBQ-VSF* (Rothbart, 2009) to determine toddler's individual temperament. Cortisol concentration and its correlation with temperament and the quality of teacher-child interaction was measured in enzymeimmunoassays of saliva collected from toddlers, concurrent with classroom data collection.

The hypothesis that cortisol concentration is correlated to the quality of teacher-child interaction for toddlers in full-day childcare was not supported by data collected and analyzed in this study. The hypothesis that cortisol concentration is correlated to characteristics of

temperament was not supported as it related to effortful control and negative effect, but was supported in data analysis that showed a moderate positive correlation between cortisol concentration and characteristics of temperament including impulsivity, activity level, shyness, and positive anticipation (surgency). While findings from this study were not significant, Chapter 5 includes a discussion of the importance of research on toddlers in full-day childcare and their stress levels related to the quality of care provided, its long-term effect across developmental domains, and the likelihood that a larger sample size (childcare center and individual participant sample) may show predictors of stress related to both temperament and the quality of care.

CHAPTER 5

DISCUSSION

Theory

This study is grounded in Bronfenbrenner and Morris's (1998) bioecological theory, which gives attention to the physical and social context in which the child develops as well as the biological processes through which he or she evolves. Their theory, which recognizes the interplay of biology and environment, proposes that from an early age, and through the life course, human development evolves through processes that include progressively more complex reciprocal interactions between the young child and the people and objects in his or her environment. In order for those processes to have meaning and impact they need to occur regularly and be sustained over time. Bronfenbrenner and Morris (1998) defined these enduring interactions in the immediate environment as proximal processes that include patterns of parent-child and caregiver-child interactions, learning of new skills, and performance of progressively more complex tasks. The concept of proximal processes is embedded in a biological model in which these processes have distinctive characteristics and meaning, which gives variance to them dependent on individual characteristics, the environment in which they occur, and the social climate in which the child lives. Bronfenbrenner and Morris (1998) observed that the extent to which these bioecological factors and processes are not maximized during development is the extent to which optimal developmental outcomes will not be realized.

Discussion of Findings

The purpose of this study was to explore the influences of caregiver-child interaction and temperament on cortisol concentrations of toddlers in full-day childcare. Research and a review

of literature presented in this study provided evidence that optimal emotional development that proceeds in the context of each developmental aspect of early childhood is dependent on rich and interactive experiences of each child with his or her teacher or caregiver. Requisites to emotional development involve the response to stress influenced by interaction with the environment (Ladd et al., 2000). This study used the data gathered to examine the quality of early relationships in full-day childcare settings and correlate the young child's physiological response as measured by cortisol concentrations to the quality of the relationship between the caregiver and young child and to temperament.

Questions were addressed in the context of 11 full-day childcare classrooms in Tennessee, with 73 toddlers, age 12 to 24 months. Data analysis revealed few significant findings that may be related to study sample size and loss of cortisol samples in Lab 1. A few statistics that approached significance may be considered for discussion. Each of the eight dimensions of the toddler *CLASS* was correlated with cortisol concentration and group engagement. Six of the eight dimensions of the toddle r *CLASS* approached significance as they related to engagement in a small sample size, which may indicate that for future study, engagement and components of teacher-child interaction may show significance in a larger sample of childcare settings.

Data analysis of parent and teacher assessments of temperament using the *ECBQ-VSF* compared mean scores of three dimensions; effortful control (EC), negative affect (NA), and surgency (S). While results for effortful control and negative affect were not statistically significant, parents rated their children significantly higher than teachers on the dimension of surgency, which includes questions related to impulsivity, activity level, shyness, positive anticipation, and smiling and laughter. Responses may have been impacted by the fact that

parents engage with their children by themselves, while teachers interact with the child in group settings and have a unique sense of developmental expectations.

Individual morning and afternoon cortisol samples (n =7) were analyzed from childcare classrooms (n=4), the number of centers remaining in samples sent to Lab 2 (Salimetrics). Mean cortisol concentration decreased from .168 µg/dL (micrograms/deciliter) to .134 µg/dL from mid-morning to mid-afternoon according to the data. Individual comparisons of morning and afternoon cortisol concentrations were analyzed for five toddlers across three centers; two showed increases in concentrations and three showed decreases. Earlier studies have documented increases in cortisol concentrations, atypical to the circadian rhythms that peak in the early morning and decrease over the course of the day, for young children in full-day childcare. For two children, both in the same center, significant increases (+.239 and +.106 µg/dL) in cortisol concentration were recorded from morning to afternoon, compared to slight movement in values for children in whom a decrease from morning to afternoon was recorded (-.009, -.052, and -.002 µg/dL).

The same dimensions of temperament (negative affect, surgency, and effortful control) were then correlated with cortisol concentrations. Data for the children (n = 22) who had both *ECBQ-VSF* teacher data and cortisol concentration data were analyzed to determine the correlation between cortisol concentration and the three dimensions of temperament evaluated by the *ECBQ-VSF*. No statistically significant correlation was found between cortisol concentration and effortful control. The correlation between negative affect and cortisol concentration was also not significant. The correlation between cortisol concentration and the dimension of surgency, however, was significant, showing a strong positive correlation between characteristics of temperament related to impulsivity, activity level, shyness, and positive anticipation (surgency)

and cortisol concentration. Again, this finding suggests a relationship between management of arousal and impulse control and cortisol concentration. It may also suggests that management of arousal may be perceived differently by teachers who have a perspective of developmental expectation and comparison to an age group, while a parent may rate his or her child based on his or her experience and expectation. While scores related the temperamental characteristic of surgency carry neither a positive or negative connotation, increased parent and teacher scores on this subscale, and its correlation to cortisol concentrations, may be information that can be used in the infant or toddler classroom to alert teachers to children for whom self-regulating strategies may be more challenging than for children in whom this correlation was not seen.

Finally, mean cortisol concentrations for each of the childcare classrooms were correlated with the eight dimensions of the toddler CLASS (LaParo et al., 2011): positive climate (PC), negative climate (NC), teacher sensitivity (TS), regard for child perspective (RCP), behavioral guidance (BG), facilitation of learning and development (FLD), quality of feedback (QF), and language modeling (LM), and the researcher-adapted *EC II* (McWilliam, 1999) to determine whether the quality of caregiver-child interaction, measured by the eight dimensions of the toddler *CLASS* and group engagement (and caregiver-child interaction and engagement) predict cortisol concentrations. Simultaneous regression analyses showed no significant main effects and no significant interaction effects.

The classroom that received the lowest study score on the researcher-adapted EC *II* also received low scores on the toddle*r CLASS.* Additionally, for two children, both in the same classroom for which low *EC II* and toddler *CLASS* scores were reported, significant increases (+.239 and +.106 µg/dL) in cortisol concentration were recorded from morning to afternoon,

compared to slight movement in values for children in whom a decrease from morning to afternoon was recorded (-.009, -.052, and -.002 µg/dL).

Childcare Classroom #7

Because participants of childcare Classroom #7 yielded the greatest number of child participants (*n*=10), the highest return of parent and teacher responses to the *ECBQ-VSF* (*n*=8), and the greatest number of successful enzymeimmunoassays (*n*=7-AM samples and *n*= 3-PM samples, including *n*= 2-AM/PM samples), an anecdotal review of results from this classroom has the best likelihood to be able to provide findings that may apply to other classrooms in the study. Weekly cost to attend the center was $136, and the classroom was predominantly made up of Caucasian children. Both teachers had associate degrees, one in early childhood (teacher 1) and one in business. Each had attended six workshops, three related to cognitive development and three related to social-emotional development, in the last three years. One was currently in school, working on child development associate certification (teacher 2). Teacher 1 had 24 years of classroom experience teaching young children and 20 years teaching toddlers. Teacher 2 had 4 years of teaching experience with young children and 2 years teaching toddlers. Teacher 1 had been in this classroom 6 years and teacher 2 for 6 months. The teachers had been with the childcare center 7 and 4 years, respectively, and had taught together for 4 years. Classroom scores on the eight dimensions of the toddle*r CLASS*, in which scores ranged from 1 to 7, were: Positive Climate (PC)-3, Negative Climate (NC)-1, Teacher Sensitivity (TS)-3, Regard for Child Perspectives (RCP)-3, Behavioral Guidance (BG)-3, Facilitation of Learning and Development (FLD)-2, Quality of Feedback (QF)-2, and Language Modeling (LM)-2. Mean scores on the *CIS* were 3.31, 3.27, 2.88, and 2.96, for each of the four *CIS* observation sessions. Percentage scores for three observation sessions using the researcher-adapted *EC II* were 89%, 83%, and 93%. The

morning mean cortisol concentration was .185 ug/dL; afternoon was .226 ug/dL. For two children, both in Classroom #7, significant increases (+.239 and +.106 µg/dL) in cortisol concentration were recorded from morning to afternoon, compared to other children from the same classroom who showed slight movement in values, and decrease instead of increase, from morning to afternoon (-.009, -.052, and -.002 µg/dL). Based on data for this center, average cortisol concentrations increased from morning to afternoon and were negatively correlated with their having the lowest *EC II* scores of the 11 classrooms studied as well as one of the lowest toddler *CLASS* scores. These scores support research that correlates teacher-child interaction with elevated cortisol concentrations in young children in full-day childcare. *ECBQ-VSF* teacher or parent responses indicated higher scores for negative affect reported by teachers than parents. In conclusion, the center for which the lowest percentage of the researcher-adapted *EC II* scores was recorded, among the lowest toddler *CLASS* scores recorded, and for which negative affect scores on the *ECBQ-VSF* were recorded as higher by teachers than parents, cortisol concentrations not only increased from morning to afternoon, atypical of circadian rhythm, but the most profound individual differences in range from morning to afternoon were recorded. The findings from this center support studies discussed in the review of literature in which cortisol concentration is correlated with quality of care (Dettling et al., 2000; Dewar, 2009; Geoffroy et al., 2006; Goldstein et al., 2007; Gunnar, 1998; Howes et al., 1998; Lisonbee et al., 2008; Sims et al., 2005; Vandell, 2004; Watamura et al., 2003), temperament (Dettling et al., 1999; and Watamura et al., 2004), and engagement (Rasp et al., 2001; Ridley et al., 2000). This finding also gives support to Cromie's (1998) observation and suggestion that a stress profile of child behaviors such as crying much of the time or being stoic, along with cortisol concentrations, may be beneficial in identification and early intervention for vulnerable children who may not do well

in certain groups or who may be at risk. It may also help to identify poor quality care in the classroom.

Analysis of demographic data and its relationship to assessment findings revealed the highest toddler *CLASS* score on the dimension of Regard for Child Perspective (RCP) in the childcare classroom where teachers had the greatest number of years of experience with young children and with toddlers (Classroom #4). The lowest score on the dimension of RCP was recorded in the classroom in which teachers had the fewest number of years of experience with young children and with toddlers. Seven of the 11 classrooms scored in the low range on the dimensions of Facilitation of Learning and Development and Quality of Feedback (Classrooms #1, 2, 3, 6, 7, 8, and 9).

Limitations

A relatively small participant sample of toddlers (*n*=73) and childcare classroom settings (*n*=11) and the reduction of usable cortisol enzymeimmunoassays in collected samples, from 48% at Lab 1 to 36% at Lab 2, may partially explain results that indicated no significant findings with analyses related to cortisol concentrations. While these findings cannot be generalized to a larger population, further study of a larger sample may result in the ability to generalize findings to toddlers in full-day childcare.

While concerns of data analysis related to the measure of "unit of analysis" (comparison of individual measures with group measures) have been expressed, existing studies of mean cortisol concentrations and their correlation to quality of care, age, and temperament have been cited (Dettling et al., 1999; Sims et al., 2005; Vermeer & van Ijzendoorn, 2006; Watamura et al., 2003; Watamura et al., 2009; Watamura et al., 2002). To address this concern in future studies, however, data analysis using hierarchical linear modeling software may be considered.

Another limitation to the study was the challenge early in the study related to collection of saliva samples from toddlers. Issues were addressed, improving percentages of samples collected by classrooms from zero to 100%. Similar challenges have been reported in cited studies with percentages of collection, and with sample sizes sufficient for enzymeimmunoassay (Dettling et al., 1999; Sims et al., 2005; Watamura et al., 2003).

Implications

Shonkoff, Director of the Center on the Developing Child, in describing the science of early development, including its neurobiological component, stated that while the developing brain is built over time, a considerable portion is constructed during the first few years of life. He noted that the interactive influences of experience and genes developed or expressed during the "serve and return" process of relationship building with parents and other caregivers shapes the architecture of the developing brain. Because brain architecture and developmental competencies are built from simple to complex, these early simple circuits and skills provide scaffolding for progressively more advanced skills. He also reported the effects of stress, other than stress that is brief and growth promoting, on the developing brain, noting that toxic stress is associated with prolonged activation of the body's stress response, the cascading of physiological events that release cortisol and altering of levels of key brain chemicals. Research has connected the continuous activation of the stress response to lifetime effects on physical, cognitive, and social-emotional functioning (Shonkoff, 2008). Here is the scientifically supported framework that is able to predict social-emotional, academic, physical, and mental health outcomes for children.

The implication for policy and best practice in the provision of childcare and early education and assurance of subsequent success for such programs as the current Race to the Top (Office of Early Learning, 2011) may take as their impetus this research-based knowledge. In

order to “prepare students to succeed” and to “transform our schools for decades to come” funding and policy for” recruiting, developing, rewarding, and retaining effective teachers” may need to be focused on those who care for and educate children as infants and toddlers. Such policy can then build on the assurance of early developmental competencies as the scaffolding of later academic success. Findings from studies of quality in childcare settings and stress related to attendance in full-day early childhood programs by infants and toddlers have relevance for federal and state policy guidelines around the components of quality childcare and its impact on the long term physical and psychological health of the nation’s children.

Findings from this dissertation study have implications for future research of childcare in settings known to be underserved with federal or state funding, to support the building of educational and social programs that can implement and sustain high quality care for children in the early years of life. Findings from the small sample size studied here that revealed two children who appear to be at high risk, based on a glimpse in a brief period of time in one classroom, for physiological exposure to unhealthy concentrations and rhythms of cortisol activity are sobering and foreboding suggestions of the status of very young children in full-day childcare. These toddlers are being served in a center that has established itself with three-star quality rating. Such findings in a center that has met quality guidelines, albeit not based on criteria for building and supporting healthy relationships, suggests the urgent need for further supportive studies of full-day early care that serves infants and young children. The creation of programs and family supports that can help assure quality based on teacher-child interaction and relationships, and focus on social-emotional, as well as physical needs, will allow optimal developmental outcomes for children. The case for further study of toddlers in full-day childcare, quality of care, physiological indicators of stress, and how differences, such as temperament

impact relationships is easily justified by Bronfenbrenner's admonition that the extent to which these influences are not maximized is the extent to which developmental outcomes for our nation's children will not be realized.

Future Directions

Because only 139 of the 338 centers included in the Tennessee online listing of childcare settings targeted for this study had a three-star rating, future studies may consider all centers in Tennessee or all centers in the counties studied, without regard for the rating. Such inclusion may also address the challenge to achieve a larger sample size and to increase cultural diversity. Small sample size that did produce results of profound changes in cortisol concentration from morning to afternoon in Classroom #7, connected to engagement and teacher reports of temperament, warrant further study of this population, childcare quality, and temperament. Further study of teacher reports of temperament and its association to elevated cortisol concentration from morning to afternoon in full-day childcare is also warranted based on findings from this study. For future studies that include the collection of saliva samples, preliminary parent education and trial demonstration of the collection process at childcare settings may serve to alleviate parental angst related to safety and to what tests may be processed on saliva samples, possibly increasing the number of parent consents.

This study focused on three-star rated centers in Tennessee. In addition to sample size, future studies that include centers that do not have a three-star rating may add to the variance of data. Gender related to cortisol concentrations was not examined in this study and may also be considered in relation to differences in cortisol concentration as well as characteristics of temperament related to cortisol concentration, in future studies.

Conclusion

For millions of children in America the experiences and relationship-building of early childhood begin when they are delivered to childcare as early as 6 weeks after they enter the world (National Institute of Child Health and Human Development, 1997). The shift of primary care for infants and young children from parents to caregivers in full-day child care and its impact on the child's early years of discovery, development, and relationship-building has been the focus of numerous studies cited in this work. While early childcare environments are evaluated and rated to assure protection of health and safety, including the arrangement of space, research cited has documented that the relationship between the child and caregiver is the most important component of quality in early childcare. The quality of relationships and interactions with children in childcare, how children are supported to build competencies that will determine how they establish and sustain relationships for a life time, how they problem-solve, how they learn to negotiate for their needs and desires, how their brains build neural circuitries to help them self-regulate, and how the building of these capacities affects their developmental trajectory, across domains including cognitive, social-emotional, physical for a life time, has become the focus of research in child development, neurobiology, mental health, brain development, attachment, and emotion regulation as cited in the review of literature for this study.

Based on research that documents the importance of the young child's experiences as he or she interacts with the environment, and supported by Bronfenbrenner and Morris's bioecological theory, which recognizes the interplay of biology and environment from early development, through the life course; this study was used to examine the influences of teacher-child interaction and temperament on cortisol concentrations of toddlers in full-day childcare.

The constructs of teacher-child interaction and relationship-building are major components that help define quality in childcare settings. Temperament impacts the child's response to his or her caregiver and to events that occur in the environment and is an integral component of early childhood development. Additionally, the young child's physiological response to adaptive efforts in the environment of full-day childcare, the activation of the HPA (hypothalamic-pituitary-adrenocortical) axis, and the resulting presence of cortisol provide a quantitative measure of stress. This study has added to the body of research that has analyzed the effects of caregiver-child interaction, cortisol concentrations, and temperament on toddlers in full-day childcare by including children in a rural setting and by using a newly created measure of quality of teacher- or caregiver-child interaction, the toddler *CLASS* (LaParo et al., 2011). While results showed no significant correlation between teacher- or caregiver-child interaction and cortisol concentration, it did find a significant positive correlation between the temperamental characteristic of surgency (impulsivity, high-intensity pleasure, activity level, shyness, positive anticipation, and smiling and laughter) and cortisol concentrations in this population. The teacher demographic of number of years of experience teaching young children and toddlers also showed a positive correlation with *CLASS* scores. Future studies can provide supportive and guiding data to help policymakers as well as providers of early care and education create and implement programs that focus on building competencies in very young children that will set the stage for future social-emotional as well as academic success. Studies of temperament, cortisol concentration, and the quality of caregiver-child interaction may be studied with larger, more culturally diverse populations in centers not evaluated using systems of quality rating. Populations of toddlers who are in childcare may be compared to those in home care for cortisol concentrations over the course of the day to add to this body of research. Because the study of

cortisol concentrations in toddlers is a challenge, as evidenced by the current study, it is not a common research endeavor in the infant or toddler population. Research and science, however, continue to support and expand the importance of opportunities to experience learning in the context of relationship building in the early years as well as the tie of quality of early relationships to this physiological indicator of stress. Because current research supports early relationships as a key to assure optimal outcomes across developmental domains, the future for research in diverse populations, with new childcare quality guidelines, in home-based and center-based childcare, and including measures such as attachment, emotion regulation, and peer interaction warrants extensive study.

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APPENDICES

APPENDIX A

Classroom Assessment Scoring System

Toddler CLASS™ Score Sheet

Toddler CLASS™

Toddler CLASS™ Score Sheet

Teacher: _____
Adults: ___ # Children: ___
Observer: _____

Format (circle):
Routine/transition
Whole Group Small Group
Individual

Start Time: ___:___
End Time: ___:___

Coding Date: ___/___/___

Domain	Dimension/Indicators:	Observations:						
Emotional Support	**Positive Climate (PC)**							
	Relationships							
	Positive affect							
	Respect	1	2	3	4	5	6	7
	Negative Climate (NC)							
	Negative affect							
	Punitive control							
	Teacher negativity							
	Child negativity	1	2	3	4	5	6	7
	Teacher Sensitivity (TS)							
	Awareness							
	Responsiveness							
	Child comfort	1	2	3	4	5	6	7
	Regard for Child Perspectives (RCP)							
	Child focus							
	Flexibility							
	Support of independence	1	2	3	4	5	6	7
Classroom Organization	**Behavior Guidance (BG)**							
	Proactive							
	Supporting positive behavior							
	Problem behavior	1	2	3	4	5	6	7
Instructional Support	**Facilitation of Learning and Development (FLD)**							
	Active facilitation							
	Expansion of cognition							
	Children's active engagement	1	2	3	4	5	6	7
	Quality of Feedback (QF)							
	Scaffolding							
	Providing information							
	Encouragement and affirmation	1	2	3	4	5	6	7
	Language Modeling (LM)							
	Supporting language use							
	Repetition and extension							
	Self- and parallel talk							
	Advanced language	1	2	3	4	5	6	7

Figure 2.1. Score Sheet.

Low range		Middle range			High range	
1	2	3	4	5	6	7
The low-range description fits the classroom and/or teacher very well. All, or almost all, relevant indicators are present in the low range.	The low-range description mostly fits the classroom and/or teacher, but there are one or two indicators in the middle range.	The middle range description mostly fits the classroom and/or teacher, but there are one or two indicators in the low range.	The middle-range description fits the classroom and/or teacher very well. All, or almost all, relevant indicators are present in the mid-range.	The middle-range description mostly fits the classroom and/or teacher, but there are one or two indicators in the high range.	The high-range description mostly fits the classroom and/or teacher, but there are one or two indicators in the middle range.	The high-range description fits the classroom and/or teacher very well. All, or almost all, relevant indicators are present in the high range.

Table 2.1 Dimension Descriptions for the CLASS™ Tool

It is important to note that although Table 2.1 provides a general scoring guideline, the CLASS™ is not a checklist and observers should view the dimensions as holistic descriptions of settings that fall in the low, mid, or high range. In many cases, it is not necessary to see examples of all markers presented in the description of a given range to assign a score. For example, within Positive Climate it is possible for a setting to score in the high end even if peer connections are not clearly demonstrated, as long as there are consistent indications of positive teacher-child relationships, positive affect from children and teachers, and respect.

Before ratings are assigned, the CLASS™ observer should carefully review the face page for each dimension (e.g., Positive Climate, Quality of Feedback) to make initial decisions about the extent to which the observed behaviors reflect a low-, mid-, or high-range score. However, we recommend that observers use the full low-, mid-, and high-range descriptions provided in the manual to make judgments about scores. **Because of the highly inferential nature of the CLASS™ tool, scores should never be given without referring to the manual**

APPENDIX B

Early Childhood Behavior Questionnaire

Early Childhood Behavior Questionnaire
Very Short Form

Child's name: _____ Child's birthdate: Mo:____ Day:____ Yr:____

Today's date: Month:____ Day:____ Yr:____ Child's age: _____Yrs, _____Months

Relation to child: _____ Sex of child (circle one): Male Female

INSTRUCTIONS: **Please read carefully before starting**.

As you read each description of the child's behavior below, please indicate how often the child did this during the last two weeks by circling one of the numbers in the right column. These numbers indicate how often you observed the behavior described during the last two weeks.

never	very rarely	less than half the time	about half the time	more than half the time	almost always	always	does not apply
1	2	3	4	5	6	7	NA

The "Does Not Apply" column (NA) is used when you did not see the child in the situation described during the last two weeks. For example, if the situation mentions the child going to the doctor and there was no time during the last two weeks when the child went to the doctor, circle the (NA) column. "Does Not Apply" (NA) is different from "NEVER" (1). "Never" is used when you saw the child in the situation but the child never engaged in the behavior mentioned in the last two weeks. Please be sure to circle a number or NA for every item.

When approached by an unfamiliar person in a public place (for example, the grocery store), how often did your child								
1. cling to a parent?	1	2	3	4	5	6	7	NA
While having trouble completing a task (e.g., building, drawing, dressing), how often did your child								
2. get easily irritated?	1	2	3	4	5	6	7	NA
When a familiar child came to your home, how often did your child								
3. seek out the company of the child?	1	2	3	4	5	6	7	NA
When offered a choice of activities, how often did your child								
4. decide what to do very quickly and go after it?	1	2	3	4	5	6	7	NA
During daily or evening quiet time with you and your child, how often did your child								
5. enjoy just being quietly sung to?	1	2	3	4	5	6	7	NA
While playing outdoors, how often did your child								
6. choose to take chances for the fun and excitement of it?	1	2	3	4	5	6	7	NA
When engaged in play with his/her favorite toy, how often did your child								
7. play for more than 10 minutes?	1	2	3	4	5	6	7	NA
8. continue to play while at the same time responding to your remarks or questions?	1	2	3	4	5	6	7	NA
When told that loved adults would visit, how often did your child								
9. get very excited?	1	2	3	4	5	6	7	NA
During quiet activities, such as reading a story, how often did your child								
10. fiddle with his/her hair, clothing, etc.?	1	2	3	4	5	6	7	NA

While playing indoors, how often did your child							
11. like rough and rowdy games?	1	2	3	4	5	6	7 NA
When being gently rocked or hugged, how often did your child							
12. seem eager to get away?	1	2	3	4	5	6	7 NA
When encountering a new activity, how often did your child							
13. get involved immediately?	1	2	3	4	5	6	7 NA
When engaged in an activity requiring attention, such as building with blocks, how often did your child							
14. tire of the activity relatively quickly?	1	2	3	4	5	6	7 NA
During everyday activities, how often did your child							
15. pay attention to you right away when you called to him/her?	1	2	3	4	5	6	7 NA
16. seem to be irritated by tags in his/her clothes?	1	2	3	4	5	6	7 NA
17. become bothered by sounds while in noisy environments?	1	2	3	4	5	6	7 NA
18. seem full of energy, even in the evening?	1	2	3	4	5	6	7 NA
While in a public place, how often did your child							
19. seem afraid of large, noisy vehicles?	1	2	3	4	5	6	7 NA
When playing outdoors with other children, how often did your child							
20. seem to be one of the most active children?	1	2	3	4	5	6	7 NA
When told "no", how often did your child							
21. stop the forbidden activity?	1	2	3	4	5	6	7 NA
22. become sadly tearful?	1	2	3	4	5	6	7 NA
Following an exciting activity or event, how often did your child							
23. seem to feel down or blue?	1	2	3	4	5	6	7 NA
While playing indoors, how often did your child							
24. run through the house?	1	2	3	4	5	6	7 NA
Before an exciting event (such as receiving a new toy), how often did your child							
25. get very excited about getting it?	1	2	3	4	5	6	7 NA
When s/he asked for something and you said "no", how often did your child							
26. have a temper tantrum?	1	2	3	4	5	6	7 NA
When asked to wait for a desirable item (such as ice cream), how often did your child							
27. wait patiently?	1	2	3	4	5	6	7 NA
When being gently rocked, how often did your child							
28. smile?	1	2	3	4	5	6	7 NA
While being held on your lap, how often did your child							
29. mold to your body?	1	2	3	4	5	6	7 NA
When a familiar adult, such as a relative or friend, visited your home, how often did your child							
30. want to interact with the adult?	1	2	3	4	5	6	7 NA
When asked to do so, how often was your child able to							
31. be careful with something breakable?	1	2	3	4	5	6	7 NA
When visiting a new place, how often did your child							
32. not want to enter?	1	2	3	4	5	6	7 NA

SCORING PROCEDURE

Early Childhood Behavior Questionnaire (ECBQ) Very Short Form

Scale scores for the eighteen dimensions represent the mean score of all scale items applicable to the child, as judged by the caregiver. If a caregiver omitted an item, or if the caregiver checked the "Does not apply" response option for an item, the item receives no numerical score and is not factored into the scale score.

Scores are to be computed by the following method:

1) Items indicated with an R on the items-by-scale list below are reverse-scored. Before using them to calculate the scale score, they must be reversed. This is done by subtracting the numerical response given by the caregiver from 8. Thus, a caregiver response of 7 becomes 1, 6 becomes 2, 5 becomes 3, 4 remains 4, 3 becomes 5, 2 becomes 6, and 1 becomes 7.

2) Sum the scores for items receiving a numerical response (do not include items marked "does not apply" or items receiving no response). For example, given a sum of 50 for a scale of 12 items, with one item receiving no response, two items marked "does not apply," and 9 items receiving a numerical response, the sum of 50 would be divided by 9 to yield a mean of 5.56 for the scale score.

Note: Most statistics programs will carry out these steps for you. Users of SPSS can copy the following commands into a syntax file to reverse items and calculate scale scores. The syntax assumes that items are titled "ECBQ1", "ECBQ2", "ECBQ3", etc. It is also assumed that no score was entered when caregivers omitted an item or checked "Does not apply".

```
COMPUTE ecbq12r = (8-ecbq12).
COMPUTE ecbq14r = (8-ecbq14).

COMPUTE ecbq34r = (8-ecbq34)


COMPUTE VSHNEG = MEAN (ecbq16, ecbq17, ecbq19, ecbq32, ecbq2, ecbq26, ecbq10, ecbq22, ecbq3,
ecbq1, ecbq33, ecbq34r) .
COMPUTE VSHSURGE = MEAN (ecbq4, ecbq13, ecbq18, ecbq20, ecbq24, ecbq6, ecbq11, ecbq9, ecbq2,
ecbq3, ecbq30, ecbq36).
COMPUTE VSHEFFCO = MEAN (ecbq21, ecbq27, ecbq31, ecbq8, ecbq15, ecbq35, ecbq7, ecbq14r, ecbq12r,
ecbq29, ecbq5, ecbq28).

EXECUTE.
```

APPENDIX C

Caregiver Interaction Scale

CAREGIVER INTERACTION SCALE
(Arnett 1989)

Center Name:

Teacher Name: **Observation Date:**

Data Collector:

For instructions, clarifications and scoring, click here.	Not at all true	Somewhat true	Quite a bit true	Very much true
1. Speaks warmly to the children.	1	2	3	4
2. Seems critical of the children.	1	2	3	4
3. Listens attentively when children speak to him/her.	1	2	3	4
4. Places high value on obedience. More	1	2	3	4
5. Seems distant or detached from children.	1	2	3	4
6. Seems to enjoy the children.	1	2	3	4
7. When the children misbehave, explains the reason or the rule they are breaking. More	1	2	3	4
8. Encourages the children to try new experiences. More	1	2	3	4
9. Doesn't try to exercise too much control over the children. More	1	2	3	4
10. Speaks with irritation or hostility to the children.	1	2	3	4
11. Seems enthusiastic about the children's activities and efforts.	1	2	3	4
12. Threatens children in trying to control them.	1	2	3	4
13. Spends considerable time in activity not involving interaction with the children.	1	2	3	4
14. Pays positive attention to the children as individuals.	1	2	3	4

15. Doesn't reprimand children when they misbehave. More	1	2	3	4
16. Talks to the children without explanation.	1	2	3	4
17. Punishes the children without explanation. More	1	2	3	4
18. Exercises firmness when necessary.	1	2	3	4
19. Encourages children to exhibit prosocial behavior, e.g., sharing, helping. More	1	2	3	4
20. Finds fault easily with children.	1	2	3	4
21. Doesn't seem interested in the children's activities.	1	2	3	4
22. Seems to prohibit many of the things the children want to do.	1	2	3	4
23. Doesn't supervise the children very closely. More	1	2	3	4
24.Expects the children to exercise self-control: e.g., to be undisruptive for group provider-led activities, to be able to stand in line calmly.	1	2	3	4
25. When talking to children, kneels, bends or sits at their level to establish better eye contact.	1	2	3	4
26. Seems unnecessarily harsh when scolding or prohibiting children.	1	2	3	4

CAREGIVER INTERACTION SCALE INSTRUCTIONS
(Arnett 1989)

GENERAL
Circle one score for each item after observing in the setting for at least 2 hours.
• Be sure to note examples of behaviors on your score sheet as you see them during the observation to make rating more accurate. • When scoring, it may help to think of the word "true" at the end of each rating descriptor (e.g., not at all *true*, somewhat *true*). • Because the words "somewhat and "quite a bit" may sound very similar to some people, here's some help. Think of "not at all" and "very much" as representing the 2 endpoints of a continuum, with "somewhat" and "quite a bit" as points equidistant between the 2 ends.
Item 4. Interpret this item to mean that the teacher places an overly strong focus on obedience. If the teacher values obedience a normal amount or less, the score is "1." If you believe that she values obedience more than normal, than you must decide whether it's somewhat high, quite a bit high, or very much high
Item 7. Interpret "misbehavior" very broadly; for example, a rule can be explained if children want to take off their shoes and the caregiver says no. If there are absolutely no such incidences during the observation, you may score this item as "Not Applicable."
Item 8. To credit the teacher for this, you must hear the teacher say something to encourage children to try something new. Just placing new, interesting materials in the classroom is not enough. "New experiences" should be interpreted broadly to include things like reading a new book, playing a new game, etc.
Item 9. It may help to remember that this item is measuring whether the teacher is *too* permissive. If you believe the teacher uses a normal amount of control (or even uses too much control), then the score is "1." If you believe that the teacher is too permissive, then you must decide wither it's "somewhat," "quite a bit," or "very much" too permissive.
Item 15. It may help to remember that this item measures the teacher's permissiveness. Although the word "reprimand" may have negative connotations, do not interpret it negatively. If the teacher intervenes when children misbehave, then the score is "1." If you do not observe any misbehavior (broadly interpreted, see clarifications to item 7), score this item "1." If you see children misbehaving without any intervention from the teacher, then you need to decide whether she "sometimes," "quite a bit," or "very much" doesn't reprimand children when they misbehave.
Item 17. If you do not observe any punishment during the observation, you should score this item as a "1."
Item 19. Pro-social behavior includes behavior toward adults and other children.
Item 23. If the teacher provides the "right amount" of supervision (or even supervises them too closely), the score is "1." If the teacher does not supervise the children closely enough, then you must decide to what degree she does *not* supervise closely.
SCORING INSTRUCTIONS
Total Mean Score: A higher score on the total mean item score indicates "better" (more positive, appropriate) interactions. To compute the total mean (average) item score: (1) Reverse the scores of items 2, 4, 5, 9, 10, 12, 13, 15, 17, 20, 21, 22, 23, 24 and 26. For example, if an items is scored "4" during the observation, use a score of "1" when computing the total score; if an item is scored "2" during the observation, use a score of "3" when computing total score. (2) Sum the scores for all items (be sure to use the "reversed" scores in the sum as directed. (3) Divide the total sum by 26 to get the total mean item score. **The total mean item score will be a number between 0 and 4.**

APPENDIX D

Teacher Consent Form

PRINCIPAL INVESTIGATOR: Helen M. Lane, Doctoral Candidate
TITLE: The Influences of Caregiver-Child Interaction and Temperament on Cortisol Levels of Toddlers in Full-Day Childcare

TEACHER CONSENT FORM

INFORMATION ABOUT: Teacher-Child Interaction Cortisol Study

PRINCIPAL INVESTIGATOR: Helen Lane, Doctoral Candidate

This informed consent will explain about being a participant in a research study. It is important that you read this material carefully and then decide if you want to be a volunteer.

PURPOSE:
The purpose of this study is to examine caregiver-child interaction, the many different ways teachers and children interact and practices teachers use with children in the classroom. By conducting this study we aim to identify caregiver-child interactions, learn about child temperament from teachers and parents, and learn how children cope with their surroundings. Findings from this study will be used to improve teacher preparation programs.

DURATION
Your participation in this project will take place over two days; the first day of two hours in the morning; a second day with one morning and one afternoon session, each two hours. You will be asked to fill out a developmental inventory, which will take about fifteen minutes to complete.

PROCEDURES
Participating teachers include teachers in toddler classrooms who have been employed in that classroom for minimum of three months prior to the study. Participating children include children age 12 to 24 months.

Each participating teacher and class of children age 12 to 24 months will be observed by a researcher and her assistants for two hours in the morning and again for two hours in the afternoon of the same day. Observation hours are from 8:30-11:30 am and from 12:30-2:30 in the afternoon. Observation hours may be adjusted to accommodate class schedule, so that the researchers will begin each observational block earlier or later in the morning or afternoon. Specific days will be scheduled with each classroom teacher. During observations the children will wear a sticker with their first initial on their back. This will enable the researcher to link the child's developmental scale with the child's interaction style with the teacher. The researchers will be completing a "running record" and classroom assessment scale of the observation noting the teacher's interactions with the children.

6-9-11 Subject Initials_____

Each participating teacher will also fill out a developmental scale on each child. The scale asks questions in the form of statements such as “child is very energetic, ” or “child cries easily, ” and teachers would answer whether this is “never” true of the child, “rarely” true, ” “almost always” true, or “always” true of the child.

ALTERNATIVE PROCEDURES
There are no alternative procedures.

POSSIBLE RISKS/DISCOMFORTS
There are no anticipated risks resulting from your participation.

POSSIBLE BENEFITSPOSSIBLE BENEFITS
There are tremendous benefits to be gained from a study of teacher-child interaction for the field of Early Childhood and society as well. Identification and description of teacher/caregiver interactions that are considered growth promoting and developmentally appropriate for toddlers can have an impact on the current knowledge and practice that could change for the better how toddlers are cared for and taught.

FINANCIAL COSTS
There will be no cost for you to participate.

COMPENSATION IN THE FORM OF PAYMENT TO RESEARCH PARTICIPANTS
There will be no payments for participation.

VOLUNTARY PARTICIPATION
Participation in this research is voluntary. You may **refuse** to participate. You can quit at any time. If you quit or refuse to participate, the benefits or treatment to which you are otherwise entitled will not be affected. You may quit by calling Helen Lane, whose phone number is (423) 213-9132. You will be told immediately if any of the results of the study should reasonably be expected to make you change your mind about staying in the study.

PRINCIPAL INVESTIGATOR: Helen M. Lane, Doctoral Candidate
TITLE: The Influences of Caregiver-Child Interaction and Temperament on Cortisol Levels of Toddlers in Full-Day Childcare

CONTACT FOR QUESTIONS

If you have any questions, problems or research-related problems at any time, you may call Dr. Lissy Gloeckler at (423)439-7705 or Helen Lane at (423)213-9132. You may call the chairman of the Institutional Review Board at (423)439-6054 for any questions you may have about your rights as a research subject. If you have any questions or concerns about the research, and want to talk to someone independent of the research team, or you cannot reach the study staff, you may call the IRB Coordinator at (423)439-6055 or (423)439-6002.

CONFIDENTIALITY

Confidentiality will be kept in a number of ways. The names of the childcare centers, the teachers, and toddlers will be changed. The childcare centers will be called Center #1, #2, #3, etc. The teachers will be called #1, #2, #3, etc. The children will identified by their first or last initial during observations and saliva collection.

Information gained from the observations and developmental scales will be kept in a locked file cabinet in the co-investigator's office for a period of five years from the ending date of the study. At that time, the developmental scales and assessment data will be shredded. All computer files will be deleted.

Every attempt will be made to see that the study results are kept confidential. A copy of the records from this study will be stored in locked file cabinets in room 510 of Warf-Pickel Hall at East Tennessee State University for at least five years after the end of this research. Although your rights and privacy will be maintained, the Secretary of the Department of Health and Human Services, the East Tennessee State University Institutional Review Board, and the ETSU Department of Human Development and Learning have access to the study records. All records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law, or as noted above.

PRINCIPAL INVESTIGATOR: Helen M. Lane, Doctoral Candidate
TITLE: The Influences of Caregiver-Child Interaction and Temperament on Cortisol Levels of Toddlers in Full-Day Childcare

By signing below you confirm that you have read or have had this document read to you. You will be given a signed copy of this informed consent document. You have been given the chance to ask questions and discuss your participation with the researcher. You freely and voluntarily choose to be in this research project.

_____

SIGNATURE OF TEACHER DATE

_____

PRINTED NAME OF TEACHER DATE

_____

SIGNATURE OF PRINICPAL INVESTIGATOR DATE

APPENDIX E

Parent Consent Form

PRINCIPAL INVESTIGATOR: Helen M. Lane, Doctoral Candidate
TITLE: The Influences of Caregiver-Child Interaction and Temperament on Cortisol Levels of Toddlers in Full-Day Childcare

PARENT/LEGAL GUARDIAN CONSENT FORM

INFORMATION ABOUT: Teacher-Child Interaction, Temperament, Cortisol Study

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PRINCIPAL INVESTIGATOR: Helen Lane, Doctoral Candidate

This informed consent will explain about being a participant in a research study. It is important that you read this material carefully and then decide if you want to be a volunteer.

PURPOSE:
The purpose of this study is to examine caregiver-child interaction, the many different ways teachers and children interact and practices teachers use with children in the classroom. This will help you decide whether or not you want your child to participate in the study. By conducting this study we aim to identify caregiver-child interactions, learn about child temperament from teachers and parents, and learn how children cope with their surroundings. Findings from this study will be used to improve teacher preparation programs. This consent form will explain about you and your child being participants in this research study.

DURATION:
Your child's participation in this project will take place over two days; the first day of two hours in the morning; a second day with one morning and one afternoon session, each two hours. You will be asked to fill out a developmental inventory, which will take about fifteen minutes to complete.

Participating children will include the children from each classroom that are 12 to 24 months of age. Participating parents include parents of the children in that age group in each classroom.

PROCEDURES:
If you decide to participate in this study and allow your child to be in this research study, you will be asked to sign this consent form after you have had all your questions answered and understand what will happen in your child's classroom.

Children
Each participating lead teacher and class of children will be observed for two hours, one session in the morning and one session in the afternoon, of the same day. This will enable the researcher to collect information about caregiver-child interactions. Midway through the observation each of the children, individually, will be offered a miniature marshmallow from a cup, and then offered a piece of gauze on a string to collect their saliva to measure cortisol. The process of saliva collection will be demonstrated for you at the childcare center.

6-9-11 Subject Initials_____

PRINCIPAL INVESTIGATOR: Helen M. Lane, Doctoral Candidate
TITLE: The Influences of Caregiver-Child Interaction and Temperament on Cortisol Levels of Toddlers in Full-Day Childcare

Parents
Parents will be asked to fill out a developmental questionnaire about their child. The scale asks questions in the form of statements such as "child is very energetic," or "child cries easily," and parents would answer whether this is "never" true of their child, "rarely true," "almost always," or "always" true of their child.

ALTERNATIVE PROCEDURES
There are no alternative procedures.

POSSIBLE RISKS/DISCOMFORTS

Children: Participation in this study should pose no risk to the study participants. However, the presence of a researcher and research assistants observing in the morning and afternoon could be a bit distracting to the teacher and children. Wearing a sticker on their back could also distract a few children. The teacher is asked to go about her usual morning routines and activities and ignore the presence of the researchers. When saliva is collected the child will remain with their teacher while the researcher offers each a miniature marshmallow and then a piece of gauze to soak with saliva to each child. Remaining with their familiar teacher will allow children to remain comfortable and secure.

Parents: There are no anticipated risks resulting from your participation. Parents of the children may ask questions regarding the participation of their 12-24 month old children by contacting Helen Lane (423) 213-9132 to discuss details of the study on the telephone or schedule a time to meet.

POSSIBLE BENEFITS
There are tremendous benefits to be gained from a study of teacher-child interaction for the field of Early Childhood and society as well. Identification and description of teacher/caregiver interactions that are considered growth promoting and developmentally appropriate for toddlers can have an impact on the current knowledge and practice that could change for the better how toddlers are cared for and taught.

FINANCIAL COSTS
There will be no cost for you or your child to participate.

COMPENSATION IN THE FORM OF PAYMENT TO RESEARCH PARTICIPANTS
There will be no payments for parent or child participation.

PRINCIPAL INVESTIGATOR: Helen M. Lane, Doctoral Candidate
TITLE: The Influences of Caregiver-Child Interaction and Temperament on Cortisol Levels of Toddlers in Full-Day Childcare

VOLUNTARY PARTICIPATION

Participation in this research is voluntary. You may **refuse** to let your child participate. You can quit at any time. If you quit or refuse to participate, the benefits or treatment to which you are otherwise entitled will not be affected. You may quit by calling Helen Lane, whose phone number is (423) 213-9132. You will be told immediately if any of the results of the study should reasonably be expected to make you change your mind about staying in the study.

CONTACT FOR QUESTIONS

If you have any questions, problems or research-related problems at any time, you may call Dr. Lissy Gloeckler at (423)439-7705 or Helen Lane at (423)213-9132. You may call the chairman of the Institutional Review Board at (423)439-6054 for any questions you may have about your rights as a research subject. If you have any questions or concerns about the research, and want to talk to someone independent of the research team, or you cannot reach the study staff, you may call the IRB Coordinator at (423)439-6055 or (423)439-6002.

CONFIDENTIALITY

Confidentiality will be kept in a number of ways. The names of the childcare centers, the teachers, and toddlers will be changed. The childcare centers will be called Center #1, #2, #3, etc. The teachers will be called #1, #2, #3, etc. The children will identified by their first or last initial during observations and saliva collection.

Information gained from the observations and developmental scales will be kept in a locked file cabinet in the co-investigator's office for a period of five years from the ending date of the study. At that time, the developmental scales and assessment data will be shredded. All computer files will be deleted.

Every attempt will be made to see that the study results are kept confidential. A copy of the records from this study will be stored in locked file cabinets in room 510 of Warf-Pickel Hall at East Tennessee State University for at least five years after the end of this research. Although your rights and privacy will be maintained, the Secretary of the Department of Health and Human Services, the East Tennessee State University Institutional Review Board, and the ETSU Department of Human Development and Learning have access to the study records. All records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law, or as noted above.

6-9-11 Subject Initials_____

PRINCIPAL INVESTIGATOR: Helen M. Lane, Doctoral Candidate
TITLE: The Influences of Caregiver-Child Interaction and Temperament on Cortisol Levels of Toddlers in Full-Day Childcare

By signing below you confirm that you have read or have had this document read to you. You will be given a signed copy of this informed consent document. You have been given the chance to ask questions and discuss your participation with the researcher. You freely and voluntarily choose to be in this research project. You understand that you are agreeing for your child to be observed in the classroom and have a saliva sample collected and yourself to fill out a developmental scale on your child.

_____

SIGNATURE OF PARENT OR LEGAL GUARDIAN OF PARTICIPANT DATE

_____

PRINTED NAME OF PARENT OR GUARDIAN OF PARTICIPANT DATE

_____

NAME OF CHILD DATE

_____

SIGNATURE OF PRINICPAL INVESTIGATOR DATE

6-9-11 Subject Initials_____

APPENDIX F

Note to Parents

To: Parents
From: Helen Lane
Re: Developmental Scale

Hello to each of you!

Here is the developmental scale I am asking you to fill out on your child. When completed please put it in the white envelope and seal it. Then bring it to your child's classroom and put it in the large manila envelope marked Parent Copies of Developmental Scales. I will return to the childcare classroom in about a week and pick them up. Thanks very much for your willingness to complete them.

Helen Lane
Doctoral Student
Department of Human Development and Learning
ETSU
423-213-9132.

APPENDIX G

Institutional Review Board Approval

Accredited Since December 2005

ETStI

East Tennessee State University
Office for the Protection of Human Research Subjects • Box 70565 • Johnson City, Tennessee 37614-1707
Phone: (423) 439-6053 Fax: (423) 439-6060

IRB APPROVAL - Initial Expedited Review

July 26, 2011

Ms. Helen Lane
314 East 5th Ave
Watauga, TN 37694

Re: The Influences of Caregiver-Child Interaction and Temperament on Cortisol Levels of Toddlers in Full-Day Childcare
IRB#: c0611.10s
ORSPA #: N/A

The following items were reviewed and approved by an expedited process:

- *Form 103; Narrative (6/9/11 stamped approved 07/25/11)*; Potential Conflict of Interest (none identified); CV; Parent/Legal Guardian Consent Form (ver. 6/9/11 stamped approved 07/25/11)*; Teacher Consent Form (ver. 6/9/11 stamped approved 07/25/11)*; Early Childhood Behavior Questionnaire Very Short Form; Caregiver Interaction Scale; Engagement Check II; Supplemental Submission Form for Studies with Children Participants; Assurance Statement*

The item(s) with an asterisk(*) above noted changes requested by the expedited reviewers.

***On July 25, 2011,** a final approval was granted for a period not to exceed 12 months and will expire on **July 24, 2012.** The expedited approval of the study and requested changes [Narrative (6/9/11 stamped approved 07/25/11); Parent/Legal Guardian Consent Form (ver. 6/9/11 stamped approved 07/25/11); Teacher Consent Form (ver. 6/9/11 stamped approved 07/25/11)] will be reported to the convened board on the next agenda.*

*The following **enclosed stamped, approved Informed Consent Documents** have been stamped with the approval and expiration date and these documents must be copied and provided to each participant prior to participant enrollment:*

- *Teacher Consent Form (ver. 6/9/11 stamped approved 07/25/11)*

Federal regulations require that the original copy of the participant's consent be maintained in the principal investigator's files and that a copy is given to the subject at the time of consent.

Based on the review of the Children's Advocate, the IRB determined that no greater than minimal risk to children is presented as the procedures take place in a setting familiar to the children and with the consent of parents. The IRB determined that the permission of each child's parents or guardian will be obtained unless one parent is deceased, unknown, incompetent, or not reasonably available, or when only one parent has legal responsibility for the care and custody of the child. Sufficient and adequate provisions are in place for permission to be obtained appropriately and to be documented. If permission is to be obtained from a guardian, the guardian will be an individual who is authorized under applicable State or local law to consent on behalf of the child to general medical care. The IRB determined that assent is NOT required because the capability of some or all of the children is so limited that they cannot reasonably be consulted as the children are too young to understand the study procedures.

The following **enclosed stamped, approved Parental Permission/Informed Consent Document** has been stamped with the approval and expiration date and this document must be copied and provided to each participant prior to participant enrollment:

- Parent/Legal Guardian Consent Form (ver. 6/9/11 stamped approved 07/25/11)

*Note: **At the time of approval no sites were identified and as such no research can begin at any site until the site is approved for the study by the IRB.***

Unanticipated Problems Involving Risks to Subjects or Others must be reported to the IRB (and VA R & D if applicable) within 10 working days.

Proposed changes in approved research cannot be initiated without IRB review and approval. The only exception to this rule is that a change can be made prior to IRB approval when necessary to eliminate apparent immediate hazards to the research subjects [21 CFR 56.108 (a)(4)]. In such a case, the IRB must be promptly informed of the change following its implementation (within 10 working days) on Form 109 (www.etsu.edu/irb). The IRB will review the change to determine that it is consistent with ensuring the subject's continued welfare.

Sincerely,
Chris Ayres, Chair
ETSU Campus IRB
cc: Phyllis Gloeckler, PhD

APPENDIX H

Researcher-Adapted Engagement Check II

Time	Interval	Number Present	Number Nonengaged	Number Engaged	Percent Engaged	Activity	Comment
	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
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	28						
	29						
	30						

Note: Adapted from Engagement Check II (McWilliam, 1999)

VITA

HELEN MORRIS LANE

Educational Background:	East Tennessee State University, Johnson City, TN, Ph.D., Early Childhood Education, December 2012. East Tennessee State University, Johnson City, TN, M.Ed., Early Childhood, Special Education, 1994. East Tennessee State University, Johnson City, TN, B.S., English, Elementary Education, 1970.
Honors:	Human Development and Learning-Early Childhood Education Doctoral Program 2012 Outstanding Graduate Student-East Tennessee State University Golden Key Honor Society Kappa Delta Pi Honor Society for Education Gamma Beta Phi Honor Society
Professional Experience:	Doctoral Fellow, Ph.D. Candidate in Early Childhood Education, East Tennessee State University, Johnson City, TN, 2008-Present. Technical Assistance, Tennessee's Early Intervention System, Johnson City, TN, 1998-2008. East Tennessee State University Physicians Practice, Developmental/Behavioral Pediatrics, Johnson City, TN, 1994-1998. Adjunct Instructor, Assessment of Young Children, East Tennessee State University, Johnson City, TN, Spring 1997.
Publications/Presentations:	Evanshen, P., Isbell, R., Baker, A., & Lane, H. (2011, November) *Learning Environments.* National Association for the Education of Young Children. Orlando, FL.

Lane, H. (2009, November). *The Dreams I Dream for You: Guidelines for Parents, Teachers, and Child Care Providers to Include Children with Special Needs in the Community.* National Association for the Education of Young Children. Washington, DC.

Gloeckler, P., & Lane, H. (2009, November). *A Study of Teacher Practices with Toddlers during Opportunities for Problem Solving.* National Association for the Education of Young Children. Washington, DC.

Lane, H. (2006, October). *The Dreams I Dream for You: Guidelines for the Inclusion of Children with Special Needs in the Community.* Paper presented to the 22nd Annual International Conference on Children with Special Needs and their Families, Little Rock, AR.

Editing staff and contributor for *Teaching Young Children with Autism Spectrum Disorder.* Dr. Clarissa Willis (2006).

Lane, H., Castle, J., Smith, M., & Burkett, A. (2000, Committee). *The Individualized Family Service Plan Manual*. Contributor to the State Department of Education, Division of Special Education, Early Intervention System's development of the manual designed to be a tool, accessible to members of the State's early intervention system who are involved in the process of individualized family service planning.

Professional Affiliations:

Appointment to the Tennessee Community Service Agency Board of Directors by Governor Phil Bredesen, March, 2010.

Tennessee Department of Mental Health and Developmental Disabilities, Planning and Policy Council, 2006-2008.

Arc of Washington County, Executive Board Member, Past Executive Board Chair, 2004-2009.

Council for Exceptional Children

National Association for the Education of Young Children