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I am submitting herewith a thesis written by Bridget Ellen Hatfield entitled "Child characteristics, parent-child interaction style, and self-regulation as predictors of externalizing behaviors in toddlers." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Child and Family Studies.

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**CHILD CHARACTERISTICS, PARENT-CHILD INTERACTION
STYLE, AND SELF-REGULATION AS PREDICTORS OF
EXTERNALIZING BEHAVIORS IN TODDLERS**

A Thesis

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DEDICATION

I dedicate this thesis project to my parents. Together they taught me the value of persistence, sacrifice, faith, and strength of character. However, individually they have also inspired and shaped me. My mom, Francine Hatfield, demonstrated the significance of patience and stability, while dedication and hard work was modeled by my dad, Gary Hatfield. Thank you for your continued support and belief in me; you have made all of the difference.

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ABSTRACT

Emotion regulation is the process by which individuals are able to manage emotional arousal, emotional display, and attention processes, as well as the ability to properly respond and express emotions to others. In toddlers, a deficit in emotion regulation is often displayed by exhibition of externalizing behaviors. This study examines the development of emotion regulation from infancy to two and a half years of age. The model proposed in this study examines heart rate variability in infancy, and child characteristics, self-regulation, and parent-child interaction style in toddlerhood as predictors of externalizing behavior in toddlers. Results from the study reveal that deficits in the self-regulatory system are the most important contributor in the development of externalizing behaviors in toddlers. However, the parent-child interaction style also played a significant role in that parents who rated themselves as being emotionally available, nurturing, not depressed, and claim mostly positive interactions with their child were less likely to have a toddler with externalizing behavior problems. However, a poor self-regulatory system, which included difficulty with sleeping and eating as well as sensory sensitivity and the expression of negative affect, accounted for 20% of the variance.

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Chapter 1: Introduction

During toddlerhood, many childhood milestones including acquisition of language, movement, and the beginning stages of independence and control are acquired (Calkins & Fox, 2002). However, the ability to cope and manage these new experiences is developing continuously in toddlers and is evident in their behaviors and emotional expression. Often toddlers are described as demanding, autonomous, and curious; their actions dominate communication and interactions due to a restricted range of emotion (Rubin, Burgess, & Dwyer, 2003). For example, a child who desires a toy that another is playing with will often just approach the child and try to take the toy with force, or a child who wants ice cream is unable to wait patiently and control his/her emotions. Children learn to handle these situations and others more efficiently as their ability to self-regulate grows throughout early childhood. Learning how to manage these new experiences and the emotions that extend from them is important for healthy development into middle childhood (Shonkoff & Phillips, 2000). In toddlerhood, children have a strong need to exert control and independence, and since parents are largely accountable for the environment of the child, they have the opportunity to help the child work through these needs productively and appropriately. It is also important to note that the behavior of toddlers is often context, time, and age specific (Blair, 2002; Squires, 2000). Due to this, an investigation of environmental characteristics as well as individual differences are important when understanding the development of regulation in toddlers.

Self-Regulation and Emotion Regulation

In this study, self-regulation is defined as a system within an individual that helps to govern behavior; learning how to manage impulses appropriately is essential for

healthy development into middle childhood and even through adulthood (Calkins & Howse, 2004). An element of the larger self-regulatory system is emotion-regulation. Emotion regulation deals primarily with the process by which individuals are able to manage emotional arousal and emotional display, attention processes, and the ability to properly respond and express emotions to others (Calkins & Fox, 2002; Eisenberg, Spinrad, & Smith, 2004; Shonkoff & Phillips, 2000; Westphal & Bonanno, 2004).

Externalizing Behaviors and Regulation in Toddlers

During toddlerhood there is a shift from external regulation to internal regulation, which requires that the child begin to control his/her own emotions and impulses as they move toward self-control. As toddlers work through this period, they tend to use aggression, force, and other negative behaviors until they learn alternative means of communicating and controlling their behaviors and impulses (Campbell et al., 2000). Externalizing behaviors are often attributed to a poor self-regulatory system in that deficits in regulation can lead to a higher frequency of externalizing behavior problems (Calkins & Dedmon, 2000; Rubin et al., 2003). Furthermore, externalizing behaviors tend to be stable across time (Rubin et al.), and therefore problems at an early age have implications for later functioning (Hill, Degnan, Calkins, & Keane, 2006).

Development of Regulation

The ability to regulate emotions is a process that begins in infancy and continues throughout early childhood, and it is during this time that children are most susceptible to learning how to regulate his/her emotions (Calkins & Fox, 2002; Shonkoff & Phillips, 2000). Infants are wired with the ability to *learn* to self-regulate; however, as each individual grows both external and internal factors will influence how regulation

develops (Calkins, 2004; Shonkoff & Phillips). Between the ages of two to four years children begin to regulate their emotions with new skills that are markedly different from the regulatory skills displayed in infancy (Cole, Martin, & Dennis, 2004). Regulatory capacities are believed to be driven by maturation and develop in conjunction with the prefrontal cortex so that around six years of age, the window begins to close (Blair, 2002). Therefore, children's early environment coupled with individual differences may be one of the most important predictors of self-regulatory abilities.

It is important to discover what influences the development of regulation as much of the research points to a combination of individual differences and external, environmental factors to explain the development of regulation. For instance, research conducted by Westphal and Bonanno (2004) shows that regulation is affected by factors such as temperament as well as the interaction between the individual and the environment. In other words, Westphal and Bonanno's perception of the regulation of emotion takes into account both individual differences as well as learned processes and the environmental demands placed upon children. With this framework in mind, temperament along with genetic characteristics, such as the maturation of biological systems like the frontal lobe, can contribute to the development of regulation. Additionally, the early parenting environment, the child's learning environment, which includes the development of motor, psychological, and cognitive processes, individual differences, and the caregiving experience are also viewed as important predictors of regulation (Calkins, 2004). When looking at factors that may affect emotion regulation, it is important to examine both internal and external components. A more complete picture of these processes can be obtained by looking at the interplay and pathways of the

interactions between biological, individual, and environmental factors and how they affect development of regulation.

Statement of the Problem

As children enter school, it is important that they exhibit the skills necessary to succeed in this new and often cognitively demanding environment. These skills include the obvious academic elements, but social and emotional competence is often forgotten when school readiness skills are examined. The ability to control behavior and exhibit appropriate responses and emotions is an important component of school readiness as it facilitates attention processes and learning capacities (Blair, 2002). Recently, research has focused on the developmental outcomes of children from preschool to middle school who exhibit differing levels of social and emotional competence, which are exhibited through behavior problems (Belsky, Kuang-Hua, & Crnic, 1998; Calkins & Keane, 2004). It seems that no matter when the behavior is assessed, the long-term effects of these problems extend into later childhood and even through adulthood (Eisenberg, Smith, Sadovsky, & Spinrad, 2004). As stated previously, the development of the regulatory system is the most pliable early in life (Calkins & Fox, 2002). It is important, then, to examine the aspects of the early environment and how it may affect the development of regulation.

Deficits/Outcomes of poor regulatory skills

Deficits in the development of regulation that occur at an early age may hinder and negatively influence self-regulatory capacities later in life. The development of regulation is often represented visually as building blocks as the earlier skills help to define the capacity of later skills; therefore, mastery is essential in the early stages

(Calkins & Howse, 2004). In other words, if an individual does not move past the regulatory milestone at a particular age, he/she will not have adequately learned what is needed for the next step.

Research supports this hypothesis in that regulatory functioning in infancy is predictive of functioning in toddlerhood as well as toddlerhood functioning being predictive of regulatory abilities in preschool (Calkins & Keane, 2004). For example, heart rate data, such as respiratory sinus arrhythmia (RSA), is thought to be a physiological measure on how the individual copes with situations, and this measure taken in infancy is predictive of itself at the toddler stage (Calkins & Keane). Low measures of RSA are often linked with poor developmental outcomes including the greater likelihood of developing externalizing behavior problems (Calkins & Howse, 2004; Shaw, Owens, Giovannelli, & Winslow, 2001). Other research also points to the development of self-regulation of emotion as critical in the later development of interpersonal relationships and social/emotional adjustment (Calkins & Fox, 2002), and children with poor emotional regulation continue to have problems with peer relationships and academic skills through adulthood. Clearly, there is evidence that regulatory abilities influence the later developmental outcomes of children and adults.

CHAPTER 2: REVIEW OF THE LITERATURE

Theoretical Framework

Bronfenbrenner and Ceci (1994) propose a bioecological model in which the genetic predispositions (internal characteristics) and the environment (external characteristics) contribute to the development of an individual. This model views development as dependent on the interplay of the environment, which includes culture, social networks, community, and parental characteristics, and genetic traits through time, context, and stages of the lifespan. The model examines five main factors: 1) the proximal processes through which the genetic predisposition is realized, 2) individual differences, as defined by heritability, and how the proximal processes and the environment shapes variation between individuals, 3) the process through which genes influence developmental outcomes, 4) the spectrum of development from the point of view of heritability and how genes predict the range of developmental outcomes, and 5) the effect of environmental characteristics and how developmental outcomes differ with respect to proximal process. The basic premise of this theory is that an individual enters the world with genetic predispositions, but the environment helps to shape how these predispositions are actualized. This theoretical model introduces three propositions that the bioecological model operationalizes.

The first proposition states that experience is a critical portion of development, and it involves both characteristics of the environment as well as the individual's perception of the environment. Through this lens, both subjective and objective elements are important in understanding development over time. Bronfenbrenner (2005) uses the terms phenomenological and experimental to identify the two forces that guide subjective

and objective experiences, respectively. Phenomenological describes how an individual recognizes and sometimes changes aspects of the environment, whereas experimental looks at individual differences in emotions (Bronfenbrenner). This proposition, when applied to the development of regulation, coincides with the development of self-regulatory abilities in that it includes both subjective and objective characteristics. In the research, temperament is a characteristic of the child that can change aspects of the environment in that it has a direct impact on parenting practices (Cole et al., 2004), thus being an example of a subjective characteristic. However, a child also comes with experimental, or objective, characteristics by the predisposition to understand and react to stimuli differently depending on the individual; an example of the objective characteristics could be the physiological aspects of regulation that are present at birth such as heart rate variability (Porges, Doussard-Roosevelt, Portales, & Greenspan, 1996).

Second, the bioecological model posits that development occurs within a framework of increasingly complex interactions while also accounting for the individual differences of others and how these differences affect the development of an individual. These forms of interaction are called proximal processes, and it is important to look at the stability of these processes over time. Interactions under this process are bidirectional in that one individual can influence both another person and the environment, or the exchange of “energy” can affect both persons involved. Also, the duration, frequency, interpretation, timing, and intensity is also important when looking at developmental outcomes (Bronfenbrenner & Evans, 2000). It also states that development is social, and as the individual grows, interactions with others and the ever-changing environment become increasingly complicated. As the individual gets older, he/she is in control of the

interactions that take place, but young children have little control over their environment (Bronfenbrenner, 2005). However, it is important to note that the intent and direction of interactions between individuals is a function of individual characteristics, developmental milestones, the environment, and how these factors interact with time. Through this lens, the development of regulation is constructed largely by the individuals who are present early in life when the plasticity of the developing construct, emotion regulation, is most pliable. These individuals shape the trajectory of development by the bidirectional nature of their actions and the environment that is shaped for the young child.

The third major proposition of Bronfenbrenner's bioecological theory recognizes that there are individual differences due to genetic predispositions as well as environmental aspects that shape development, but it is the interaction of the two over time and context that guides development. The proposition states that as individuals grow, relationships become increasingly complex. It is imperative for development that these interactions are reciprocal and involve a person who is in a secure, loving relationship with the child. Through these interactions, the child will have a better understanding of others and will be able to develop relationships that are defined by commitment, strength, and reciprocity (Bronfenbrenner & Evans, 2000). The relationships the child learns to develop and the interactions he/she is exposed to help form a model for communicating with others. One of the first steps in effectively communicating with others is understanding the emotion and regulating it appropriately.

The Bronfenbrenner model views development as a communication between genetics and environmental experiences. In other words, it is the interaction between the two that defines development throughout the life span. Through this lens people in the

environment as well as individual differences have an impact on the development of an individual. The development of emotion regulation can be viewed through this theoretical perspective. For instance, the child is born with individual characteristics including temperament and differences in heart rate, which affect the trajectory of regulation, but both the environment and the interaction between the environment and the child can affect the eventual outcome of regulatory abilities. The models described below help to explain the many relationships that exist to understand the development of regulation.

Structural Models and Regulation

Research has shown that certain child and environmental characteristics have long lasting effects on regulatory abilities. Internal characteristics of the child such as temperament, verbal ability, heart rate variability, and sex are often predictive of regulatory capacities. Other external factors such as parenting stress, emotional availability/nurturance, maternal depression, and parental response to a child's temperament has been linked to the trajectory of emotional regulation. In the field of emotion regulation, models have been presented that examine certain components of the child and/or the environment as predictors of emotion regulation (Calkins & Howse, 2004; Feldman, Eidelman, & Rotenberg, 2004; Scaramella & Leve, 2004; Supplee, Shaw, Hailstones, & Hartman, 2004). These models have examined the outcomes of aggressive behavior and self-regulatory functioning, but few have encompassed the wide range of predictor variables and influences on the trajectory of development in their model as research presents. For example, one model may focus on mother-child interaction to understand the development of externalizing behaviors whereas yet another

model may focus solely on temperament. Each model presented here focuses on aspects of development that have shown to be strong predictors of regulation in current research.

A theoretical model postulated by Calkins and Howse (2004) examines the pathways of numerous direct and indirect influences on the development of emotion regulation and aggression in young children. It assumes that early disruptive behavior can be observed across many different levels and domains and these are influenced by both parent and child characteristics. It could be, according to this model, that the interplay between positive parenting affectivity and strategies would be more likely to produce a child with appropriate regulation skills even though the child has a difficult temperament. Alternatively, negative parenting practices with a difficult temperament would create a poorly regulated child. The manifest components of the model: child characteristics, parenting, self-regulation, and aggression, are all linked to the trajectory of self-regulatory capacities. The Calkins and Howse model provides a theoretical framework to test the development of regulatory capacities in toddlerhood while examining child characteristics, self-regulatory capacities, parenting characteristics, and the outcome of externalizing behaviors.

A theoretical model proposed by Scaramella and Leve (2004) includes types and levels of parent-child interactions as an instrument through which children develop externalizing behavior problems later in life. Through this model children learn how to regulate emotion through their interactions with parents, as sensitive, responsive parenting encourages and promotes positive regulatory abilities in children. However, temperament also plays an important role in the dynamics of parent-child interactions in that temperament can affect the way the parent responds to a child. The model proposes

that harsh parenting has detrimental affects on emotion regulation and peer relations. Additionally, negative emotionality has an effect on both harsh parenting and emotion regulation. However, this model does not give us the complete picture of the development of regulation as it only includes one environmental influence on the child--- parenting. Furthermore, similar to the Calkins and Howse model (2004), it has not been empirically tested. Even though this model focuses on factors such as temperament, negative emotionality, and the bidirectional nature of parent-child interaction, it is important to look at all interactions as well as individual characteristics when looking at developmental outcomes.

Feldman, Eidelman, and Rotenberg (2004) evaluate a model that includes infant emotional regulation, parenting stress, parental social support, and maternal sensitivity to assess infant cognitive outcomes in families of triplets. The goal of the study was to examine factors in triplets' early environment across the first year to understand outcomes at the end of the year. In the study, the model was assessed using structural equation modeling (SEM). A number hypotheses about the directionality as well as the mediating and moderating roles of infant emotion regulation and maternal sensitivity was tested. First, maternal sensitivity, which was expected to remain the same across the first year and be mediated by infant emotion regulation, was hypothesized to have a direct effect on child outcomes. Secondly, infant emotion regulation was also expected to have a direct effect on child outcomes in addition to mediating the relationship between maternal sensitivity and child outcomes. Thirdly, parenting stress was anticipated to have an indirect effect on cognitive outcomes and also be mediated by maternal sensitivity. Lastly, social support was added as a direct effect on parenting. The results showed that

maternal sensitivity remained stable across time and the hypothesized paths between maternal sensitivity, emotion regulation, parenting stress, and social support to child outcomes were all significant. This model supports the idea that emotionality, nurturance, and parenting stress are important components to the developing regulatory system.

The last model examined child negative emotionality, maternal depressive symptoms, maternal education, maternal IQ, maternal instruction at 18, 24, and 42 months, and the direct and indirect effects of these variables on school outcomes at ages six and seven (Supplee et al., 2004). The model tested a mediational relationship with maternal instruction between negative emotionality of the child and the child's academic behaviors as well as the relationship between maternal depression and academic behaviors moderated by maternal instruction. Results indicated that mothers' active cognitive engagement and instruction strategy was positively correlated with emotion regulatory behaviors and academic outcomes. Also, a regression analysis was preformed with active cognitive engagement as predictors and again, emotional regulation was significantly predicted by maternal education and active cognitive engagement as well as the interaction between the two variables. This model shows that maternal characteristics such as depression and interaction style are important when examining the development of regulation.

The Proposed Model

It seems that from the research examined, a model that examines child characteristics, parent-child interaction characteristics, and the regulatory capacities as predictors and influences on the development of externalizing behaviors in young children is not available at this time. This study proposes a model (Figure 1) that builds

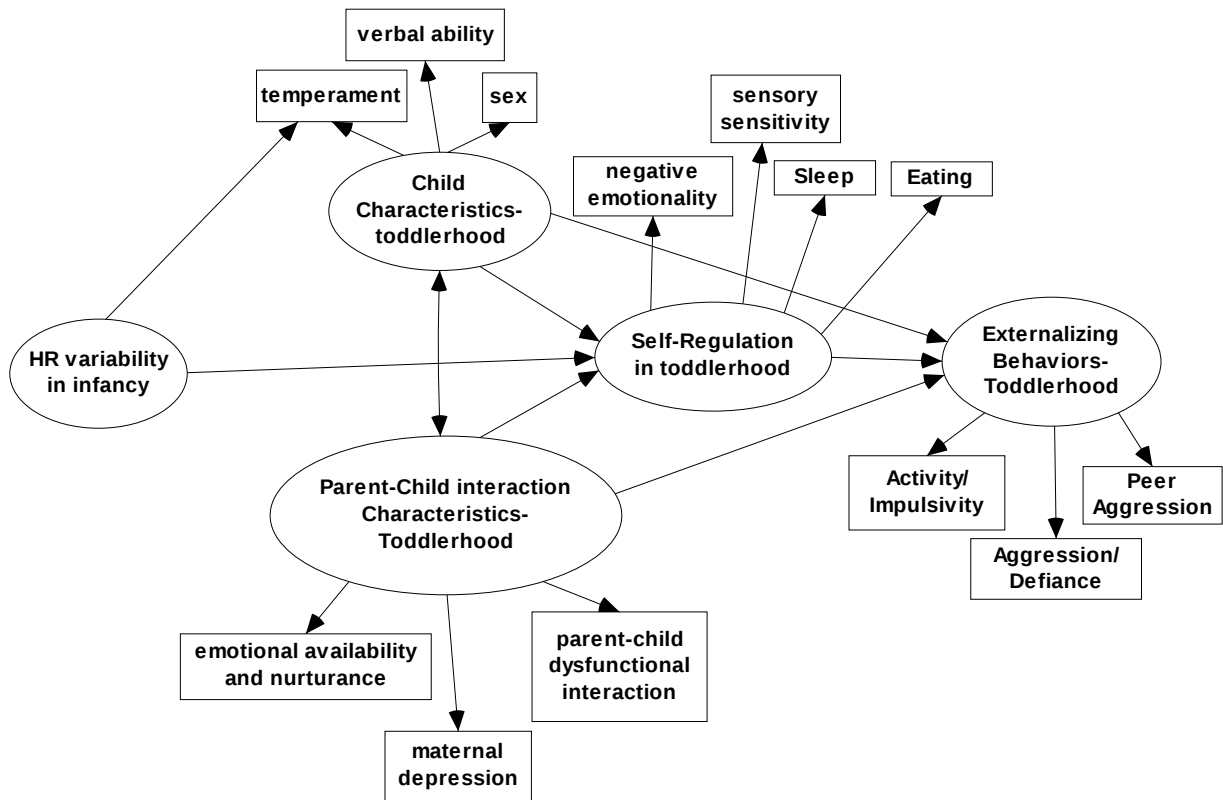


Figure 1. *Proposed model examining the pathways to the development of externalizing behaviors in toddlerhood.*

upon the four previously introduced models to guide the framework in identifying important characteristics concerning the development of emotion regulation and externalizing behaviors. This adapted model proposes that heart rate variability in infancy, child characteristics in toddlerhood, parent-child interaction style, and self-regulatory abilities in toddlerhood has an effect on the development of emotion regulation in toddlerhood as displayed by externalizing behaviors. As listed below, each manifest variable in the model, heart rate, child characteristics, parent-child interaction style, self-regulation, and externalizing behaviors, as well as each latent variable of the construct, which includes temperament, verbal ability, sex, negative emotionality, sensory sensitivity, sleep, eating habits, parent-child dysfunctional interaction, maternal depression, and emotional availability/nurturance, is supported through past research.

The Factors in the Model

In the proposed model listed above in Figure 1, there are four main constructs that are linked to the development of externalizing behaviors in toddlers: 1) heart rate variability in infancy, 2) child characteristics in toddlerhood, 3) parent-child interaction style in toddlerhood, and 4) self-regulatory functioning in toddlerhood. In the following sections each component of the proposed model, including externalizing behaviors, will be reviewed and literature that supports the inclusion of the construct will be highlighted.

Child Characteristics in Infancy

heart rate variability.

Measures of cardiac activity, such as baseline heart rate, are commonly used to examine individual differences in the development of regulation. These measures of heart rate are acquired from the vagus nerve. The vagus nerve extends from the brain to the

heart and passes through many organs and muscles. This nerve is thought to be responsible for linking the brain and specific organs (including the heart) and sending both motor and sensory feedback to these organs. In general, vagal tone is thought to be an index of reactivity. Research across fields has supported the notion that cardiac vagal tone, which is a measure of the control of blood flow to the right side of the heart, is linked to reactivity and emotion (Calkins, 1997; Porges, Doussard-Roosevelt, & Maiti, 1994).

Cardiac activity is often measured through high frequency heart period variability (HFHPV), which is a measure of vagal tone. Research supports a relationship between HFHPV and behavior; specifically it suggests that physiological measures of regulation such as HFHPV are related to externalizing behavior problems in young children (Calkins & Dedmon, 2000). For example, infants with a higher resting vagal tone often have positive social outcomes and are thought to regulate their emotions better when compared to those with a lower resting vagal tone (Blair, 2002). Also, high resting levels of respiratory sinus arrhythmia (RSA), which is another measure of vagal tone, (Calkins & Keane, 2004), has been correlated with appropriate emotional reactivity and good attentional ability in infants and toddlers (Calkins & Howse, 2004). RSA is often linked to positive developmental outcomes including fewer externalizing behaviors and less negative emotionality in preschool children (Calkins & Keane).

Research suggests a link between heart rate variability in infancy and later child outcomes, and it is therefore included in the model presented in this study as an early predictor of self-regulation and temperament measured in toddlerhood. Numerous studies link vagal tone to temperament characteristics, attention, and emotional regulation

throughout infancy and beyond early childhood. For example, in a study by Huffman et al. (1998), the authors found that baseline vagal tone in 12-week old infants was significantly linked to negativity in that infants with a low baseline vagal tone needed more soothing. Another study showed a positive significant relationship between high baseline vagal tone and short lookers during a visual task implying that these infants are processing the information faster than the infants with a low baseline (Bornstein & Suess, 2000). Therefore, it seems that heart rate variability is an important component when examining child outcomes, and due to this, high frequency heart period variability at 13 weeks is included in the proposed model.

Child Characteristics in Toddlerhood

Each child has individual differences that shape the way in which the child reacts to and deals with his/her environment. There are three differences that the proposed model highlights: temperament, verbal ability, and sex. Each of these components affect the child's trajectory of the development of emotion regulation; however, it is important to note that these characteristics are influenced through the environment and are therefore not constructed or developed completely without help from the environment (Bronfenbrenner, 2005). The model presented in this study recognizes that child's individual differences often effect and even cause change in the environment, but it is also important to note the direct influences that temperament, verbal ability, and sex have on the development of emotion regulation in toddlers.

temperament.

Individuals are born with inherent characteristics that influence the way they react to the environment; these characteristics are often referred to as temperament. Rothbart, Ellis, and Posner (2004) define temperament as predisposed individual differences in reactivity and regulation, which is displayed through attention, motor, and emotion capacities. Temperament has been shown to be a stable construct throughout life and research has shown that temperament involves, to some effect, regulation of emotion in that it may predispose the child to have certain reaction tendencies (Cole et al., 2004). This construct even carries predictive value concerning behavior problems. In a study by Kyrios and Prior (1990), temperament was the greatest predictor of behavior problems at ages three to four and four to five even after controlling for sex and other environmental factors. Due to this, temperament is the most widely used characteristics in young children when discussing the development of emotion regulation.

There are three domains of temperament according to Sanson, Hemphill, and Smart (2002); reactivity or negative emotionality, self-regulation, and approach/withdrawal or inhibition. Most of the research examining regulation and aggressive behavior emphasizes the reactivity/negative emotionality domain of temperament. In this domain, infants who are hard to please, difficult, and hard to soothe are often referred to as easily frustrated. Infants who are easily frustrated are described by mothers as less soothable, have shorter attention spans, and are more distressed to novelty. Also, infants who are easily frustrated have difficulty in regulating their emotions and attention (Calkins, Dedmon, Gill, Lomax, & Johnson, 2002). It is important

then, to understand how temperament relates to the development of emotional regulation and what other factors contribute to its development.

Research has shown that an infant's temperament has a direct and indirect effect on the development of regulation (Calkins, 2004). The direct effect is that temperament guides the way the child responds and reacts to situations in the environment. Regulation abilities are then restricted to the capacity in which the child is able to respond to emotionally stimulating events/factors. Infants who are highly negative reactive to new situations may develop a limited amount of regulation capabilities, and therefore will not develop the wide range of regulatory skills needed to emerge as a healthy, well-regulated child. Indirectly, however, temperament affects the response the child receives from the parent. For example Zeidner, Matthews, Roberts, and MacCann (2003) theorize that gene-environment interaction is also important to understand how the parent reacts to the child's temperament in that child characteristics can directly influence parenting practices. For example if a child is hard to soothe or requires a large amount of attention parents may become frustrated or annoyed and these behaviors are communicated to the infant. This may then cause the child to develop poor dysregulation capabilities because the parenting was devoid of affective, positive emotion regulation skills. However, the inability to recognize and understand emotions may also contribute to the development of inappropriate regulatory skills.

verbal ability.

The development and acquisition of language is a milestone that is typically met during the toddlerhood stage. The improvement in and introduction of language skills

during toddlerhood is important as it helps the child to understand and label emotions, organize the environment, and internalize rules and expectations (Bronson, 2000). When a child is able to do this, he/she will be better equipped to deal with and recognize these emotions as it is only upon recognition that the emotion is dealt with (Denham, von Salisch, Olthof, Kochanoff, & Caverly, 2002). Being able to recognize and label emotions is referred to as emotional intelligence. This construct is reflected in an individual's capacity to learn emotion-regulation skills and is related to cognitive abilities that enable the child to differentiate between emotions (Zeidner et al., 2003). In fact, Izzard et al. (2001) shows a strong correlation between verbal ability and emotional intelligence highlighting the importance of language in the development of emotion regulation.

There is also research to support the idea that temperament may have an effect on language development in that children who exhibit a happier, easy to soothe temperament may engage in more mother-child interaction. Possibly due to the increased mother-child time these children have a higher language acquisition in early childhood than children with a difficult temperament (Dixon & Smith, 2000). Also, a recent article by Ensor and Hughes (2005) shows a clear relationship between emotion understanding and verbal ability. In fact, the findings in this study link emotion understanding and verbal ability to the presence of positive behaviors in toddlers. The link between verbal ability and emotion understanding, although assessed through different means such as temperament, mother-child interaction, or emotional intelligence, is clear and should be included as a factor when evaluating emotion regulation.

sex.

Sex is another child characteristic that may have an effect on the development of regulation. There is support that sex may afford differences in the expression of externalizing behaviors and compliance in young children (Calkins & Keane, 2004; Diener & Kim, 2004; Fox & Calkins, 2003; Rubin et al., 2003; Rubin, Hastings, Chen, Stewart, & McNichol, 1998); however, there is also evidence that states that sex has no or little effect in children five years of age (Hipwell, Murray, Ducornau, & Stein, 2004). For those studies that support sex as an individual difference, girls tend to have an advantage over boys. For example, toddler aged boys are more likely to display aggressive behaviors and initiate conflict than girls (Rubin et al, 2003; Rubin et al, 1998). Additionally, boys tend to display more externalizing behavior problems than girls with both teacher and parent report at two to five and a half years of age (Calkins & Keane; Diener & Kim).

Differences are seen not only when evaluating regulation tendencies but also when examining sex differences in temperament. Temperament, as previously stated, is viewed in the literature as a sound predictor of problems in emotion regulation. In a recent meta-analysis by Else-Quest, Hyde, Goldsmith, and Van Hulle (2006), they found that temperament only accounted for a small amount of sex differences. In fact, the only area in which there was a significant difference was with effortful control. Effortful control, which is defined as an individual's ability to control impulses and strong behaviors (Eisenberg et al., 2004), was found to be notably greater in girls than boys. This has implications for the individual's ability to control behavior and may be manifested in poor emotional control.

It is important to note these individual differences in children when looking at the development of regulation as temperament, language, and sex all contribute to how regulation develops in young children. These factors, temperament, verbal ability, and sex may place limits on the development of self-regulation in that milestones or successes as well as regulatory strategies are confined based on these individual differences. However, it is also important to note that child characteristics also influence other aspects of the environment such as parenting, and child variables directly affect parenting and self-regulation abilities.

Parent-Child Interaction Style

Intrinsic factors and individual differences are not the only influence on the development of regulation. Extrinsic elements, such as the characteristics of the parent-child interaction style may also have a large affect (Shonkoff & Phillips, 2000). The development of regulation in early childhood is largely dependent on environmental and social factors. Parents and caregivers share responsibility for the development of emotion regulation in the child as they are accountable for the environment, interaction style, guidance strategies, and the behaviors they model (Bronson, 2000). It is important that parents are able to guide, effectively and appropriately, young children through the process of understanding and reacting to emotion as children are likely to model the regulation style of their parents (Denham et al., 2002). This is important as poor, negative parenting experience have been linked to the development of aggressive behaviors in young children (Rubin et al., 2003). Before delving into characteristics of parent-child interaction, it is also important to note the bidirectional nature of the parent-child interaction and how this may affect the style of interaction (Zeidner et al., 2003).

The following section goes beyond the basic premise that child characteristics will influence the characteristics of the interactions between the parent and the child. It outlines some important characteristics of the parent-child interaction style that may be important to the development of emotion regulation. It is important to note how parents interact with the child as this model of interaction often becomes the guide to all future interactions. This model defines parent-child interaction through emotional availability and nurturance, dysfunctional interaction, as well as maternal depression.

emotional characteristics and parent child dysfunctional interaction.

Infants' emotions are regulated and responded to by their caregivers; there is a reliance on parents and other caregivers and how they as caregivers shape and influence regulatory abilities in children. The influence that parents have on the development of regulation continues into toddlerhood as parents begin to control or allow for the child's choices, independence, and need for exploration (Thompson, 1998). These individuals begin to shape the development of the child's regulation skills as they model and react to the child's needs (Parke et al., 2002) as the child is dependent on others for stimulation and modeling (Bronson, 2000). Some believe, such as Cicchetti, Ganiban, and Barnett (1991), that the behaviors of mothers, or other primary caregivers, exude when responding to emotion are eventually internalized by the child. Therefore, the quality of the interaction between mother and child could be a crucial predictor of the child's ability to self-regulate. The three components of the model that examine these aspects of the parent-child interaction are variables emotional availability and nurturance, parent-child dysfunctional interaction, and maternal depression.

A study by Rubin, Cheah, and Fox (2001) found that the parents of inhibited infants displayed a distinct parenting style characterized by overprotection and anxiousness. Also, parenting that is characterized by a harsh, negative interaction style is often linked to the development of externalizing behavior in preschool children (Scaramella & Leve, 2004). In male preschoolers, for example, a negative interaction style led to an increase in externalizing behavior problems (Belsky et al., 1998). Overall, mothers of toddlers who are more controlling and dominating when interacting with their child have children who contain few, if any, strategies of regulation when placed in a situation when regulatory abilities were required (Calkins, Smith, Gill, & Johnson, 1998). It seems that the characteristics of the interaction between a mother and a child has long lasting effects on the child's ability to regulate emotion in that mothers who model appropriate regulatory behaviors characterized by emotional availability and nurturance are more likely to have children who are able to appropriately manage their emotions (Calkins & Howse, 2004; Parke et al., 2002).

maternal depression.

The last component of the interaction of parenting and child regulatory abilities is the presence of maternal depression. Maternal depressive symptoms, even below the clinical level, can have an impact of the development of externalizing behaviors (Marchland & Hock, 1998). Results from West and Newman (2003) indicated that mild depressive symptoms are related to higher levels of externalizing behaviors in preschoolers which included aggression and destructive/delinquent behaviors as specifiers. Depressive symptoms were also associated with the five temperament

dimensions including higher activity level and displays of anger, as well as lower ability for attention shifting and soothability. Additionally, mothers who were recently diagnosed with maternal depression were associated with higher verbal aggression among kindergarten girls in a study by Hipwell et al. (2004). The above studies show support for the hypothesis that the greater the magnitude of environmental risks the child is exposed to, the greater likelihood the child will develop aggressive tendencies (Campbell et al., 2000)

It is evident from the literature reviewed that mental health, interaction style, and level of emotional support provided by the parents is an important part of the developing child. These parenting dimensions influence children's exhibition of externalizing behaviors, social functioning, academic competence, and regulatory functioning. Also, it highlights the emotional availability, nurturance, and modeling of appropriate regulatory abilities as important predictors for developmental outcomes. The proposed model includes self-regulation as a factor predicting the development of emotion regulation, and as the literature suggests, parents play a role through their interaction and modeling of positive regulatory tactics in the development of this system. The next section looks at components of the larger governing body, the self-regulatory system, and how it relates to emotional functioning in toddlerhood

Self-Regulation in Toddlerhood

Emotion regulation can be defined by how the individual manages psychological arousal, emotions, and attention; learning how to manage these expressions/impulses are essential for healthy development. In toddlerhood, it seems that developing self-regulatory capacities is critical as the toddler is acquiring increasing independence,

control, and a more defined identity. The model presented in this study examines four factors that research has shown contributes to the development of successful regulatory skills; these factors are negative emotionality, sensory sensitivity, eating, and sleep.

negative emotionality.

Research supports negative emotionality as a moderator of self-regulatory functioning and parent-child interaction in elementary school children (Eisenberg, Guthrie, Fabes, Shepard, & Losoya, 2000). Negative emotionality can be defined as a temperament or personality variable which examines the occurrence of behaviors characterized by anger, frustration, and hostility (Eisenberg et al., 2001). Furthermore, the presence of negative emotionality in children is linked to the occurrence of externalizing behaviors (Valiente et al., 2003). Previous research has shown that toddlers who exhibit both poor regulation of negative affect are more likely to show aggressive behaviors as they age (Rubin et al., 2003). Additionally, externalizing problems in two year-old children was correlated .21 with emotion dysregulation in a study by Rubin et al. (1998). Furthermore, measures of attention and negative emotionality collected in toddlerhood accounted for 43% of the variance in a model predicting male IQ, 26% of the variance when predicting overall behavior problems, and 25% when predicting hyperactivity at age three and a half years (Lawson & Ruff, 2004). The research supports the notion that negative emotionality is a central component of self-regulation.

sensory sensitivity.

Sensory sensitivity/reactivity is identified in the research as sensitivity to touch, strong reactions to tactile stimuli, as well as exhibiting an abnormal response to loud,

sudden noises and/or bright lights (Carter & Briggs-Gowan, 2005). Deficits in these areas are often an indicator of a poor self-regulatory system. Research presented by DeGangi & Breinbauer (1997) followed typically developing infants and infants with regulatory disorders until two years of age. They found that children with regulatory disorders often displayed problems with sensory processing. In a study where typically developing infants were compared to infants with self-regulatory deficiencies at 36 months, those children with problems in sensitivity had delays in motor, language, and cognitive skills (DeGangi et al., 2000). Also, sensory sensitivity/reactivity has been connected to emotional difficulties in school age children (DeGangi et al.). In this model, a high score in sensory sensitivity is a marker for possible problems with the child's regulatory system.

eating.

Infant eating problems have been shown to predict eating problems in adolescence (Rydell, Dahl, & Sundelin, 1995). Characteristics in infancy and early childhood such as picky eater, refusal to try new foods, and other feeding problems can lead to adolescents who diet and refuse to eat. Most of the research in this area has mainly focused on adolescents, highlighting obesity, eating disorders, and comorbidity of eating disorders with Attention Deficit/Hyperactivity Disorder (ADHD). Furthermore, some studies even highlight the potential link between emotion regulation and eating disorders as well as general eating problems. For example, a study by Hagekull and Bohlin (2004) shows support for the link between emotion regulation and problems such

as picky eating, stomachaches, and other psychosomatic symptoms. There is clearly a need to further explore the relationship between the self-regulatory system and eating.

sleep.

Issues concerning lack of sleep and/or poor sleep patterns are listed as part of the criteria to define regulatory problems in children (Zero to Three, 1994). When a child, or even an adult, has an abnormally difficult time with sleep, there is a risk of poor outcomes. For example, similar to the relationship between developmental outcomes and sensory sensitivity, disturbances in sleep may also be linked to behavior problems and attention (Mattison, Handford, & Vela-Bueno, 1987). Sadeh, Gruber, and Raviv (2002) explored the possible differences in the functioning of specific cognitive and social-emotional skills when sleep patterns were examined. They found that in a sample of non-referred school-aged children, poor sleepers had significantly higher instances of behavior problems and scored lower on some cognitively demanding tasks. Additionally, Gregory and O'Conner (2002) found that the occurrence of sleep problems in early childhood was predictive of poor social and emotional functioning in later childhood and through adolescence. These articles show a clear link between the sleep problems in early childhood and the exhibition of externalizing behavior problem. The sleep subscale of the Infant Toddler Social and Emotional Assessment (ITSEA) is included in the analysis as a component of self-regulation and research shows that it is a significant factor in the development of emotion regulation.

Negative emotionality, sensory sensitivity, eating, and sleep are included in this model as manifest variables of the self-regulation construct in the proposed model. Each

of these components uniquely contribute to the overall developmental trajectory of the child and have been linked to regulatory functioning throughout the life span.

Abnormalities in the self-regulation system as described in the above sections are linked to behavior problems as well as poor cognitive abilities. A deficit in self-regulatory functioning may lead to problems in other regulatory systems such as emotion regulation, and, as previous research has shown, anomalies in this system are often exhibited as behavior problems in toddlers.

Externalizing Behaviors in Toddlerhood

Overall, the proposed model examines components of the early environment as well as child characteristics that influence the development of regulation; however, in toddlers, a lack of, or deficit in, regulatory abilities represents itself through the display of externalizing behaviors (Calkins & Fox, 2002, Rubin et al., 1998). Self-regulatory ability is linked to externalizing behaviors in the proposed model as it has a strong relationship with aggression. Activity/Impulsivity and Aggression/Defiance are defined in the Infant and Toddler Social and Emotional Assessment (ITSEA) as components of externalizing behaviors and are explored below.

activity/impulsivity.

Problems in regulating emotions are often synonymous with externalizing behavior problems in young children (Campbell et al., 2000). Furthermore, externalizing behavior problems are associated with poor attention shifting skills in school-aged children (Eisenberg et al., 2000). These deficits have implications for school readiness and adjustment. One of the ways that impulsivity is manifested in the regulation and

externalizing behavior research is through effortful control. Effortful control is important to help an individual control impulse or a strong feeling (Kochanska, Murray, Harlan, 2000), and therefore has implications when studying impulsivity as impulsivity is a lack of control over emotions.

In a study examining effortful control in toddlers' greater effortful control, assessed via parent report, at 22 months was predictive of appropriate emotional regulatory abilities at 22 months and 33 months of age (Kochanska, Murray, & Harlan, 2000). Another study also highlights the relationship between effortful control and externalizing behaviors in a longitudinal study with participants in the primary school-aged years (kindergarten to sixth grade). They found that effortful control at both time one and time three were predictive of externalizing behaviors at time three which was 4 years after the first assessment. Specifically, those children with high levels of effortful control have low occurrences of externalizing behaviors at both assessments (Valiente et al., 2003). Other studies of effortful control also linked high effortful control with low levels of impulsivity and externalizing behaviors (Eisenberg, Spinrad, Fabes, et al., 2004; Eisenberg, et al., 2005; Spira & Fischel, 2005). However, impulsivity and activity are only two traits that are commonly associated with externalizing behaviors. In order to acquire a more complete picture, aggression and defiance must also be addressed.

aggression/defiance.

When toddlers are unable to appropriately manage or regulate their emotions they often react in an aggressive, inappropriate manner and this lack of emotional control is often considered an indicator of externalizing problems (Calkins, 2004). There seems to

be a negative relationship between regulatory abilities and externalizing behavior problems such as aggression (Calkins & Howse, 2004), and infants that display poor regulation are more likely to become toddlers who engage in negative behaviors (Eisenberg, Sprinrad, & Smith, 2004). Aggression, similar to the trajectory of regulation, is a stable construct from toddlerhood to adulthood (Smith, Calkins, Keane, Anastopoulou, & Shelton, 2004; Vecchio & O’Leary, 2006). Research from Calkins and Dedmon (2000), found that high-risk two year olds characterized by stable externalizing behavior problems, displayed dissimilar vagal suppression when compared to the low risk children. More specifically, high-risk two year olds displayed a markedly small decrease from baseline RSA to challenge whereas the low risk displayed a much larger decrease from baseline to challenge. Additionally, the high-risk children had more episodes of aggression, were less engaged in the task, and exhibited fewer regulatory capabilities than their counterparts (Rubin et al., 1998).

Summary

The research identifies that physiological data, child characteristics, parent-child interaction style, and self-regulatory functioning are all essential components when examining the development of externalizing behaviors in toddlers. Children who have deficits in any of these areas have been tied to poor developmental outcomes such as poor social skills (Calkins & Fox, 2002), lower attention levels (Bornstein & Suess, 2000), and higher levels of aggression (Rubin et al., 2003). It is imperative that research supports a more complete understanding of the pathways leading to poor emotion regulatory abilities in toddlers, which is often exhibited through externalizing behavior problems at this age (Calkins & Fox), in order to support optimal child outcomes.

Hypotheses and Goals

The construct of emotion regulation has been identified through the research as an important component for a healthy child; however, the field lacks a clear picture of what influences the development of regulation in toddlerhood. The goal of this study is to identify the pathways, internal and external, that influence the development of poor emotional regulation of toddlers exhibited through externalizing behaviors. Specifically, what are the significant factors that influence the development of poor emotional regulation of toddlers exhibited through externalizing behaviors? The author proposes four hypotheses. First, that each of the independent variables will significantly correlate with externalizing behaviors, suggesting that these variables are contributors to the overall model. Secondly, that the four constructs with manifest variables---parent-child interaction style, child characteristics, self-regulation, and externalizing behaviors, each of the variables in the construct will be related. Thirdly, a regression analysis with the independent variables in the model will reach significance. Finally, that a structural equation model including all variables in the proposed model will be significant.

CHAPTER 3: METHODS

Sample

This study is a secondary analysis of a longitudinal study concerning infant and preschool predictors of school readiness. The participants were identified through a database consisting of individuals who expressed an interest in participating in research. An eligible pool of participants was obtained from this database of new parents. This study excluded any child who was premature, had a low birth weight, was hospitalized, or exhibited congenital anomalies or a genetic disorder. The first phase of the study began in infancy when all eligible participants were contacted by phone when their child was 12 to 14 weeks. If the parent was interested in participating, a visit to the laboratory was scheduled to assess learning, processing speed, and physiological self-regulation. The total number of participants in that stage was 117. Then, the second stage was initiated when the child was approximately two and a half years of age. The parents were contacted again to see if they were interested in participating in a follow up study. Of the original 117 participants, all were eligible for follow up. 96 of the 117 agreed to participate, and while either parent was given the option to participate, moms were targeted for this phase of the study. Only one father participated in this phase of the study. The following section outlines the procedures in this longitudinal study regarding school readiness that are applicable to this study of externalizing behaviors in toddlers.

Procedure

A packet of questionnaires was sent to the home address and a phone interview with a member of the research team was scheduled for approximately two weeks after the parent received the packet. The packet of questionnaires included the measures outlined

in the sections below. Other measures were included in the packet but are not relevant to the current study. The phone interview consisted of a demographic interview and a temperament survey to measure four aspects of temperament. Please see Table 1 for a brief description of the questionnaire and the construct it is measuring.

MacArthur-Bates Communicative Development Inventory-Short Form

The MCDI-SF is a measure of a child's expressive language through parental report. It includes 100 words and the parent simply marks whether or not the child has ever produced the word. The MCDI-SF is able to distinguish between late talkers and typically developing children, thereby validating the measure as an accurate language assessment (Heilmann, Weismer, Evans, & Hollar, 2005). Research resulting from a study conducted by Fenson et al. (2000) demonstrates that the short form has a strong correlation with the entire MacArthur battery and additionally exhibits moderate levels of reliability and validity. In the current study, the MCDI-SF is used to represent the verbal ability of the child. Percentile rank is used in the analyses as it corrects for any age differences. Studies have shown a link between language skills at age two and executive functioning and phonological awareness at age four (Farrar, Ashwell, Maag, 2005; Waston, Painter, & Bornstein, 2001), and language in toddlerhood is often used as a predictor for later intelligence and academic functioning (Saxon, Colombo, Robinson, & Frick, 2000). Also, deficits in early language ability have been tied to poor social and emotional functioning (Irwin, Carter, Briggs-Gowan, 2002).

Table 1 *Visual Representation of Measures and Constructs*

MEASURE	CONSTRUCT
MacArthur-Bates Communicative Development Inventory-Short Form (MCDI-SF)	Child Characteristics latent variable-Verbal Ability
Infant/Toddler Social and Emotional Assessment (ITSEA)-Dysregulation Subscale	Self-Regulation latent variable-Negative Emotionality, Sensory Sensitivity, Eating, and Sleep
ITSEA-Externalizing Subscale	Externalizing Behaviors Variable (Outcome variable)-Aggression/Defiance, Peer Aggression, and Activity/Impulsivity
Self-Efficacy Parenting Task Index-Toddler Scale (SEPTI-TS)-subscales of Emotional Availability and Nurturance	Parent-Child Interaction Style latent variable-emotional availability and Nurturance
Centre for Epidemiological Studies-Depression Scale (CESD)	Parent-Child Interaction Style latent variable-Maternal Depression
Parenting Stress Index-Short Form-Parent-Child Dysfunctional Interaction subscale (PSI-SF/PCDI)	Parent-Child Interaction Style latent variable-dysfunctional interaction
Demographic Questionnaire	Maternal education, maternal age, paternal age, household income, ethnicity, and child age.
Early Childhood Behavior Questionnaire-average of impulsivity and sociability in Surgency-Extranversion factor (ECBQ)	Child Characteristics-Temperament
High Frequency Heart Rate Variability (HFHRV)	Heart Rate in Infancy

Infant/Toddler Social and Emotional Assessment

The ITSEA is a new assessment consisting of 170 questions with four subscales and was developed in order to identify social and emotional competency from one to three years. Behaviors measured in the ITSEA tap typically developing behaviors that may become a problem when displayed either inadequately or excessively, as well as behaviors that may indicate maladaptive tendencies. The age group which the ITSEA targets is important because even infants who react intensely to negative emotions and have low regulation capacities are at risk for later externalizing and internalizing problems (Carter, Briggs-Gowan, Jones, & Little, 2003). Overall, the assessment demonstrates strong criterion validity (.85) with the CBCL/1.5-5, and a strong test-retest reliability was demonstrated at two weeks for the 14 scales (ICC ranging from .91 to .61) (Carter et al.).

It is comprised of four broad social and emotional areas of behavior that include externalizing, internalizing, dysregulation, and competency; these four domains show acceptable fit with the assessment tool. Furthermore, 70% of the subscales show validation as separate constructs (Carter et al, 2003), and confirmatory factor analysis provided support for the existence of each subscale indicating good fit with the subscale's latent variable (Briggs-Gowan & Carter, 1998). Four subscales consisting of anxiety, impulsivity, aggression, and defiance define externalizing behaviors. Internalization problems are described as symptoms of depression, social withdrawal, anxiety, separation distress, and extreme inhibition/shyness making up five subscales. Issues with sleeping, eating, problems regulating negative emotional states with respect to reactivity and regulation, and unusual sensory activities are indicative of the dysregulation domain.

Lastly, high scores in the competence domain are a strong indicator for positive developmental outcomes. These competencies continue to grow with age, which is developmentally appropriate. There are six subscales in the competence domain including compliance, attention, mastery motivation, imitation/play, empathy, and prosocial peer relations (Carter & Briggs-Gowan, 2005).

Self-Efficacy Parenting Task Index-Toddler Scale

The SEPTI-TS originated from the work of Robert Emde (Emde, 1989) which identified components that are central characteristics of the parent-child relationship. The characteristics of this relationship are largely biological, but the interaction of parent and child characteristics is important. Emde acknowledged seven child factors: attachment, vigilance, physiological regulation, affect regulation and sharing, learning, play, and self-control. Parent characteristics include bonding, protection, provision of organized structure, responsiveness to needs, empathetic responsiveness, teaching, play, and discipline. The current SEPTI-TS is comprised of 53 questions and includes seven subscales consisting of emotional availability, nurturance, protection, discipline, play, teaching, and instrumental care. It was developed by Coleman and Karraker (2003) and uses a 6-point Likert scale with high scores indicating a higher sense of parenting self-efficacy. Six of the seven subscales displayed high levels reliability with Cronbach's alpha ranging from .53 to .92, and overall exhibiting high to moderate levels of internal consistency. For this study, the subscales Emotional Availability, with moderate internal consistency ($\alpha = 0.67$) and Nurturance ($\alpha = .71$) will be used to measure the parental efficacy of emotional availability and nurturance when interacting with the child.

Centre for Epidemiological Studies-Depression Scale

The CES-D was developed for use in the general population to assess depressive symptoms and the results of this measure are comparable across groups. The 20 item self-report questionnaire consists of four independent subscales that demonstrate moderate factor loadings: depressed affect, positive affect, somatic and retarded activity, and interpersonal difficulties (Radloff, 1977). In general, a total score over 16 is considered within the clinical range as higher scores on the scale are indicative of depressive symptomology. The scale demonstrates moderate reliability coefficients across populations ranging from .90 -.80 (Knight, Williams, McGee, & Olaman, 1997; Radloff) and high levels of discriminant validity with the Raskin Rating scale ($r = .54$) (Radloff). In the current study, internal reliability was good ($\alpha = 0.86$).

Parenting Stress Index-Short Form

The Parenting Stress Index-Short Form was developed as a reliable way to assess family stress. It is derived from the original PSI and is both reliable and valid. It contains three subscales: 1) Difficult Child, 2) Parental Distress, and 3) Parent-Child Dysfunctional Interaction (Abidin, 1995). The measure maintains strong test-retest reliability ($r = .75$) and criterion validity, but there is conflicting results concerning the validity of the three subscales (Reitman, Currier, & Stickle, 2002; Haskett, Ahern, Ward, & Allaire, 2006). Both Reitman et al. (2002) and Haskett et al. (2006) found that the three-factor model was not a significant fit with the data. Both studies suggest that a two or even single factor model is more parsimonious, theoretically stable, and a better model fit than the three-factor model proposed by Abidin (1995).

In the current study, the Parent-Child Dysfunctional Interaction subscale was used from the three-factor model of the Parenting Stress Index-Short Form (Abidin, 1995). Only this subscale was used in the current analyses as it is the only component of the PSI-SF to measure the interaction style of the parent and child. The total score from the Parent-Child Dysfunctional Interaction subscale indicates how well the parent is understanding and meeting the needs of his/her child, how the parent interacts, and if the child meets the parent's expectations. In the current study, internal reliability for the entire measure was excellent ($\alpha = 0.94$), and moderate for the Parent-Child Dysfunctional Interaction subscale ($\alpha = 0.76$).

Demographic Questionnaire

A demographic questionnaire designed by the research team was administered during the first part of the phone interview. Questions included child medical history, maternal education, job title (if any), and questions about the satisfaction with the current child care arrangement if applicable. Also, the child's secondary caregiver was identified as well as his/her education level, job title and responsibilities, and hours spent with the child. Income and government assistance was also noted.

Early Childhood Behavior Questionnaire

The Early Childhood Behavior Questionnaire (ECBQ) is a parental report questionnaire for children 1 to 3 years of age and is based on the definition of temperament described previously in this paper, which includes emotion, motor, and attention. The questionnaire uses a 7-point Likert scale ranging from never to always to describe the child's behavior over the last two weeks. It shows moderate reliability and validity and each of the 18 subscales measuring temperament were found to be internally

consistent. In a factor analysis of the ECBQ, three factors emerged among the 18 subscales, Negative Affectivity, Surgency-Extraversion, and Effortful Control (Putnam, Gartstein, & Rothbart, 2006). In the current study, subscales impulsivity and sociability from the Surgency-Extraversion Factor are used to define temperament. The two subscales are averaged together and a composite score was made. A study from Donovan, Leavitt, Taylor, and Broder (2007), employed a similar analysis plan with their use of the ECBQ in a study examining mother-toddler interaction. The two subscales demonstrated moderate internal consistency in this study ($\alpha = 0.74$)

High Frequency Heart Period Variability at 13 weeks

At approximately 13 weeks of age, heart rate was collected using 3 disposable pediatric electrodes, Vermed A10000, which were placed on the child's chest and abdomen. Each child's heart rate was measured while the mother was holding him/her for 5 minutes in order to establish a baseline measure. The infant's physiological data which included EKG and respiration was collected using the Biopac MP100 data acquisition system and Acknowledge software which are standard, reliable programs/software. Other studies have utilized similar procedures for collecting physiological data in infancy (Calkins, 1997; Huffman, et al., 1998).

Analysis Plan

A model is presented containing important factors of the child and environment including child characteristics with respect to temperament, sex, and verbal ability, self-regulatory skills, physiological data of the child during infancy, and parent-child interaction style including parenting stress, emotional availability and nurturance, and maternal depression (Figure 1). Frequency of externalizing behavior is used as the

outcome because toddlers who lack appropriate emotional regulatory capacities are more likely to display externalizing behavior problems. First, a correlational analysis was conducted to determine which of the variables contribute to the development of externalizing behaviors. Then, a regression analysis was run including all significant variables to determine a model that predicts externalizing behaviors in toddlers. Finally, a confirmatory factor analysis and then a SEM model with all significant variables were analyzed. Correlation and regression analyses were run using SPSS 13.0 while the SEM analysis was conducted using AMOS 5.0.

CHAPTER 4: RESULTS

The model tested in the study (Figure 1, page 13) examines the effects that the parent-child interaction style, child characteristics, self-regulation, and heart rate variability may have on the development of the emotion regulatory system in toddlers. The externalizing behaviors construct is used as the manifest variable for the emotion regulatory system and the dysregulation variable in analysis is a measure of poor self-regulation in the analysis of the model. The following hypotheses were tested: 1) each variable in the model would contribute to the development of externalizing behaviors, 2) within the four constructs with manifest variables---parent-child interaction style, child characteristics, self-regulation, and externalizing behaviors---each of the variables in the construct would be related, 3) each construct in the model---child characteristics, heart rate variability, parent-child interaction style, and self-regulation---would emerge as a significant predictor, and 4) the proposed model would best represent the data.

Participants

The participants in this study were recruited as part of a longitudinal study to examine memory and attention that began when the children were approximately 13 weeks. When the children were approximately two and a half years, they were recruited to participate in a follow up study examining school readiness. During the first phase of the study, 117 families participated, and at the second phase of the study, 96 families participated. The following statistics represent the 96 families who participated in the first and second phases of the study. Ninety-nine percent of the participants were mother-child dyads, with only one father-child dyad completing the survey data. However, paternal characteristics were collected as part of the demographic survey (*M* maternal age

= 33.16, $SD = 4.85$, M paternal age = 35.87, $SD = 5.78$). Fifty of the children were females, and 46 were males (M age = 2.46 years, $SD = 0.15$). Income ranged from \$9,200 to \$375,000 with a median of \$65,000, and 89% of the participants were married. Maternal education ranged from 10% with a high school degree, 29% with a Bachelor's degree to 20% with a graduate degree. In addition, 89.6% of the participants were Caucasian, 3.1% were African American, 4.2% were Hispanic, and 3.1% other. The following sections outline the analysis and results examining the significance of the model predicting externalizing behaviors in toddlers.

Descriptive Statistics of Variables in Model

The descriptive statistics for each variable in the model are listed in Table 2 (the constructs that the measures assess is in Table 1). While the total N is 96, some of the participants did not complete all portions of the study. For example, the N is 95 on some of the measures as one participant did not complete the phone interview, thereby losing the ECBQ, whereas another participant did not complete the packet, which included the ITSEA, PSI-SF, SEPTI-TS, and the MacArthur. Additionally, the HFHRV data for two infants did not have enough artifact free data, meaning that there was not enough heart rate information to calculate the HFHRV, therefore N dropped to 94. Finally, during the initial portion of the study, as well as during the study, some of the children aged out of the MacArthur and therefore did not meet the age requirement necessary to complete the measure, thus lowering the sample for that measure to 76.

Table 2 also includes clinical cutoffs for the measure if relevant as well as the number of participants in the clinical range. If the research team noticed marked issues with a child's ITSEA or MacArthur score, the parents were sent a letter informing them

Table 2

Descriptives of all Variables in Model

<i>MEASURE/VARIABLE</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Potential Range</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Clinical Cutoff/Range</i>	<i>Percent in Clinical Range</i>
CES-D/Depression	96	7.81	6.78	0-32	0	32	≥ 16	13.5%
ECBQ: Average of two subscales/Temperament	95	5.38	0.56	1-7	4.10	6.44	N/A	N/A
PSI-SF: PCDI subscale/Parent-Child Dysfunctional Interaction	95	16.10	4.91	12-60	12	34	No Clinical Range for Subscale	N/A
MacArthur: Percentile Rank/Verbal Ability	76	45.28	28.46	0-99	1	99	≤ 10 th percentile	11.8%
ITSEA: Dysregulation Tscore/Poor Self-Regulation	95	43.27	12.57	0-100	18	84	≥ 70 clinical 63-69 of concern	2% 6%
ITSEA: Externalizing Behaviors Tscore/ Externalizing Behaviors	95	49.28	9.40	0-100	32	78	≥ 70 clinical 63-69 of concern	2% 8%
SEPTI-TS: Average of two subscales/Emotional Availability and Nurturance	95	39.56	4.63	7.5-45	12	45	N/A	N/A
HFHRV (Log transformed)/Heart Rate	94	0.66	0.38		-0.35	1.72	N/A	N/A

their child fell below the expected range, and received a follow-up call to answer any questions they might have. Additionally, every parent was given a resource packet, which included organizations in the local area to promote healthy development as well as agencies providing support if necessary.

Correlational Analysis

In order to test the first and second hypotheses a bivariate correlation analysis was performed using all of the variables in the model. Results are presented in Tables 3 and 4. Listwise deletion was used to handle the missing variables, as this method is also used in the regression analyses. The scatterplots for the variables were examined for potential outliers and curvilinearity. None of the scatterplots indicated a problem with either outliers or curvilinearity.

In regards to hypothesis one that all of the variables in the model would be correlated with externalizing behaviors, the findings partially supported this hypothesis. In this analysis the dysregulation and externalizing T-scores from the ITSEA were used rather than individual variables. An analysis performed on the ITSEA showed that the domains of dysregulation and externalizing behaviors are indeed separate factors and are representative of the subscales (Carter et al., 2003).

Four variables emerged which significantly correlated to externalizing behaviors. Parent-child dysfunctional interaction had a positive relationship, maternal depression had a positive relationship, as did dysregulation with externalizing behaviors. On the contrary, emotional availability and nurturance had a negative relationship with externalizing behaviors. None of the other variables significantly correlated with the

Table 3

Results of a Correlation Analysis for Variables in the Model (N = 74)

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Heart rate	---	.10	-.06	.10	.20	-.08	.04	.08	-.04
2. Sex		---	.15	.14	-.12	-.04	-.11	-.11	-.18
3. Temperament			---	-.23*	-.15	.08	-.13	-.03	.16
4. Parent-Child Dysfunctional Interaction				---	.54**	-.66**	.24*	.38**	-.02
5. Maternal Depression					---	-.62**	.22	.30**	-.08=
6. Emotional Availability & Nurturance						---	-.20	-.44**	.11
7. Dysregulation							---	.56**	-.04
8. Externalizing Behaviors								---	-.16
9. MacArthur Raw Score									---

** Correlation significant at the .01 level.

* Correlation significant at the .05 level

Females coded: 0

Males coded: 1

Table 4

Results of a Correlation Analysis for all Variables in the Externalizing and Self-Regulation Constructs (N = 95)

	1.	2.	3.	4.	5.	6.	7.
1. Activity/ Impulsivity ^a	---	.55**	.30**	.38**	.45**	.37**	.26**
2. Aggression/ Defiance ^a		---	.43**	.40**	.70**	.41**	.12
3. Peer Relations ^a			---	.10	.24*	.25*	.10
4. Eating ^b				---	.42**	.38**	.32**
5. Negative Emotionality ^b					---	.27**	.20
6. Sensory Sensitivity ^b						---	.06
7. Sleep ^b							---

* Correlation significant at the .05 level

** Correlation significant at the .01 level.

^a Variables in the Externalizing Behavior construct

^b Variables in the Self-Regulation construct

outcome variable. However, the temperament subscale was negatively correlated with parent-child dysfunctional interaction. High frequency heart rate variability was not significantly correlated with externalizing behaviors, and neither were any of the child characteristics. Moreover, high frequency heart rate variability was not significantly correlated to any of the variables in the model.

Hypothesis two examined the variables in the constructs, determining whether the variables in each construct would be significantly related to each other. This hypothesis was also partially supported, see Table 3 and 4 for specific results. The subscales of dysregulation and externalizing behaviors were included in this analysis, and the correlation results for these variables are presented in Table 4. The correlation results from the variables in the parent-child interaction style and the child characteristics can be viewed in Table 3.

The variables in the parent-child interaction style construct are significantly related to one another implying that variables such as parenting stress, maternal depression, temperament, and emotional availability and nurturance are possibly representing one construct. This finding has implications for the environment of the child and the regulation style that the parent is exhibiting. All of the variables in the externalizing behavior construct were significantly related. However, results in the dysregulation domain showed that sleep was only correlated with eating, implying that sleep may not be an important variable in self-regulation. Even so, it was considered an important subscale and was not deleted as a variable in the construct.

The results from this analysis showed that high frequency heart rate variability and the child characteristics construct, which included sex, verbal ability, and temperament, were not significant contributors to the outcome variable. However, these variables are still included in the remaining analyses as the variables may react differently in subsequent analyses.

Regression Analysis

Each construct in the model---child characteristics, heart rate variability, parent-child interaction style, and self-regulation was speculated to have an effect of the development of externalizing behaviors according to hypothesis three. The regression analysis was ran to determine what variables and/or constructs would emerge as a significant predictor of externalizing behaviors. A sequential regression analysis was used based on research concerning the development of externalizing behaviors as well as the logistic development of variables in the model being tested. A regression model was executed by entering heart rate variability in the first step, sex, verbal ability, and temperament in the second step, emotional availability and nurturance, maternal depression, parenting child dysfunctional interaction in the third step, and finally regulation as the final step in a model predicting externalizing behaviors. Results from the regression analysis are listed in Table 5. The N is 74 as listwise deletion was used. The residuals and normality of the regression model were acceptable, and there were no significant outliers.

The data did not present any problems with normality, homoscedasticity, non-linear relationship between variables, multicollinearity, or influential outliers. An

Table 5

Summary of Sequential Regression Analysis for Variables Predicting Externalizing Behaviors in Toddlers (N = 74)

	Model 1			Model 2		Model 3			Model 4			
Variable	B	SEB	β	B	SEB	B	B	SEB	B	B	SEB	β
Heart Rate	1.64	2.67	0.07	2.02	2.70	0.09	1.38	2.40	0.06	0.97	2.06	0.04
Gender ^a				-3.00	2.25	-0.16	-3.00	2.00	-0.16	-2.02	1.72	-0.11
Temperament				0.55	2.01	0.03	2.00	1.85	0.12	2.45	1.60	0.15
Verbal Ability				-0.06	0.04	-0.19	-0.06	0.04	-0.17	-0.05	0.03	-0.16
Maternal Depression							0.24	0.20	0.17	0.08	0.18	0.06
Parent-Child Dysfunctional Interaction							0.41	0.28	0.17	0.38	0.24	0.21
Emotional Availability and Nurturance							-0.45	0.37	-0.18	-0.42	0.32	-0.17
Dysregulation T-score										0.39	0.08	0.47*
R^2			0.01			0.05			0.29*			0.49**
ΔR^2						0.05			0.24**			0.20**

** $p \leq .00$

* $p \leq .001$

^a Sex Coded: 0, Female; 1, Male

examination of the distribution of the residuals did not indicate a problem with normality. Additionally, an examination of a scatterplot of the predicted values and the residuals did not indicate a problem with homoscedasticity. Furthermore, an examination of bivariate scatterplots did not suggest anything but linear relationships between the variables. The largest tolerance value was .90 suggesting no problem with multicollinearity, and the largest value of Cook's D was .23 ($M = .02$), suggesting that there were no influential outliers.

Child characteristics and heart rate variability did not contribute to the overall regression model. However, the parent-child interaction style and dysregulation steps significantly contributed to the variance of the model in the step that they were entered. In the final model (Step 5), the *Beta* strength of two variables in the parent-child interaction style construct, parent-child dysfunctional interaction ($\beta = .21$) and emotional availability and nurturance ($\beta = -.17$), is considered to be of moderate strength. Additionally the dysregulation construct ($\beta = .47$) was considered to be of large strength (Keith, 2006). Therefore, these variables are important components in the development of externalizing behaviors, which leads to a poor emotion regulatory system in toddlers. Hypothesis three is therefore partially supported with two of the constructs in the model contributing to the development of emotion regulation.

Confirmatory Factor Analysis

Stemming from the regression model, further analysis was performed on three constructs, which include parent-child interaction style, dysregulation, and the externalizing behaviors. The results from three confirmatory factor analyses are listed below. Also, due to the missing data on some of the measures and a small sample size,

maximum likelihood estimation was used with all CFA analysis. According to Byrne (2001) this is the most efficient and appropriate method to manage missing data with AMOS. The only drawback to this method is that modification indices are not provided by AMOS when estimating variables. First, a confirmatory factor analysis (CFA) was ran for the dysregulation construct, which includes the variables eating, sleeping, sensory sensitivity, and negative emotionality, and the results are presented in Figure 2. Then, a CFA was ran for the externalizing behavior construct, which includes peer relations, activity/impulsivity, and aggression/defiance, and those results are listed in Figure 3.

A CFA was conducted for the parent-child interaction style construct, which includes maternal depression, parent-child dysfunctional interaction and emotional availability and nurturance, and those results are listed in Figure 4. Due to the large number of variable indicators in this model and the small sample size, item parceling was employed to create a more succinct model (Little, Cunningham, Shahar, & Widaman, 2002). For the three constructs, parent-child interaction style, maternal depression, and emotional availability and nurturance, the indicators were randomly assigned to three groups. This constructed three groups, or item parcels, of indicator variables (A, B, and C) for each of the constructs.

The dysregulation and externalizing CFA model showed adequate fit. However, the peer aggression variable in the externalizing behavior construct was positively skewed with little range, and this must be considered when evaluating the overall model fit as this variable may not be contributing to the model. However, when the peer

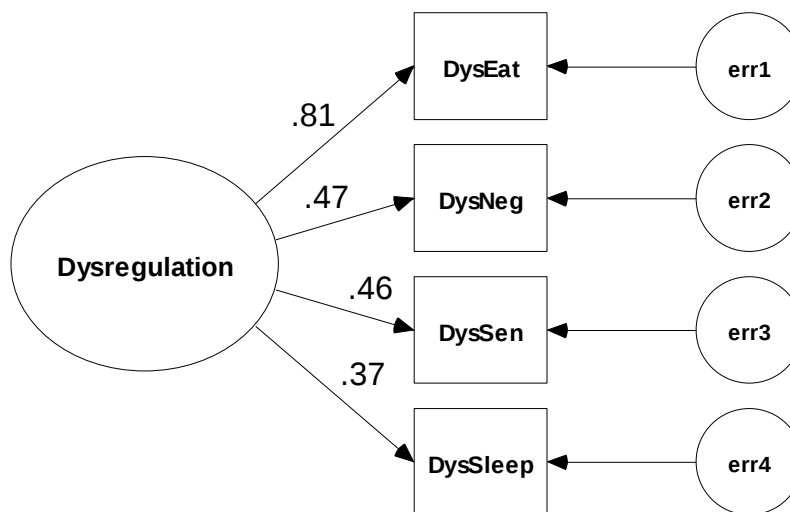


Figure 2

Confirmatory Factor Model of the Dysregulation Construct with Standardized Coefficients (N = 96)
($\chi^2(2) = 2.47, p = .29, CFI = .99, RMSEA = .05$)

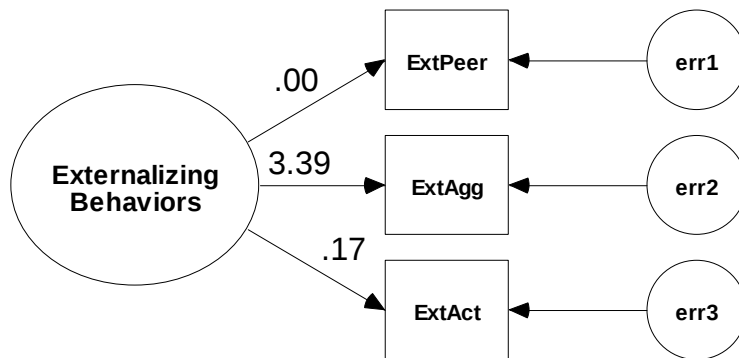


Figure 3

Confirmatory Factor Model of the Externalizing Behaviors Construct with Standardized Coefficients (N = 96)
 $(\chi^2(1) = .33, p = .55, CFI = 1, RMSEA = .00)$

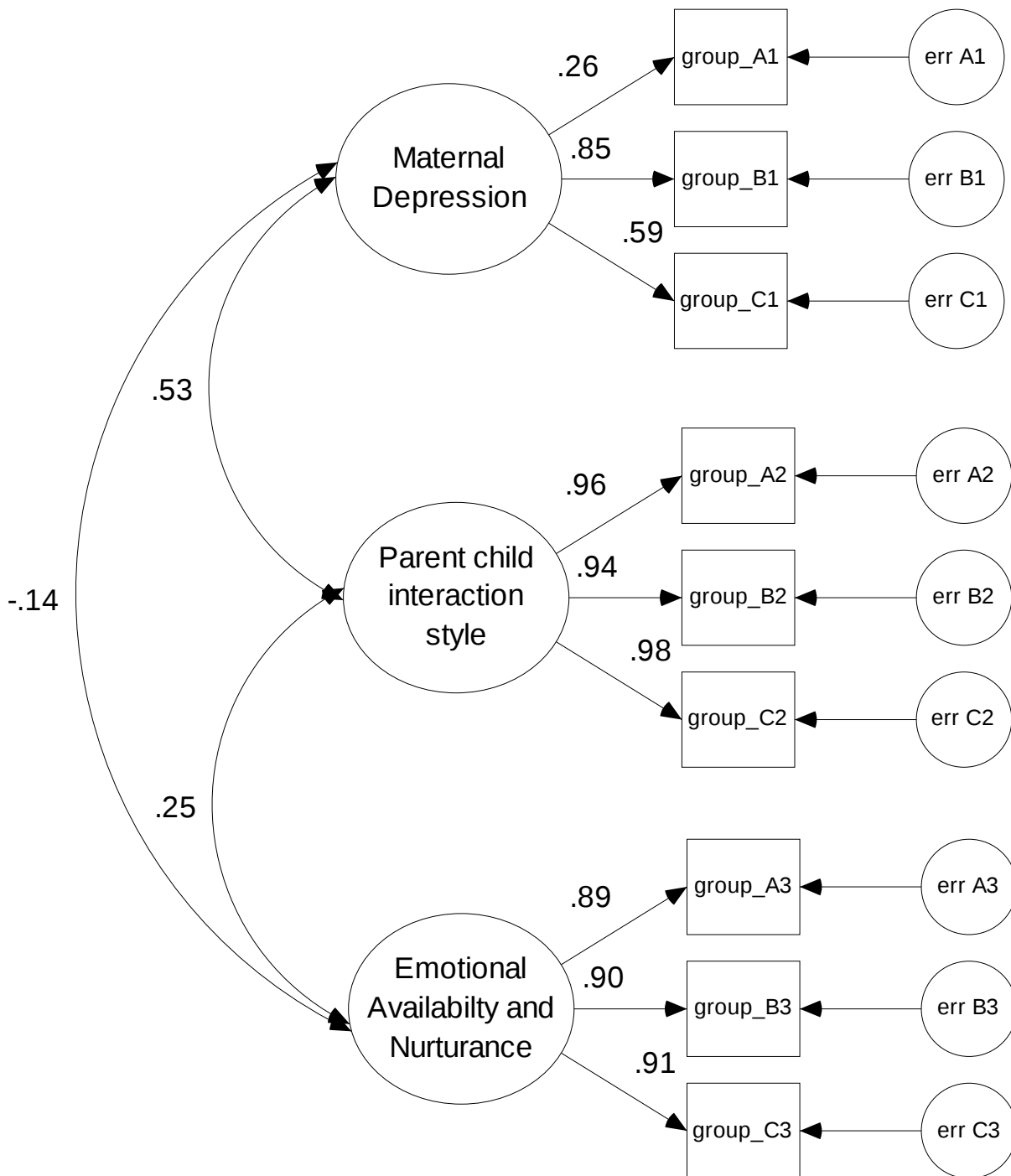


Figure 4

Confirmatory Factor Model for the Parent-Child Interaction Style Construct with Standardized Coefficients (N = 96)
 $(\chi^2(24) = 50.09, p = .00, CFI = .96, RMSEA = .11)$

aggression variable was removed from the CFA, there was not a significant change in fit. The parent-child interaction style model showed moderate to poor fit. Since there was only one missing variable in this construct, the CFA was ran without estimation and allowed for modification indices. However when the modification indices were examined, none of the suggestions were theoretically sound.

Path Analysis

A path analysis was ran with dysregulation and externalizing behavior construct with AMOS 5.0. The parent-child interaction style construct was not included in the final model analysis due to the inadequate model fit found in the CFA. The final model is listed in Figure 5. Hypothesis 4 that the proposed model would result in a good fit received mixed levels of fit indices ($\chi^2(13) = 26.02, p = .02, \text{CMIN/DF} = 2.00, \text{CFI} = .92, \text{RMSEA} = .10$). For instance, both chi-square and the root mean square error of approximation calculated poor model fit, but the comparative fit index and the chi square ration indicated reasonable fit (Hu, & Bentler, 1999). However, Marsh, Hau, and Wen (2004), state that when there are discrepancies between the fit indexes, look to the chi-square to determine overall fit. Thus, according to this, the current model is rejected.

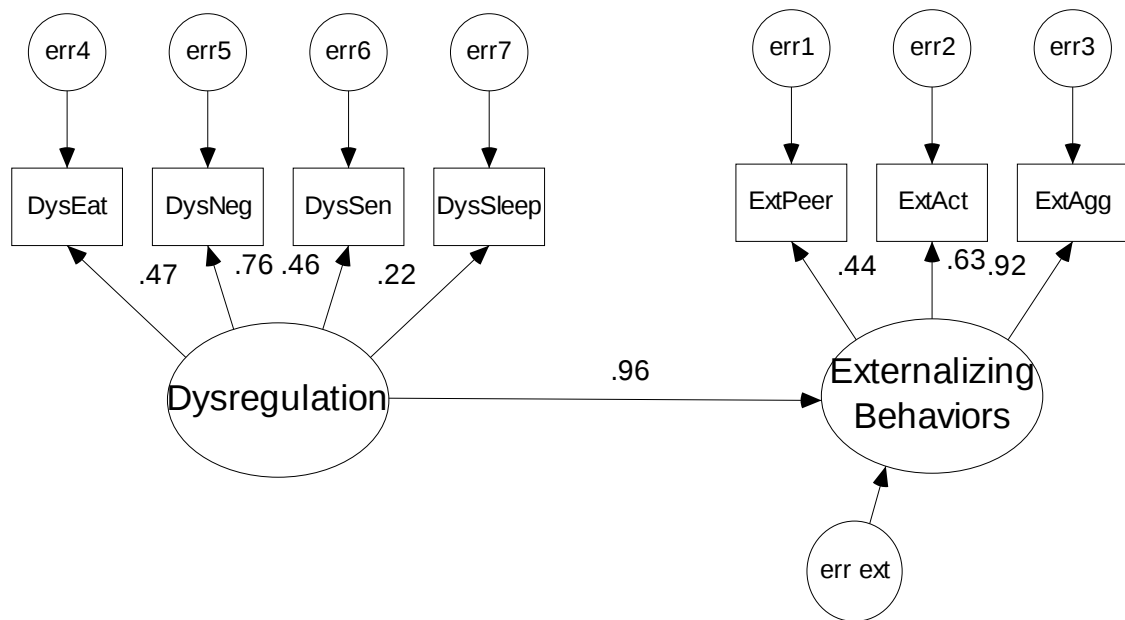


Figure 5

SEM analysis of a model predicting externalizing behaviors with Standardized Coefficients (N = 95)

$(\chi^2(13) = 26.02, p = .02, \text{CMIN/DF} = 2.00, \text{CFI} = .92, \text{RMSEA} = .10)$

CHAPTER 5: DISCUSSION

The primary purpose of this study was to identify the constructs and pathways that influence the development of poor emotional regulation of toddlers exhibited through externalizing behaviors. The constructs consisted of HFHRV in infancy, as well as child characteristics, parent-child interaction style, and regulation in toddlers to predict externalizing behaviors in toddlers. The results indicated that the most important predictor of externalizing behaviors in toddlers is the self-regulatory system. This result corroborates findings from Calkins and Howse (2004) and Eisenberg, Sprinrad, and Smith (2004). These studies also showed that the self-regulatory system is a significant predictor of externalizing behaviors in toddlers. However, variables in the parent-child interaction style construct, which included maternal depression, emotional availability and nurturance, and parent-child dysfunctional interaction was also a significant pathway in the development of externalizing behaviors, although not as strong as the self-regulatory system. The findings from the four hypotheses that this study explored are presented in detail in the following sections.

Hypothesis 1

The results from this study partially supported hypothesis one that each variable in the model would contribute to the development of externalizing behaviors. The variables in the model included HFHRV, sex, temperament, verbal ability, maternal depression, emotional availability and nurturance, parent-child dysfunctional interaction, and self-regulation. All variables except HFHRV, sex, verbal ability, and temperament were significantly correlated with externalizing behaviors.

In many studies utilizing heart rate and externalizing behaviors, oftentimes the measurement of heart rate is different than the method presented in this study. In the current study, a measure of baseline heart rate was used. However, many studies have used heart rate suppression in response to a stressor as the heart rate variable (Blair, 2002; Calkins, 1997; Calkins, & Fox, 2002). This method of measuring heart rate is often able to predict the development of externalizing behaviors. For example, in a study by Calkins and Keane (2004), they found that higher RSA suppression at two was related to fewer behavior problems at four and a half. Children with high RSA group at both ages were rated by mothers as more social, displayed fewer negative behaviors, and were less likely to exhibit externalizing behaviors when compared to the low RSA group. Therefore, perhaps the measurement of heart rate in this study contributed to the insignificance of HFHRV.

Past research has noted inconsistent effects of sex and externalizing behaviors. Research has shown that it is not clear whether sex truly has an impact on development of these behaviors. For example, behavior problems at ages three to four was positively correlated with low self-regulation, difficult temperament, and poor parental coping skills with no gender differences (Kyrios & Prior, 1990). However, a study by Campbell, Shaw, & Gilliom (2000), found that boys may exhibit risk factors such as high levels of hyperactivity and aggression as well as high levels of parenting and family stress. So, as this study shows, there is still exploration needed to understand the effect that sex may have on the development of externalizing behaviors.

Verbal ability, as measured by the MacArthur-Bates Communicative Development Inventory-Short Form (MCDI-SF), did not contribute to externalizing

behaviors in this study. These findings are similar to a study from Irwin et al. (2002) in which the MCDI-SF and externalizing behaviors from the ITSEA were not shown to have a significant relationship. This may be because the MCDI-SF tests only word utterances, and the words included in this measure are not expressive, emotional, or social in nature. They include simple recognition words such as couch, chair, porch, and cup. Therefore, this measure of verbal ability may not have adequately captured the child's ability to communicate effectively with others.

Effective communication is also dependent on the child being able to define and recognize his/her emotions, and this may not be the purpose of the MCDI-SF. Denham et al. (2002) demonstrated that when children are able to identify and label emotions, they are then able to effectively deal with those emotions. The addition of other measures including a parent-child observation of a social interaction may better define this variable with respect to externalizing behaviors. For example, a study examining toddler's use possessive pronouns showed that toddlers who utilized these pronouns were more likely to have positive peer relations (Hay, 2006). Therefore it may be the way in which toddlers articulate and express words that has a influence on the development of externalizing behaviors. Also, emotional recognition and effective social communication skills grow with age, and it may be that these behaviors are not developmentally appropriate in toddlers.

Lastly, the definition of temperament in this study is not a complete definition of temperament as it only includes sociability and impulsivity. Therefore, this study may not have adequately defined the aspects of temperament that are predictive of externalizing behaviors. In other studies examining the relationship between temperament and

externalizing behaviors, there has been a focus on the term difficult temperament. Mazaida et al. (1990) used low adaptability, high intensity and distractability, negative mood, and approach style to define difficult temperament. Their definition supported a strong link between temperament and externalizing behaviors in adolescents. Furthermore, other studies have included hard to soothe as the main component of temperament. For example, in a study by Calkins et al. (2002), infants who are easily frustrated have difficulty in regulating their emotions and attention. It may be that certain aspects of temperament not measured here are related to the development of externalizing behaviors, and studies with a more satisfactory, complete definition may yield interesting results.

There were significant findings with regards to hypothesis one; all variables in the parent-child interaction style and the self-regulation construct did significantly contribute to the development of externalizing behaviors in toddlers. These findings are in accord with numerous other research studies. For example, results from Campbell et al. (2000) support the idea that children from highly stressed families who are poor regulatory models are more likely to manifest impulsivity, hyperactivity, aggression, and noncompliance. Also, Shonkoff and Phillips (2000), state that throughout early childhood, emotional regulation can be affected by attachment style and parent-child interaction. Self-regulation is also commonly tied to externalizing behaviors. For example, infants that display poor regulation are more likely to become toddlers who engage in negative behaviors (Eisenberg, Sprinrad, & Smith, 2004). The findings presented in this study, with regards to hypothesis one, are similar to results from other research.

Hypothesis 2

Hypothesis two states that within the four constructs with manifest variables---parent-child interaction style, child characteristics, self-regulation, and externalizing behaviors---each of the variables in the construct would be related. A correlational analysis was run to determine the significance of this hypothesis. Results indicated that parent-child interaction style, self-regulation, and externalizing behaviors all included variables that were highly correlated with one another. However, child characteristics did not emerge as a significant construct.

One of the basic premises of Bronfenbrenner's bioecological theory (Bronfenbrenner & Ceci, 1994; Bronfenbrenner, 2005) is that environments help to guide the expression of genes in individuals. Keeping this in mind, it follows that examining child characteristics without respect to context and environment may not accurately represent verbal ability, temperament, and sex. For example, with verbal ability, it may not be how well the child scored on the MCDI-SF, but what activities and scaffolding techniques that the mother-child dyad engages in (Dieterich, Assel, Swank, Smith, Landry, 2006). Additionally, temperament is largely shaped and determined by the interaction between the parent and the child. Zeidner et al. (2003) theorize that gene-environment interaction is also important to understand how the parent reacts to the child's temperament in that child characteristics can directly influence parenting practices. Therefore, the present study's child characteristics construct may be more accurately viewed with respect to the environment. Perhaps including variables such as socioeconomic status, maternal education, as well as other environmental variables may

lead to a more complete construct of child characteristics as indicated by other studies (Hoff & Tian, 2005; Molfese, DiLalla, & Lovelace, 1996).

The parent-child interaction style construct consisted of maternal depression, emotional availability and nurturance, and parent-child dysfunctional interaction. The variables in this constructed were highly correlated with each other. This follows the results from a study by Rubin et al. (2003), in which harsh parenting and high conflict in parent-child interaction was significantly related to aggressive behaviors. However, maternal depression can also play a role in parent-child interaction as the results from West and Newman (2003), exhibited in their study of mild depressive symptoms and externalizing behaviors of preschoolers.

The results also indicated that the externalizing behaviors and self-regulation construct emerged as significant constructs. This is not surprising given the extensive nature of the studies examining the reliability and validity of the ITSEA (Carter, Briggs-Gowan, Jones, & Little, 2003) where the authors found them to be valid constructs. It is also not surprising in regards to hypothesis one, that there were significant correlations between the variables in the two constructs as the problems in the self-regulatory system can lead to deficits in the emotion regulatory system.

Hypothesis 3

Hypothesis three explored each construct in the model---child characteristics, heart rate variability, parent-child interaction style, and self-regulation--- and hypothesized that each would emerge as a significant predictor. A sequential regression analysis was performed with four steps predicting externalizing behaviors in toddlers. The steps were entered in the order of the influence the variable had on externalizing

behaviors in past research. Also, heart rate variability was entered first as it was the only variable measured in infancy. Child characteristics were entered second as there have been differing results about the significance of some of the variables in construct, specifically, sex and verbal ability. Then, parent-child interaction style was entered as it molds and mediates the child characteristics. Finally, self-regulation was entered as it is during toddlerhood where many of the variables in this construct are beginning to develop and emerge. It is also one of the strongest predictors of externalizing behaviors.

Results from the regression analysis yielded similar results as the correlational analyses. Only parent-child interaction and self-regulation constructed emerged as significant predictors. One of the most important findings in this analysis was that even after accounting for environmental influences like maternal depression, self-regulation was still a highly significant predictor of externalizing behaviors. The other variables such as heart rate and the child characteristics, most likely were not significant due to reasons previously addressed.

From these analyses is it clear that the parent-child environment and interaction style as well as the child's self-regulatory system are the most important predictors in this study. In fact, the two variables accounted for 49% of the variance in the development of externalizing behaviors in toddlers. Furthermore, the only significant change occurred when the parent-child interaction style variables were entered. Thus, from these results, teachers, parents, therapists, and educators may want to focus on the self-regulatory skills of the child including sleeping and eating behaviors, negative expression, and sensory acceptance as well as the interaction characteristics between the mother and child.

Identifying these maladaptive behaviors early in development may help to defer some of the effects and decrease the expression of externalizing behaviors.

Hypothesis 4

A SEM analysis of the proposed model would result in a model of good fit was the hypothesized outcome of the fourth hypothesis. In order to test for model fit, however, confirmatory factor analyses (CFA) were first completed on the parent-child interaction style, self-regulation, and externalizing behaviors constructs. Maximum likelihood estimation was used as there were missing responses in several variables. CFA revealed that two models, self-regulation and externalizing behaviors, were of good fit. The parent-child interaction style model, while the CFI indicated good fit, was determined to not adequately represent the data as a good model. Many of the variables in this model had little range and/or a skewed distribution. This is most likely due to the manner in which the variables were measured as parents are often hesitant to admit that their parenting styles need improving or that there is conflict in the interactions with their child. In fact maternal reports are subject to the many threats to validity that self-reports are exposed to (Schwarz, 1999).

A more complete model of parent-child interaction would include both observational data of parents interacting with their child as well as parent report. In fact observation may be a more reliable and accurate measure for assessing parenting practices and beliefs. For example, a study by Zaslow et al. (2006), examined preschool parenting measures by both parental report as well as observation. They found that the observational parenting data were the most predictive of later socio-emotional and cognitive outcomes in middle childhood. The use of observation or both observation and

maternal report as a better predictor for parent-child interaction is corroborated with other studies as well (Karp, Serbin, Stack, & Schwartzman, 2004; Matheny, Wilson, & Thoben, 1987).

Finally, a path model was presented for analysis that included dysregulation , which is a poor self-regulatory system, predicting externalizing behaviors. This model, while the standardized coefficients indicated a strong relationship, did not support a model of good fit. Mostly likely the poor model fit is due to the normal, but limited range of scores as well as the sample size. It is also possible that given the high correlation between dysregulation and externalizing behaviors, the parent may not be able to separate these constructs in context. Therefore, these behaviors assessed in this study may be perceived as co-occurring. For example, if a child mainly hits or acts out before bed, or if a child displays extreme negative affect when asked to put on a shirt he/she does not like, the parent may associate these behaviors as occurring simultaneously and may be able to distinguish between the two. A potential solution to this may include changing the parameters in the model to indicate that these behaviors may be bi-directional. Also, with a more representative sample, increased participants, and a mixture of observation and self-report data, a stronger model may be possible.

However, even though the model evaluated did not generate a good model fit, some of the results are important in understanding externalizing behaviors. Perhaps the most important finding is the extremely high variance between dysregulation and externalizing behaviors. There are two conclusions that can be inferred from these findings. First, that perhaps externalizing behaviors, which has been shown to be a measure of the emotion regulatory system in toddlers (Calkins & Fox, 2002), is a part of

the self-regulatory system. Secondly, it could also be that a deficit in areas of self-regulation, such as sensory sensitivity and picky eating behaviors, could induce deficits in the other regulatory systems like the emotion regulatory system. This idea of a connection between the regulatory systems is supported by other studies (Calkins & Dedmon, 2000; Rubin et al., 2003). More research should be conducted on the characteristics of the regulatory systems and how they may impact one another.

Through the findings in this study, it is clear that a positive parent-child environment and interaction style coupled with adaptive self-regulatory abilities such as good eating and sleep habits, low negative emotionality and sensory sensitivity may lead to a decrease in the exhibition of externalizing behaviors. Furthermore, an examination of the development of emotion regulation and thus externalizing behaviors in toddlers, requires study beyond the child characteristics and the physiological data, to the environment and dominant self-regulatory system. It is important that parents model and exude appropriate responses when dealing with emotions as well as engage in positive interactions with the child. These activities may support healthy emotional development in young children.

Limitations

There are several limitations that should be addressed when interpreting the results from this study. First, the sample size in the present study was 96 with the target child born in the local area. Therefore, the results in this study are not representative of the population and may not be generalizable. Secondly, some of the variables in the parent-child interaction style construct exhibited little range and a skewed distribution. As previously stated, this is common with measures tapping parenting beliefs, however,

the marginally restricted range may decrease the validity of the results. Lastly, since parent report was used for all variables, views of the child from multiple sources or environments are not available.

One of the most important reasons as to why these results may not be generalizable is that approximately 20% of the children in this study have been diagnosed with allergies and are on medications for this medical problem. In other studies examining asthma and behavior disorders including ADHD, asthma has been a significant influence on the development of behavior problems, ADHD, and conduct disorder in children (Blackman & Gurka, 2007; Pretorius, 2004). This high percentage of children with allergies may be a confound which was not examined in the current study.

The use of parent report as the sole indicator as data for the child may be inadequate, as some studies have shown that there may be bias in the report. In a study conducted to assess if maternal depression had an effect on the report of child behavior, results indicated that depressed mothers were more likely to over report child behavior problems (Fergusson, Lynskey, & Horwood, 1993). Moreover, in a study by Matheny et al. (1987), maternal characteristics, such as emotional stability, were found to influence maternal report of a child's temperament. Also, Sameroff, Seifer, and Elias (1982), examined individual differences in mothers and subsequent differences in early temperament ratings. They found that individual differences in anxiety, mental illness, and social status were able to predict the child's temperament, but the reverse was not true. In other words, maternal characteristics may trickle into the temperamental perceptions of the child. Finally a study from Karp et al. (2004) reveals that it is

imperative to utilize both maternal report and observation measures to truly capture childrens' behavior.

Contributions to the Body of Literature

However, even with these limitations in mind, the current study did make a significant contribution to the breadth of knowledge about the development of externalizing behaviors. First, it examined a sample of children from infancy to toddlerhood, which is a range that is often not studied. Also, the current study utilized a biological and contextual model of the development of externalizing behaviors using longitudinal data. The breadth of variables in this study is important in order to fully understand the development of externalizing behaviors in toddlers. Previous studies have only examined certain variables included in the model. For example one study included the variables infant emotional regulation, parenting stress, and maternal to sensitivity to test infant cognitive outcomes (Feldman et al., 2004), whereas a study by Supplee et al. (2004) employed child negative emotionality, maternal depressive symptoms, maternal education, maternal IQ, and maternal instruction at 18, 24, and 42 months and the direct and indirect effects of these variables on school outcomes are ages six and seven. So, this is one of the first studies to study the effects of numerous variables within the same study.

This study aimed at increasing the knowledge surrounding the development of externalizing behaviors as children with these behavior problems have an impact of the current and future functioning of the child (Hill et al., 2006). With a better understanding about what may influence the development of these maladaptive behaviors, teachers, researchers, and parents will be better equipped to prepare our children for positive social

functioning and the academic world. This study has shown that there are two main predictors that may influence the development of externalizing behaviors---parent-child interaction style and self-regulation. However, proper and adequate functioning of the self-regulatory system may be the most important predictor of externalizing behaviors in toddlers.

One of the greatest contributions to the literature that this study brings may actually be in the population studied. There is a large number of research articles that are aimed at studying externalizing behaviors in preschoolers, early childhood, and middle childhood (Belsky et al., 1998; Calkins & Keane, 2004; Hipwell et al., 2004), but very few actually focus on children in toddlerhood (Calkins & Keane, 2004; Supplee et al. 2004). Since the regulatory system is most pliable early in life (Calkins & Fox, 2002; Shonkoff & Phillips, 2000), and externalizing behaviors tend to increase and remain stable over time (Rubin et al., 2003), understanding the population at this age may help to curve these maladaptive behaviors at an early age.

Future studies should examine the model presented in this study utilizing larger and more diverse samples. Furthermore, physiological data such as heart rate variability and suppression, although not significant in the current study, should continue to be used as numerous other research studies have shown a clear link between the two variables. In conclusion, it is important, as the results in this study have shown, to look at the bigger, contextual picture of the child's development as many environmental factors have an impact on child outcomes.

REFERENCES

References

- Abidin, R. R. (1995). *Parenting Stress Index (3rd ed.)* Odessa, FL: Psychological Assessment Resources.
- Belsky, J., Kuang-Hua, H., & Crnic, K. (1998). Mothering, fathering, and infant negativity as antecedents at age 3 years: Differential susceptibility to rearing experience? *Development and Psychopathology, 10*, 301-319.
- Blackman, J. A., & Gurka, M. J. (2007). Developmental and behavioral comorbidities of asthma in children. *Journal of Developmental & Behavioral Pediatrics, 28*, 92-99.
- Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111-127.
- Bornstein, M. H., & Suess, P. E. (2000). Physiological self-regulation and information processing in infancy: Cardiac vagal tone and habituation. *Child Development, 71*, 273-287.
- Briggs-Gowan, & Carter, A. S. (1998). Preliminary acceptability and psychometrics of the Infant-Toddlers Social and Emotional Assessment (ITSEA): A new adult report questionnaire. *Infant Mental Health Journal, 19*, 422-445.
- Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development*. Thousand Oaks: CA: Sage Publications
- Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nurture reconceptualized in developmental perspective: A bioecological model. *Psychological Review, 101*, 568-586.

- Bronfenbrenner, U., & Evans, G. W. (2000). Developmental science in the 21st century: Emergin questions, theoretical models, research designs and empirical findings. *Social Development, 9*, 115-125.
- Bronson, M. B. (2000). *Self-regulation in early childhood: Nature and nurture*. New York: Guilford Press.
- Byrne, B. M. (2001). Structural Equation Modeling With Amos; Basic Concepts, Applications, and Programming. Mahwah, N.J: Lawrence Erlbaum Associates.
- Calkins, S. D. (1997). Cardiac vagal tone indices of temperamental reactivity and behavioral regulation in young children. *Developmental Psychobiology, 31*, 125-135.
- Calkins, S. D. (2004). Temperament and emotional regulation: Multiple modles of early development. In M. Beauregard *Consciousness, Emotional Regulation, and the Brain* (pp. 35-59). Philadelphia, PA: John Benjamins Publishing Company.
- Calkins, S. D., & Dedmon, S. E. (2000). Physiological and behavioral regulation in two-year-old children with aggressive/destructive behavior problems. *Journal of Abnormal Child Psychology, 28*, 103-118.
- Calkins, S. D. , Dedmon, S. E., Gill, K. L., Lomax, L. E., & Johnson, L. M. (2002). Frustration in infancy: Implications for emotion regulation, physiological processes, and temperament. *Infancy, 3*, 175-197.
- Calkins, S. D., & Fox, N. A. (2002). Self-regulatory processes in early personality development: A multilevel approach to the study of childhood social withdrawal and aggression. *Development and Psychopathology, 14*, 477-498.

- Calkins, S. D., & Howse, R. B. (2004). Individual differences in self-regulation: Implications for childhood adjustment. In P. Philippot & R. S. Feldman (Eds.), *The regulation of emotion* (pp. 307-332). Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Calkins, S.D. & Keane, S.P. (2004). Cardiac vagal regulation across the preschool period: stability, continuity, and implications for childhood adjustment. *Developmental Psychobiology*, 45, 101-112.
- Calkins, S. D., Smith, C. L., Gill, K. L., & Johnson, M. C. (1998). Maternal interactive style across contexts: Relations to emotional, behavioral and physiological regulation during toddlerhood. *Social Development*, 7, 350-369.
- Campbell, S.B., Shaw, D. S., & Gilliom, M. (2000). Early externalizing behavior problems: Toddlers and preschoolers at risk for later maladjustment. *Development and Psychopathology*, 12, 467-488.
- Carter, A. S., & Briggs-Gowan, M. J. (2005). *Infant Toddler and Brief Infant Toddler Social and Emotional Assessment (ITSEA) (BITSEA) Manual*. San Antonio, TX: Harcourt Assessment.
- Carter, A. S., Briggs-Gowan, M. J., Jones, S. M., & Little, T. D. (2003). The infant-toddler social and emotional assessment (ITSEA): Factor structure, reliability, and validity. *Journal of Abnormal Child Psychology*, 31, 495-514.
- Cicchetti, D., Ganiban, J., & Barnett, D. (1991). Contributions from the study of high-risk populations to understanding the development of emotional regulation. In J. Garber & K. A. Dodge (Eds.), *The development of emotion regulation and dysregulation* (pp. 69-88). Cambridge: Cambridge University Press.

- Cole, P. M., Martin, S. E., & Dennis, T. A. (2004). Emotion regulation as a scientific construct: Methodological challenges and directions for child development research. *Child Development, 75*, 317-333.
- Coleman, P. K., & Karraker, K. H. (2003). Maternal self-efficacy beliefs, competence in parenting, and toddlers' behavior and developmental status. *Infant Mental Health Journal, 24*, 126-148.
- Degangi, G. A., Breinbauer, C., Roosevelt, J. D., Porges, S., & Greenspan, S. (2000). Prediction of childhood problems at three years in children experiencing disorders of regulation during infancy. *Infant Mental Health Journal, 21*, 156-175.
- Denham, S., von Salisch, M., Olthof, T., Kochanoff, A., & Caverly, S. (2002). Emotional and social development in childhood. In P. K. Smith & C. H. Hart (Eds.), *Blackwell Handbook of Childhood Social Development* (pp. 307-328). Malden, MA: Blackwell Publishers.
- Diener, M. L., & Kim, D-Y. (2004). Maternal and child predictors of preschool children's social competence. *Applied Developmental Psychology, 25*, 3-24.
- Dieterich, S. E., Assel, M. A., Swank, P., Smith, K. E., Landry, S. H. (2006). The impact of early maternal verbal scaffolding and child language abilities on later decoding and reading comprehension skills. *Journal of School Psychology, 43*, 481-494.
- Dixon, W. E., Jr., & Smith, H. P. (2000). Links between Early Temperament and Language Acquisition. *Merrill-Palmer Quarterly, 46*, 417-440.
- Donovan, W., Leavitt, L., Taylor, N., & Broder, J. (2006). Maternal sensory sensitivity, mother-infant 9-month interaction, infant attachment status: Predictors of mother-toddler interaction at 24 months. *Infant Behavior and Development, 30*, 336-352.

- Eisenberg, N., Cumberland, A., Spinrad, T. L., Fabes, R. A., Shepard, S. A., Reiser, M. et al. (2001). The relations of regulation and emotionality to children's externalizing and internalizing problem behavior. *Child Development, 72*, 1112-1134.
- Eisenberg, N., Guthrie, I. K., Fabes, R. A., Shepard, S., Losoya, S., et al. (2000). Prediction of elementary school children's externalizing problem behaviors from attentional and behavioral regulation and negative emotionality. *Child Development, 71*, 1367-1382.
- Eisenberg, N., Smith, C. L., Sadovsky, A., & Spinrad, T. L. (2004). Effortful control: Relations with emotion regulation, adjustment, and socialization in childhood. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation* (pp. 259-282). New York: The Guilford Press.
- Eisenberg, N., Spinrad, T. L., Fabes, R. A., Reiser, M., Cumberland, A., Shepard, S. A., et al. (2004). The relations of effortful control and impulsivity to children's resiliency and adjustment. *Child Development, 75*, 25-46.
- Eisenberg, N., Spinrad, T. L., & Smith, C. L. (2004). Emotion-related regulation: Its conceptualization, relations to social functioning, and socialization. In P. Philippot & R. S. Feldman (Eds.), *The regulation of emotion* (pp. 277-306). Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Else-Quest, N. M., Hyde, J. S., Goldsmith, H. H., & Van Hulle, C. A. (2006). Gender Differences in Temperament: A Meta-Analysis. *Psychological Bulletin, 132*, 33-72.

- Emde, R. N. (1989). The infant's relationship experience: Developmental and clinical aspects. In A. J. Sameroff & R. N. Emde (Eds.), *Relationship disturbances in early childhood* (pp. 33-51). New York: Basic Books.
- Ensor, R. , & Hughes, C. (2005). More than talk: Relations between emotion understanding and positive behaviour in toddlers. *British Journal of Developmental Psychology*, 23, 343-363.
- Farrar, M. J., Ashwell, S., & Maag, L. (2005). The emergence of phonological awareness: Connections to language and theory of mind development. *First Language*, 25, 157-172.
- Feldman, R., Eidelman, A. I., & Rotenberg, N. (2004). Parenting stress, infant emotion regulation, maternal sensitivity, and the cognitive development of triplets: A model for parent and child influences in a unique ecology. *Child Development*, 75, 1774-1791.
- Fenson, L., Pethick, S., Renda, C., Cox, J. L., Dale, P. S., & Reznick, J. S. (2000). Short-form versions of the MacArthur Communicative Development Inventories. *Applied Psycholinguistics*, 21, 95-116.
- Fergusson, D. M., Lynskey, M. T., & Horwood, L. J. (1993). The effect of maternal depression on maternal ratings of child behavior. *Journal of Abnormal Child Psychology*, 21, 245-269.
- Fox, N. A., & Calkins, S. D. (2003). The development of self-control of emotion: Intrinsic and extrinsic influences. *Motivation and Emotion*, 27, 7-26.

- Gregory, A. M., & O'Connor, T. G. (2002). Sleep problems in childhood: A longitudinal study of developmental change and association with behavioral problems. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 964-971.
- Hagekull, B., & Bohlin, G. (2004). Predictors of middle childhood psychosomatic problems: An emotion regulation approach. *Infant and Child Development*, 13, 389-405.
- Haskett, M. E., Ahern, L. S., Ward, C. S., & Allaire, J. C. (2006). Factor structure and validity of the Parenting Stress Index-Short Form. *Journal of Clinical Child and Adolescent Psychology*, 35, 302-312.
- Hay, D. F. (2006). Yours and mine: Toddler's talk about possessions with familiar peers. *British Journal of Developmental Psychology*, 24, 39-52.
- Heilmann, J., Weismer, S. E., Evans, J., & Hollar, C. (2005). Utility of the MacArthur-Bates Communicative Development Inventory in identifying language abilities of late-talking and typically developing toddlers. *American Journal of Speech-Language Pathology*, 14, 40-51.
- Hill, A. L., Degnan, K. A., Calkins, S. D., & Keane, S. P. (2006). Profiles of externalizing behavior problems for boys and girls across preschool: The roles of emotion regulation and inattention. *Developmental Psychology*, 42, 913-928.
- Hipwell, A. E., Murray, L., Ducournau, P., & Stein, A. (2004). The effects of maternal depression and parental conflict on children's peer play. *Child: Care, Health, and Development*, 31, 11-23.
- Hoff, E., & Tian, C. (2005). Socioeconomic status and cultural influences on language. *Journal of Communicative Disorders*, 38, 271-278.

- Huffman, L. C., Bryan, Y. L., del Carmen, R., Pedersen, F. A., Doussard-Roosevelt, J. A., & Porges, S. W. (1998). Infant temperament and cardiac vagal tone: Assessments at twelve weeks of age. *Child Development, 69*, 624-635.
- Irwin, J. R., Carter, A. S., Briggs-Gowan, M. J. (2002). The social-emotional development of “late talking” toddlers. *Journal of the American Academy of Child Adolescent Psychiatry, 41*, 1324-1332.
- Izzard, C. E., Fine, S. E., Schultz, D., Mostow, A. J., Ackerman, B. P., & Youngstrom, E. A. (2001). Emotion knowledge as a predictor of social behavior and academic competence in children at risk. *Psychological Science, 12*, 18-23.
- Karp, J., Serbin, L. A., Stack, D. M., & Schwartzman, A. E. (2004). An observational measure of children’s behavioural style: Evidence supporting a multi-method approach to studying temperament. *Infant and Child Development, 13*, 135-158.
- Keith, T. Z. (2006). *Multiple Regression and Beyond*. Boston, MA: Allyn & Bacon.
- Knight, R. G., Williams, S., McGee, R., & Olaman, S. (1997). Psychometric properties of the Centre for Epidemiologic Studies Depression Scale (CES-D) in a sample of women in middle life. *Behavior Research Theories, 35*, 373-380.
- Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36*, 220-232.
- Kyrios, M., & Prior, M. (1990). Temperament, stress and family factors in behavioral adjustment of 3---5-year-old children. *International Journal of Behavioral Development, 13*, 67-93.

- Lawson, K. R., & Ruff, H. A. (2004). Early attention and negative emotionality predict later cognitive and behavioural function. *International Journal of Behavioral Development, 28*, 157-165.
- Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling, 9*, 151–173.
- Li-tze, H., & Bentler, P. M. (1999) Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.
- Marchland, J. F., & Hock, E. (1998). The relation of problem behaviors in preschool children to depressive symptoms in mothers and fathers. *The Journal of Genetic Psychology, 159*, 353-366.
- Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling, 11*, 320-341.
- Matheny, A. P. Jr., Wilson, R. S., & Thoben, A. S. (1987). Home and mother: Relations with infant temperament. *Developmental Psychology, 23*, 323-331.
- Mattison, R. E., Handford, H. A., & Vela-Bueno, A. (1987). Sleep Disorders in Children. *Psychiatric Medicine, 4*, 149-64.
- Maziade, M., Caron, C., Cote, R., Merette, C., Bernier, H., Laplante, B., Boutin, P., & Thivierge, J. (1990). Psychiatric status of adolescents who had extreme temperaments at age seven. *American Journal of Psychiatry, 147*, 1531-1536.

- Molfese, V. J., DiLalla, L. F., & Lovelace L. (1996). Perinatal, home environment, and infant measures as successful predictors of preschool cognitive and verbal abilities. *International Journal of Behavior Development, 19*, 101-119.
- Parke, R. D., Simpkins, S. D., McDowell, D. J., Kim, M., Killian, C., & Dennis, J. et al. (2002). Relative contributions of families and peers to children's social development. In P. K. Smith & C. H. Hart (Eds.), *Blackwell Handbook of Childhood Social Development* (pp. 156-177). Malden, MA: Blackwell Publishers.
- Porges, S. W., Doussard-Roosevelt, J. A., & Maiti, A. K. (1994). Vagal tone and the physiological regulation of emotion. *Monographs of the Society for Research in Child Development, 59*, 167-186.
- Porges, S. W., Doussard-Roosevelt, J. A., Portales, A. L., & Greenspan, S. I. (1996). Infant regulation of the vagal "brake" predicts child behavior problems: A psychobiological model of social behavior. *Developmental Psychobiology, 29*, 697-712.
- Pretorius, E. (2004). Asthma medication may influence the psychological functioning of children. *Medical Hypotheses, 63*, 409-413.
- Putnam, S. P., Gartstein, M. A., Rothbart, M. K. (2006). Measurement of fine-grained aspects of toddler temperament: The Early Childhood Behavior Questionnaire. *Infant Behavior and Development, 29*, 386-401.
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for reasearch in the general population. *Applied Psychological Measurement, 1*, 385-401.

- Reitman, D., Currier, R. O., & Stickle, T. R. (2002). A critical evaluation of the Parenting Stress Index-Short Form (PSI-SF) in a Head Start population. *Journal of Clinical Child and Adolescent Psychology, 31*, 384-392.
- Rothbart, M. K., Ellis, L. K., & Posner, M. I. (2004). Temperament and Self-Regulation. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 357-370. New York: The Guilford Press
- Rubin, K. H., Burgess, K. B., & Dwyer, K. M. (2003). Predicting preschoolers' externalizing behaviors from toddler temperament, conflict, and maternal negativity. *Developmental Psychology, 39*, 164-176.
- Rubin, K. H., Cheah, C. S. L., & Fox, N. A. (2001). Emotion regulation, parenting, and display of social reticence in preschoolers. *Early Education and Development, 12*, 97-115.
- Rubin, K. H., Hastings, P., Chen, X., Stewart, S., & McNichol, K. (1998). Intrapersonal and maternal correlates of aggression, conflict, and externalizing problems in toddlers. *Child Development, 69*, 1614-1629.
- Rydell, A. M., Dahl, M., & Sundelin, C. (1995). Characteristics of school children who are choosy eaters. *The Journal of Genetic Psychology, 156*, 217-229.
- Sadeh, A., Gruber, R., & Raviv, A. (2002). Sleep, Neurobehavioral Functioning, and Behavior Problems in School-Age Children. *Child Development, 73*, 405-417.
- Sameroff, A. J., Seifer, R., & Elias, P. K. (1982). Sociocultural variability in infant temperament ratings. *Child Development, 53*, 164-173.

- Sanson, A., Hemphill, S. A., & Smart, D. (2002). Temperament and Social Development. In P. K. Smith & C. H. Hart (Eds.), *Blackwell Handbook of Childhood Social Development* (pp. 97-116). Malden, MA: Blackwell Publishers.
- Saxon, T. F., Colombo, J., Robinson, E. L., & Frick, J. E. (2000). Dyadic interaction profiles in infancy and preschool intelligence. *Journal of School Psychology, 38*, 9-25.
- Scaramella, L. V., & Leve, L. D. (2004). Clarifying parent-child reciprocities during early childhood: The early childhood coercion model. *Clinical Child and Family Psychology Review, 27*, 89-107.
- Schwarz, N. (1999). Self-reports: How questions shape the answers. *American Psychologist, 54*, 93-105.
- Shaw, D. S., Owens, E., Giovannelli, J., & Winslow, E. B. (2001). Infant and toddler pathways leading to early externalizing disorders. *Journal of American Academy of Child and Adolescent Psychiatry, 40*, 36-43.
- Shonkoff, J. P. & Phillips, D. A. (Eds.) (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, D. C.: National Academy Press.
- Smith, C. L., Calkins, S. D., Keane, S. P., Anastopoulos, A. D., & Shelton, T. L. (2004). Predicting stability and change in toddler behavior problems: Contributions of maternal behavior and child gender. *Developmental Psychology, 40*, 29-42.
- Spira, E. G., & Fischel, J. E. (2005). The impact of preschool inattention, hyperactivity, and impulsivity on social and academic development: A review. *Journal of Child Psychology and Psychiatry, 46*, 755-773.

- Squires, J. K. (2000). Identifying social/emotional and behavior problems in infants and toddlers. *Infant Toddler Intervention, 10*, 107-119.
- Supplee, L. H., Shaw, D. S., Hailstones, K., & Hartman, K. (2004). Family and child influences on early academic and emotion regulatory behaviors. *Journal of School Psychology, 42*, 221-242.
- Thompson, R. A. (1998). Early sociopersonality development. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol 3. Social emotional, and personality development* (5th ed., pp. 25-104). New York: Wiley.
- Valiente, C., Eisenberg, N., Smith, C. L., Reiser, M., Fabes, R. A., Losoya, S., et al. (2003). The relations of effortful control and reactive control to children's externalizing problems: A longitudinal assessment. *Journal of Personality, 71*, 1171-1196.
- Vecchio, T. D., & O'Leary, S. G. (2006). Antecedents of toddler aggression: Dysfunctional parenting in mother-toddler dyads. *Journal of Clinical Child and Adolescent Psychology, 35*, 194-202.
- Waston, A., Painter, K., & Bornstein, M. (2001). Longitudinal relations between 2-year-olds' language and 4-year-olds' theory of mind. *Journal of Cognition and Development, 2*, 449-457.
- West, A. E. & Newman, D. L. (2003). Worried and blue: Mild parenting anxiety and depression in relation to the development of young children's tempermanet and behavior problems. *Parenting: Science and Practice, 3*, 133-154.

- Westphal, M., & Bonanno, G. A. (2004). Emotion self-regulation. In M. Beauregard (Ed.), *Conscious Emotional Regulation, and the Brain* (pp. 1-33). Philadelphia, PA: John Benjamins Publishing Company.
- Zaslow, M. J., Weinfield, N. S., Gallagher, M., Hair, E. C., Ogawa, J. R., and Egeland, B, Tabors, P. O., & De Temple, J. M. (2006). Longitudinal predictions of child outcomes from differing measures of parenting in a low-income sample. *Developmental Psychology, 42*, 27-37.
- Zeidner, M., Matthews, G., Roberts, R. D., & MacCann, C. (2003). Development of emotional intelligence: Towards a multi-level investment model. *Human Development, 46*, 69-96.
- Zero to Three: Diagnostic Classification: 0–3. Arlington, Va, Zero to Three, 1994.

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