MACKLER, JENNIFER S. M.A. The Role of Emotion Regulation in Children's Coping with Environmental Stress. (2009)
Directed by Susan D. Calkins. 69 pp.

The goal of this study was to examine whether the ability to effectively regulate emotions would moderate how children respond to environmental stress. It was hypothesized that children who exhibited greater emotion regulation and less reactivity at 4 years and also reported encountering environmental stress at 5 would experience less externalizing and internalizing behavior problems at 5 and 7 than children who exhibit poorer emotion regulation earlier in development. Measures of contextual stress were predictive of externalizing behavior problems at 5. The interaction of maternal reported reactivity and life events was significant for children who experienced a high degree of stress, where those who were highly reactive experienced the most externalizing behavior problems ($b = 1.86$, $p = .001$). This research indicates that environmental stress results in adjustment difficulties, and that distinct processes of emotion regulation may play a crucial role in how children react to these stressors.

THE ROLE OF EMOTION REGULATION IN CHILDREN'S COPING WITH ENVIORNMENTAL STRESS

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A Thesis Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Science

Greensboro
2008

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CHAPTER I

INTRODUCTION

Children face a great deal of environmental stress as a natural process of development and life experience. Experience with contextual stress is thought to influence many facets of children's lives and, as a consequence, their functioning and well being. Grant and colleagues (2003) propose a model of stressors and the etiology of psychopathology in children and adolescents. In this model, they pose five central points: (1) stressors contribute to psychopathology, (2) mediators such as biological and social processes explain the relation between stressors and psychopathology, (3) moderators such as child and environmental characteristics influence this relation (4) there is specificity to all these relations, and (5) these relations are reciprocal and dynamic. It is the aim of this study to investigate the third element of this model and to examine what child characteristic may moderate the relation between stressors and psychopathology, thereby determining an important resilience factor against the effects of environmental stress.

CHAPTER II

REVIEW OF THE LITERATURE

Stressful Life Events

Stressful life events, have been defined as events and experiences occurring at the personal level that may have chronic negative consequences (Attar, Guerra, & Tolan, 1994; Dubow, Edwards, & Ippolito, 1997). These stressors can range from normative developmental experiences and day to day hassles to non-normative events and chronic stressors (Grant et al., 2003). The vast majority of children will inevitably experience at least one life stressor. According to US Census data, in 2000 an estimated 1.5 million children experienced a divorce in their family (US Bureau of the Census, 2004). From 2002 to 2003 the geographic mobility (or moving) rate was 21.4% for 1-4 year-olds, 15.9% for 5-9 year-olds, and 13.2% for 10-14 year-olds (US Bureau of the Census, 2005). In a study of children's adjustment to stressors, within a sample of 315 inner-city children, 63% reported a family member becoming seriously ill or injured, 45% reported moving to a new home, and 59% reported death of a family member with the average child reporting experiencing 4 of 13 possible stressors (Dubow, Edwards, & Ippolito, 1997). Thus, stressful life events appear to be a natural occurrence in children's development; however, they may be the catalyst for many non-normative outcomes.

Experiences with environmental stress may have significant implications for a child's development. Often, the impact of stressors result in negative outcomes, and these outcomes may emerge as externalizing behavior problems (Wertlieb, Weigel, & Feldstein, 1989). Children who experience life stressors are more likely to exhibit externalizing behavior problems and aggression (Dodge, Pettit, & Bates, 1994; Morales & Guerra, 2006) and to engage in antisocial behavior and drug use (Dubow, Edwards, & Ippolito, 1997). Additionally, experiences with divorce and marital conflict have been associated with problems in adjustment and greater externalizing behavior (Amato, 2001; Amato & Keith, 1991; El-Sheikh & Whitson, 2006). Therefore, the effects of stress manifest themselves outwardly for many children in overt acts of aggression and oppositional behavior, and generally in terms of adjustment difficulties.

Support also exists for the link between stressors and internalizing behavior problems. Luthar and Zigler (1991) highlight the importance of measuring maladjustment, particularly internalizing outcomes, because so-called "resilient" individuals often experience internalizing symptoms. For example, adolescents labeled as resilient due to high competence and absence of disruptive behavior problems score high on measures of depression and anxiety (Luthar, 1991). Stressful life events are associated with preschooler's concurrent depression and anxiety, are predictive of their depression severity 6 months from reporting the stressors, and mediate the relationship between family history for depression and later depression severity (Luby, Belden, & Spitznagel, 2006). In a study of monozygotic twins who differentially experienced a

history of Major Depressive Disorder, the affected twin reported more stressful life events including financial difficulties, romantic problems and divorce, and job loss (Kendler & Gardner, 2001). While acute or recent stressors have a clear impact on depression, chronic stressors including health and marital problems, tend to be associated with longer, more severe depression that is prone to relapse (Tennant, 2002; Turner, Wheaton, & Lloyd, 1995). In addition to depression, stressful events, particularly those that impact the individual directly versus those that impact close family and friends, are also significantly related to anxiety (Rijsdijk et al., 2001). Therefore, no only do stressors have an outward impact on children's behavior problems, but they may also result in less obvious difficulties that manifest at the internal level of the child.

Contextual Risk

Research on the impact of stress tends to focus on its effects in two ways; (a) how types of stressors differentially impact outcomes, or (b) how stressors cumulatively affect outcomes. The former method breaks down stressors into different categories that may differentially affect the child. For example, a meta-analysis by Tennant (2002) found that loss events are more associated with depression while events that were conflictual or personally stressful predict externalizing problems. In contrast, other research focuses on how cumulative stressors collectively lead to outcomes. Research by Forehand, Biggar, and Kotchick (1998) suggests that the accumulation of stressors, regardless of type, is related to both long and short term problems with adjustment. Further, the number of

stressors their sample reported experiencing (half of mothers experienced two or more stressors) indicates that children and their families often have to cope with multiple stressors in their environment within a relatively short time span. The measurement of cumulative stressors has been employed in much of the stress literature (e.g. Buckner, Mezzacappa, & Beardslee, 2003; Dube, Felitti, Dong, Giles, & Anda, 2003; Gutman, Sameroff, & Cole, 2003; Morales & Guerra, 2006) and focuses more generally on how a demanding environment impacts the individual rather than on the impact of discrete stressors. This method may be advantageous because stressors are measured more generally, rather than attempting to estimate the influence of different types of life events, as adverse life events may affect one child very differently than the next. This research indicates it is not any one stressor that ultimately affects a child's wellbeing, but rather the accumulation of stressors resulting in a cumulatively stressful environment that puts a child at risk of maladaptive outcomes.

Assessments of environmental stressors may be most telling of the child's experiences when these measures assess global or cumulative stress. Moore, Vandivere, and Redd (2006) suggest that a composite measure of risk quantifies the dynamic and cumulative effect of multiple risk factors in the environment. Such an index is theoretically advantageous because it addresses problems that have arisen by measuring stressors in isolation, as stressors tend to have an additive effect in combination (Moore, Vandivere, & Redd, 2006). Past research on contextual risk has demonstrated that a composite of risk produces an accurate assessment of stress in the environment (Calkins,

Blandon, Williford, & Keane, 2007; Cote, Borge, Geoffroy, Rutter, Tremblay, 2008; Moore, Vandivere, & Redd, 2006). For example, Calkins and colleagues (2007) found that the typical decline in behavior problems in childhood was offset by high contextual risk, and that increases in contextual risk were predictive of children's internalizing and externalizing behavior problems. Environmental stress places challenges on the family, thereby resulting in challenges in the child's ability to behave adaptively (Calkins et al., 2007). Further, high contextual risk may be indicative of a stressful environment that predisposes children to encounter more stressful life events. A measure of contextual risk is therefore a means to more accurately depict how many interplaying factors in the environment additively create stress on the family and the child, resulting in negative outcomes.

Through an index of risk, the numerous risk factors that cumulatively make up contextual risk can be identified. These risk factors often include factors that assess family makeup, demographic information, and maternal wellbeing. Socioeconomic status (SES) is often included as a variable of risk given that families of low SES are impacted by financial strain and may have less access to resources. Wadsworth and Achenbach (2005) indicate that, based on the social causation hypothesis, families of low SES deal with greater amounts of adversity and psychopathology develops as a result of financial stressors. Low to middle SES has consistently been linked with childhood symptom severity including depression, behavior problems, somatic complaints, and aggression (Counts, Nigg, Stawicki, Rappley, & Von Eye, 2005; Graham &

Easterbrooks, 2000; Wadsworth & Achenbach, 2005). Families dealing with economic stress also have unique risk factors that differentially predispose children for psychopathology. For example, family size has been implicated as an environmental risk factor (Gutman, Sameroff, & Cole, 2003), indicating that large families who may already be dealing with environmental stressors may also have to spread limited resources over more children. Even further, single mothers are likely to have fewer resources and less support to cope with this adversity, creating more stress in the environment. As such, this variable has been included in several composites of contextual risk (e.g. Calkins et al., 2007; Cote, Borge, Geoffroy, Rutter, Tremblay, 2008).

Socioeconomic disadvantage may also place undue stress on parents and may impede parents' abilities to effectively discipline and show affection towards their children. Parent reports of their own experiences of stress have consistently been linked with poor outcomes for children including overall behavior problems and internalizing and externalizing symptomology (Abidin, 1992; Anthony et al., 2005; Barry, Dunlap, Cotton, Lochman, & Wells, 2005; Crnic, Gaze, & Hoffman, 2005). Stress effects the parent's well being and functioning and use of constructive parenting practices which in turn effects the child's well being (Crnic and Low, 2002; Deater-Deckard, 2004; Webster-Stratton, 1990). Whether this stress impacts the child depends on the parent's support system, their own mental health, and their available resources (Webster-Stratton, 1990). Maternal psychological well-being, in turn, is also a factor that puts a child at risk for environmental stress. More specifically, maternal depression impacts emotionality

and the ability to regulate emotions and cope with stressors, which impacts how the mother reacts to stress in the environment, thereby affecting the child (Ashman, Dawson, & Panagiotides, 2008). Maternal psychopathology has been linked to several adjustment difficulties in children including AD/HD symptomatology and behavior problems (Counts, Nigg, Stawicki, Rappley, & Von Eye, 2005; Goldstein et al., 2007), depressive symptomatology (Graham & Easterbrooks, 2000; Marmorstein & Iacono, 2004), and defiant behavior (Ashman, Dawson, & Panagiotides, 2008, Goldstein et al., 2007; Marmorstein & Iacono, 2004). Overall, research on contextual risk indicates that several risk factors may be acting in the child's environment, impacting their adjustment in multiple domains of functioning. While these risk factors separately are found to impact child outcomes, an accumulation of these stressors may have an even greater impact on children's well being and mental health.

Although there has been extensive research to clarify the link between stressors and psychopathology, gaps in the literature still remain. While the effects of experiencing stressors in childhood are found to be related to adjustment difficulties, health problems, and behavior problems, there is little research explaining why this is, and much research assumes this relation but does not explain it (Grant et al., 2003). Additionally, not every child that experiences environmental stress experiences negative outcomes. It is the goal of this research to contribute to the body of literature aiming to answer the question of why some children experience externalizing and internalizing problems while other children do not experience these outcomes. Grant and colleagues'

(2003) model of stressors and the etiology of psychopathology in children and adolescents posits that moderators such as child and environmental characteristics influence this relation. It is the aim of this study to investigate this element of this model and to examine whether child characteristics may moderate the relation between stressors and psychopathology. Emotion regulation is one child characteristic that may moderate the relation between stress and psychopathology.

Emotion Regulation

Coping has been defined as regulation of emotion under stress and, as such, emotion regulation and coping are intrinsically tied together (Losoya, Eisenberg, & Fabes, 1998; Skinner and Zimmer-Gembeck, 2007). The concept of regulation has been extensively studied in the field of child development. Emotion regulation has been described as the strategies utilized by the individual, whether unconsciously or of their own volition, that work to enhance or inhibit the experience and expression of emotions (Calkins & Hill, 2007). Emotion dysregulation would suggest impairment in the regulatory process where a pattern of responding impairs adaptive and appropriate functioning (Cicchetti, Ganiban, & Barnett, 1991). Emotional reactivity, or emotionality, is an important component of emotion regulation, and is often studied as part of the regulatory process (Calkins & Hill, 2007; Eisenberg, Hofer, & Vaughan, 2007; Gross & Thompson, 2007).

The development of emotion regulation is thought to occur through intrinsic and extrinsic mechanisms (Fox & Calkins, 2003). An important extrinsic mechanism through

which children develop their ability to regulate emotions is the caregiving environment. Research on the acquisition of emotion regulation skills often draws on Bowlby's (1969/1982) attachment theory to explain this process (Cassidy, 1994; Sroufe, 2000). Emotion regulation is thought to emerge through interactions with the caregiver that rely on the expectations that are developed through the attachment relationship (Cassidy, 1994). As infants are limited in their ability to regulate independently, the attachment relationship provides cues on how to effectively regulate and opportunities to practice and refine self-regulation skills (Sroufe, 2000). Throughout development, these interactions lead to a pattern of regulation or dysregulation in the child that began with the lead taken by the caregiver (Sroufe, 2000). The importance of the role that caregivers play in the early stages of regulation acquisition has been demonstrated both in fathers (Carson & Park, 1996; Diener, Mangelsdorf, McHale, & Frosch, 2002); and in mothers (Calkins and Johnson, 1998; Calkins, Smith, Gill, & Johnson, 1998; Eisenberg, Fabes, & Murphy; 1996) These findings indicate the important role that early caregiver influences play in the development of emotion regulation. As caregivers set the stage early on for emotion regulation, they influence which skills and strategies become part of the child's repertoire to use in managing real world stressors.

Intrinsic components also provide important insight into an individual's ability to regulate his (or her) emotions. A biological measure of interest is autonomic nervous system (ANS) reactivity. Porges' polyvagal theory (Porges, Doussard-Roosevelt & Maita, 1994; Porges, 1996) describes how neural regulation of the ANS, which in turn

regulates homeostatic functioning, is involved in the regulation of motion, communication, and emotion. The vagus is a cranial nerve that projects to organs, including the heart and digestive system, and functions bilaterally to regulate homeostasis via digestion, respiration, and emotion (Porges, Doussard-Roosevelt & Maita, 1994). An established method for evaluating cardiac vagal tone is to measure respiratory sinus arrhythmia (RSA) which involves the stable increase and decrease in heart rate that changes as a function of the influence of the vagus (Porges, 1995; Porges, Doussard-Roosevelt & Maita, 1994). Shifts in an individual's ability to regulate can be detected by monitoring the heart rate as influenced by inspiration and expiration (Porges, Doussard-Roosevelt & Maita, 1994). In the presence of an environmental demand or stressor, the ANS increases metabolic output via withdrawal of the vagal brake (which is associated with an increase in heart rate) and an excitation of the sympathetic nervous system promoting the fight or flight response (Porges, Doussard-Roosevelt & Maita, 1994). The vagus system can therefore modulate the ability to physically approach or withdraw in response to the environment and can allow for more resources to become available to deal with a stressor (Porges, 1996). Given this ability to determine responses to demands in the environment, how a child regulates their physiological responses over time may have implications on many long term outcomes.

Emotion Regulation and Behavior Problems

The pattern of regulation that emerges as a function of important extrinsic and intrinsic mechanisms early in an infant's development has implications for later

developmental outcomes. Dysregulation is often conceptualized as lying on a continuum, where at one end are individuals whose responses are too intense and difficult to recover and exhibit a pattern of over-regulation, and at the other are individuals whose responses are weak and constricted and exhibit a pattern of under-regulation (Cole, Michel, & Teti, 1994; Kennan, 2000). Early behavior problems can be thought of as falling at either end of this spectrum, with externalizing behavior problems such as aggression and conduct problems representing an under-regulation of emotions, and internalizing behavior problems such as depression, anxiety, and somatic problems resulting from an over-regulation of emotion in response to demands in the environment (Cole, Michel, & Teti, 1994; Mullin & Hinshaw, 2007). While this distinction of over- versus under-regulation is likely not clear-cut, this conceptualization suggests there may be an optimal level of regulation, and that deviations from this level result in later adjustment difficulties (Beauchaine, 2001; Cole, Michel, & Teti, 1994, Mullin & Hinshaw, 2007).

Research indicates that child behavior problems may emerge from a pattern of over- or under-regulation. Children with externalizing behavior problems exhibit an under-control of anger and sadness responses, while children who experience internalizing behavior problems both under- and over- regulate their emotions, exhibiting an over-control of their anger responses and displaying inappropriate and excessive expressions of anger and sadness (Zeman, Shipman, & Suveg, 2002). Eisenberg and colleagues (2001) found a similar pattern in a longitudinal study. Children with externalizing behavior problems and mixed externalizing and internalizing problems

showed a consistent pattern of lower effortful and attentional regulation and higher impulsivity, while children with internalizing behavior problems displayed higher inhibitory control and greater attentional regulation (Eisenberg et al., 2001). The participants displayed a similar relation between dysregulation and developmental outcomes at a 2 year follow up study (Eisenberg et al., 2005). Early emotion regulation also predicts the later severity of pre-existing externalizing behavior problems, with better emotion regulation in girls tempering the later severity of externalizing problems (Hill, Degnan, Calkins, & Keane, 2006). In adolescents, greater emotional intensity, lability, and low regulation of negative affect are associated with an increase in depressive symptoms and externalizing behavior problems (Silk, Steinberg, Sheffield Morris, 2003). Cognitive emotion regulation strategies, such as rumination and self-blame, have been found to predict internalizing problems (Garnefski, Kraaij, & van Etten, 2005). Additionally, Suveg and Zeman (2004) found that children with anxiety disorders experience greater self-reported dysregulation, more intense worry and sadness, and more maternal-reported inflexibility, lability, and negativity.

Research on physiological regulation also provides evidence that dysregulated children show particular patterns of externalizing and internalizing behavior problems. Based on the polyvagal theory, individuals with poor vagal regulation (low vagal tone) are hypothesized to have difficulty regulating emotions and exhibiting proper emotional responses to demands in the environment (Porges, Doussard-Roosevelt, & Maiti, 1994). Similar to the findings for emotion regulation more generally, there are also adverse

developmental outcomes for individuals with poor vagal regulation. Infants who display lower baseline vagal tone exhibit greater negative temperament and require more calming (Huffman et al., 1998), and infants who have difficulty regulating their vagal withdrawal develop more behavior problems (Porges, Doussard-Roosevelt, Portales, & Greenspan, 1996). Children who are high-risk for externalizing problems exhibit more negative affect, less effective regulation strategies, and consistently lower physiological regulation in terms of RSA suppression during challenging tasks (Calkins & Dedmon, 2000). Conversely, children who consistently exhibit greater RSA suppression display better social skills, less negative reactivity, and experience fewer externalizing behavior problems (Calkins & Keane, 2004). Recent research examining children's response to challenge tasks found that children at risk for both externalizing and internalizing behavior problems display the greatest vagal withdrawal or decrease in RSA, and child at risk for pure externalizing behavior problems display the smallest decrease in RSA as compared to children with low behavior problems (Calkins, Graziano, & Keane, 2007). These findings further support the notion that there may be an optimal level of physiological regulation at which to function (Beauchaine, 2001).

Recent research has examined the role of vagal tone in handling life stress, particularly marital conflict. El-Sheikh and colleagues (2001, 2006) found that high vagal regulation and suppression buffer against the negative effects of experiencing marital conflict including internalizing behavior problems, externalizing behavior problems, and health problems. These findings indicate that high vagal tone and

suppression, and therefore more effective emotion regulation, serves as a protective factor for children from the effects of family stress and discord. Whitson and El-Sheikh (2003) suggest that greater vagal regulation, in terms of vagal tone and suppression, moderate the effects of challenges in the environment by allowing the individual to manage appropriate affective responses and to elicit a tempered physiological response, rather than engaging the sympathetic nervous system which may lead to detrimental effects on an individual's health.

Although these findings are based on the marital conflict literature, this buffering effect would likely occur for other stressors in a child's environment. Greater vagal regulation should not only protect children from the negative effects of marital discord, but should also play an important role in the managing of other stressors such as geographic relocation or school transitions. Physiological regulation impacts how an individual responds to demands in the environment, thereby affecting the strategies that are utilized to manage the situation. A well-regulated child may have more available resources to manage the stressor, whether in response to a divorce, loss in the family, or a move across the country. A dysregulated child, however, may display a pattern of over-regulation and a dampening of emotional response, or they may exhibit an intense emotional reaction due to an under-regulation of their response.

Environmental stress and emotion regulation, as measured both behaviorally and physiologically, are both associated with externalizing and internalizing behavior problems, and this may be because these factors interact early in development. Evidence

suggests that children who appropriately regulate their emotions develop better skills to manage stress, and are better able to regulate their negative reactions to the situation. These children should therefore experience fewer negative consequences of exposure to the stressor. Conversely, children who have difficulty regulating their emotions should have more trouble generating effective strategies and may utilize less adaptive, more immediate ways of handling their negative emotions such as aggression or avoidance. When faced with stressors, these children will have less effective strategies and resources to deal with their negative experiences, and therefore will experience the negative effects of the stressor. Therefore, while experiences with environmental stressors certainly increases the risk for negative child outcomes including externalizing and internalizing behavior problems, emotion regulation may play a mitigating role in whether a child is resilient to these maladaptive outcomes.

CHAPTER III

GOALS AND HYPOTHESES

The aim of this study was to examine whether children's ability to effectively regulate emotions moderated the relation between stressful environments and the negative outcomes of externalizing and internalizing behaviors. Environmental stress was assessed through a maternal report of stressful life events and also through an index of contextual risk. Emotion regulation and reactivity were measured using multiple methods to assess conceptually different aspects of these constructs. Parental report was obtained to measure the mother's interpretations of their children's reactivity and ability to regulate emotions. Laboratory measures were also collected to assess behavioral reactivity and regulation. Additionally, physiological regulation was assessed by measuring cardiac vagal tone. The child outcomes of interest included both externalizing problems (disruptive behavior problems and aggression) and internalizing problems (depression and anxiety). These outcomes were assessed at two time points in order to estimate both the immediate and long term effects of environmental stress. In addition, previous externalizing and internalizing behavior problems were accounted for so that their present occurrence could be attributed to the stressor and not to any previous characteristics of the child.

It was hypothesized that emotion regulation would moderate the immediate and long term negative effects of experiencing environmental stress. Specifically, it was predicted that children who effectively regulated their emotions, were more positively

reactive at 4 years and experienced a stressful life event or lived in a risky environment at 5 years would experience less negative outcomes (in terms of externalizing and internalizing behavior problems) at 5 and 7 years, while those children who were poor regulators of their emotions and were more negatively reactive at 4 years would experience more negative outcomes at 5 and 7 after experiencing a stressful environment. In other words, children who were better regulators of their emotions and were less negatively reactive were hypothesized to have fewer externalizing and internalizing problems as compared to their peers who were poorer regulators of emotion.

CHAPTER IV

METHODS

Recruitment and Attrition

The study utilized data from three cohorts of children who are part of an ongoing longitudinal study, the RIGHT Track project. The goal for recruitment was to obtain a sample of children that included those at risk for developing future externalizing behavior problems that was representative of the surrounding community in terms of race and socioeconomic status (SES). All cohorts were recruited through child day care centers, the County Health Department, and the local Women, Infants, and Children (WIC) program. Potential participants for cohorts 1 and 2 were recruited at 2-years of age (cohort 1: 1994-1996 and cohort 2: 2000-2001) and screened using the Child Behavior Checklist (CBCL 2-3; Achenbach, 1992) completed by the mother in order to over-sample for externalizing behavior problems. Children were identified as being at risk for future externalizing behaviors if they received an externalizing T-score of 60 or above**.** Efforts were made to obtain approximately equal numbers of males and females. A total of 307 children were selected. Cohort 3 was initially recruited when infants were 6-months of age (in 1998) for their level of frustration based on laboratory observation and parent report and followed through the toddler period (See Calkins, Dedmon, Gill, Lomax, & Johnson, 2002, for more information). Children whose mother's completed

the CBCL at 2-years of age were included in the current study (n = 140). Of the entire sample (N = 447), 37% of the children were identified as being at risk for future externalizing problems. There were no significant demographic differences between cohorts with regard to gender, χ^2 (2, N = 447) = .63, p = .73, race, χ^2 (2, N = 447) = 1.13, p = .57, or 2-year SES, F (2, 444) = .53, p = .59. Cohort 3 had a significantly lower average 2-year externalizing T-score (M = 50.36) compared to cohorts 1 and 2 (M = 54.49), t (445) = -4.32, p = .00.

Of the 447 original screened participants, 6 were dropped because they did not participate in any 2 year data collection. At 4 years of age, 399 families participated. Families lost to attrition included those who could not be located, who moved out of the area, who declined participation, and who did not respond to phone and letter requests to participate. There were no significant differences between families who did and did not participate in terms of gender, χ^2 (1, N = 447) = 3.27, p = .07, race, χ^2 (1, N = 447) = .70, p = .40, 2-year SES, t (424) = .81, p = .42, or 2-year externalizing T-score, t (445) = -.36, p = .72. At 5-years of age 365 families participated including 4 that did not participate in the 4-year assessment. Again, there were no significant differences between families who did and did not participate in terms of gender, χ^2 (1, N = 447) = .76, p = .38, race, χ^2 (1, N = 447) = .17, p = .68, 2-year socioeconomic status, t (424) = 1.93, p = .06) and 2-year externalizing T-score (t (445) = -1.73, p = .09). At 7-years of age 350 families participated including 19 that did not participate in the 5-year assessment. Again, there

were no significant differences between families who did and did not participate in terms of gender, χ^2 (1, N = 447) = 2.12, p = .15, race, χ^2 (3, N = 447) = .60, p = .90 and 2-year externalizing T-score (t (445) = -1.30, p = .19). Families with lower 2-year socioeconomic status, t (432) = 2.61, p > .01) were less likely to continue participation at the 7-year assessment.

Participants

The current data was drawn from the larger study and participants included those children who had complete data on all variables at all time points. Of the 198 children included for analyses, 83 were male (42%) and 115 were female (58%). Sixty six percent were Caucasian, 28% were African American, 4.0% were mixed race, and 2.0% were of other ethnicity. Children were on average 53.3 months (SD = 3.48) at the 4 year assessment, 67.7 months (SD = 3.00) at the 5 year assessment, and 92.3 months (SD = 4.11) at the 7 year assessment. The families were economically diverse based on Hollingshead (1975) scores at the 4, 5, and 7 year assessments respectively (see Table 1).

Materials and Procedures

Participants were assessed at multiple time points. At 4 years, emotion regulation was assessed by parent report, physiological methods, and observational methods. Internalizing and externalizing behavior problems were measured by parent report at 4, 5 and 7 years. At 5 years, the occurrence of stressful life events within the past year and current environmental stress was assessed. The study sample (see Table 2) generally was

comparable to the overall RIGHT Track sample (see Table 3) on all predictor and outcome variables.

Environmental Stress

Life Events. Stressful life events were assessed when children were 5 with the Life Experiences Scale (α = .64) which was adapted for use in the current study (LES; Sarason, Johnson, & Seigel, 1978). For the purposes of the current study, the original measure was reduced from 43 to 19 questions to include items more applicable to the sample. Mothers completed the measure, indicating which events occurred to their immediate family in the past 12 months. The LES assessed stressors that are thought to have both a direct and indirect impact on the child, and only the stressors thought to directly challenge children's coping skills were of interest in this study. Therefore, to determine which stressors the child directly experienced, 26 graduate students were asked to code each item as either proximally or distally affecting the child. Only proximal items that elicited at least 90% agreement between raters were included, which resulted in 9 items. Fleiss' kappa was calculated to assess the inter-rater agreement, and this yielded a kappa of 76.24, indicating substantial agreement. The proximal items identified were *divorce, marital reconciliation, marriage, separation, other relatives move in, death of a family member, start a new school, move to a new location, and trouble with teachers*. The items identified as distal to the child and therefore were not included in analyses were *pregnancy, income increase, deep debt, promotion, increase decrease, alcohol/drug problems, death of a family friend, starting a new job, trouble with work superiors, and*

legal problems. This variable was analyzed continuously with a range from 0 to 9 with higher scores indicating the experience of a greater number of stressors. Reliability of scores in this sample approached that of the original measure (α = .56).

Contextual Risk. An index assessing contextual risk at the 5 year assessment was created based on previous work (Calkins, Blandon, Williford, & Keane, 2007). All five risk factors as indicated below were coded as present (1) or absent (0), weighted equally, and then summed to create a single contextual risk index (Moore, Vandivere, & Redd, 2006; Calkins, Blandon, Williford, & Keane, 2007). For continuous variables, individuals who scored within the lowest or highest quartile were placed in the risk category.

Marital status. Children of mothers who were unmarried were considered at risk.

SES. Those children scoring in the lowest quartile on the Hollingshead Index (1975) of SES were assigned to the risk category.

Number of siblings. Those children who had more than two siblings at the 5 year laboratory assessment were considered at risk.

Parenting stress. Parenting stress was assessed with the total stress subscale of the Parenting Stress Index-Short Form (PSI; Abidin, 1995). The PSI includes items assessing stress associated with the parent-child relationship, the child, and the parent, measured on a 5-point scale ranging from 1 to 5 (*strongly agree, agree, not sure, disagree,* and *strongly agree)*. Those children whose mothers scored a *T*-score of 90 or

above on the total stress subscale (α = .91; Abidin, 1995) were considered at risk.

Maternal psychopathology. Maternal psychopathology was assessed with the Symptom Checklist-90 –Revised (Derogatis, 1994). Mothers rated the 90 items based on a 5-point scale ranging from 0 to 4 (*not at all, a little bit, moderately, quite a bit,* and *extremely)*, indicating how much distress the stressor caused over the previous week. Those children whose mothers scored a *T*-score at or above 60 on the General Severity Index (α = .84; Derogatis, 1994) were considered at risk.

Externalizing and Internalizing Behavior Problems. Mother's completed the Child Behavior Checklist (CBCL; Achenbach, 1991; 1992) when children were 4, 5 and 7 years. Items were rated on a 3-point scale (*Not true, Sometimes true, Often true*). Reliability for the CBCL ranged from α = .46 on the Activities subscale to α = .93 on the externalizing subscale (Achenbach, 1991, 1992). Externalizing and internalizing subscales were used as an index of behavior problems at each age. The same version of the measure was used at all three time points, thereby allowing the CBCL externalizing and internalizing raw scores to be used, where higher scores indicate more externalizing and internalizing behaviors. The externalizing and internalizing subscales were assessed at age 5 and 7 to assess both the immediate and long term effects of contextual stress. Behavior problems at 4 were entered as a first step in all regression analyses to statistically control for pre-existing problems and thus assess behavior problems that emerged after age 4. Across all time points, roughly 3% of the study sample experienced internalizing or externalizing behavior problems at the clinical level.

Emotion Regulation. Emotion regulation was assessed when children were 4 years and included parental report, physiological measures, and laboratory observation designed to assess three different aspects of children's emotion regulation: emotion regulation skills, emotional reactivity, and physiological regulation. Emotion regulation was assessed at 4 to establish that participants' emotion regulation skills were assessed prior to the measure of stress at 5, given that the Life Events measure was a 1 year retrospective account. Further, research indicating the stability of emotion regulation over time suggests that our measure of emotion regulation at 4 years is sufficient to make predictions at later time points (Calkins & Keane, 2004).

Parental Assessment. Mothers completed the Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997) which assessed parents' perceptions of their child's emotion regulation and emotionality. The ERC is a 24-item questionnaire with items rated on a 4-point Likert scale indicating the frequency of behaviors from 1 (never) to 4 (always) scale. This measure yields two subscales, Negativity/Lability and Emotion Regulation. The ERC is found have to good internal consistency on both the Negativity/Lability (α = .90) and Emotion Regulation (α = .81) subscales (Shields et al., 2001). The Negativity scale contains 15 items that refer to the child's tendency to become distressed. Items on this scale include *"exhibits wild mood swings*," "*is easily frustrated*," and "*is impulsive*." Higher scores indicate greater negativity. The Regulation scale contains 8 items that refer to the child's ability to modulate emotional reactivity. Items on this scale include *"is a cheerful child*," "*responds positively when*

adults talk to or pay attention to her/him," and *"can say when s/he is sad, angry, mad, fearful, or afraid*." Items were recoded so that higher scores indicate better emotion regulation.

Physiological Assessment. Participant's cardiac vagal regulation (RSA) was collected to assess physiological regulation. To measure vagal tone, in the laboratory the experimenter placed three electrodes in an inverted triangle pattern on the child's chest while the mother was seated next to the child. The electrodes were connected to a preamplifier, the output of which was transmitted to a vagal tone monitor (VTM-I, Delta Biometrics, Inc, Bethesda, MD) for R-wave detection. The vagal tone monitor displayed ongoing heart rate and computed and displayed an estimate of RSA (vagal tone) every 30 seconds. A data file containing the interbeat intervals (IBIs) for the entire period of collection was transferred to a laptop computer for later artifact editing (resulting from child movement) with MXEdit and analysis. While connected to the collection equipment, the child was observed during a multiepisode sequence derived from the Laboratory Temperament Assessment Battery (LAB-TAB; Goldsmith & Rothbart, 1993) and methods used in prior work (Calkins, 1997; Calkins & Keane, 2004; Kochanska, Murray & Coy, 1997). Physiological arousal of autonomic activity was measured in terms of baseline patterns of vagal tone.

The tasks included in analyses were the baseline task and the frustration task. During the baseline task, the child was instructed to sit quietly and watch a 5 minute segment of the videotape, "Spot." For the frustration task *(*Impossibly Perfect Circles*),*

the experimenter sat next to the child and asked the child to draw a perfect circle. The experimenter told them in a neutral tone each time the child drew a circle that it was not perfect and requested that they do it again. The task lasted for 3.5 minutes unless the child exhibited over 30 seconds of intense distress. Suppression scores of vagal withdrawal were calculated based on a difference score of mean vagal tone in the frustration task from the mean baseline score. A positive score indicated an increase in RSA suppression.

Laboratory Observational Assessment. Reactivity and regulation behaviors were also coded from videotapes of 2 frustration tasks. The frustration tasks include the *Impossibly Perfect Circles task* and the *Toy in Box task.* During the *Toy in Box task*, the child was given a toy in a clear, plastic box that was locked. The child was given a set of keys to try to open the box; however, the correct key was not on the key chain. This task lasted 4 minutes; however, the tasks were ended early if the child was highly distressed for more than 30 seconds.

For both frustration tasks global frustration and global regulation was coded. The global frustration code for both frustration tasks was coded on a scale from 0 to 5 (*no emotional response*, *some mild distress, mild distress most of the time, distressed, task should end with the child in extreme distress*). The global regulation code for both frustration tasks was coded on scale from 0 to 5 (*unregulated*, *mostly unregulated, somewhat regulated, mostly regulated, well regulated*). Coders trained by working together on 10% of the videotaped sessions (which were recoded after achieving

reliability) and independently coding an additional 10% for reliability. Composite laboratory reactivity and regulation variables were created by calculating an average reactivity score and an average regulation global score over the two frustration tasks.

CHAPTER V

RESULTS

Preliminary Analyses

Table two provides descriptive statistics for all study variables. Continuous variables were adequately distributed. Preliminary analyses examined gender, SES, and race differences on all study measures and found no differences. Therefore, these measures are not included in the main analyses.

Bivariate Analyses

Interrelations between all measures were examined (See Table 4). Life events were significantly and positive correlated with the risk composite. Life events were also significantly correlated in the expected direction with parent reported reactivity and lab measured regulation and the risk composite was significantly correlated in the expected direction with parent reported reactivity and regulation. As expected, parent reported reactivity was significantly and negatively correlated with regulation, and lab measured reactivity was significantly and negatively correlated with regulation. While parent reported reactivity was significantly positively correlated with lab measured reactivity and negatively correlated with lab measured regulation, parent report regulation was not. Suppression was significantly correlated only with parent report regulation. These mixed associations demonstrate that, while these measures are indices of emotion regulation,

they are assessing very different domains of the construct and tap into different aspects of emotional experiences, supporting their use separately in analyses.

Moderators of Environmental Stress and Behavior Problems

A series of hierarchical regression models were conducted to explore the associations between 4-year old's emotion regulation and their externalizing and internalizing behavior problems when they were 5 and 7 years old after experiencing contextual stress. It was hypothesized that various indices of emotion regulation would moderate the impact of environmental stress on behavior problems. These indices were tested in separate models, as they assess different components of emotion regulation and are expected to yield different effects (Cole, Michel, & Teti, 1994; Mullin & Hinshaw, 2007). Therefore, parent report regulation, parent report reactivity, physiological suppression, lab measured regulation, and lab measured reactivity were examined as moderators. Regression models were conducted for life events and contextual risk on internalizing and externalizing CBCL scores separately, given that theoretical models posit that differential outcomes are predicted for different levels of emotion regulation. These regressions were conducted for CBCL scores at age 5 and 7 to assess both short term and long term outcomes, while controlling for previous behavior problems at age 4. All continuous variables were centered around the mean. Centered variables were multiplied to create the interaction terms that were included in the model. Post-hoc analyses of significant interactions were conducted with Preacher's online tool for assessing 2 way interactions (Preacher, Curran, & Bauer, 2006). First, the regions of

significance for continuous variables were identified at $\alpha = .05$ and next conditional values were placed at 1 SD above and 1 SD below the mean values of the variables. Next, simple slopes analyses were conducted to determine whether the slope of the plotted simple regression lines were significantly different from zero. The simple slopes analysis indicated whether there was a significant difference in the association between the predictor and the dependent variables for children at high and low levels of each moderating variable (Frazier, Tix, & Barron, 2004; Aiken & West, 1991). The variables were entered into the model in the following order (step 1) CBCL score at 4, (step 2) environmental stress variable and moderating variable, and (step 3) interaction between stress and moderator.

Maternal Reported Emotion Regulation. No direct effect of life events or contextual risk at age 5 on internalizing behavior problems at age 5 or 7 was found (see Table 5). However, life events accounted for a significant amount of the variance in externalizing behavior problems at age 5. Therefore, children who experience a greater number of stressful life events are more likely to experience externalizing behavior problems during that same period of time. No direct effect of maternal reported emotion regulation was found on short or long term behavior problems. Interaction terms did not add significantly to the model.

Laboratory Assessed Emotion Regulation. Once again, a similar pattern of effects are shown. No direct effect of stressors on internalizing behavior problems was found; however, both life events and the risk index at age 5 accounted for a significant amount

of the variance in externalizing behavior problems at the same time point (see Table 6). Again, children who experience a greater number of stressors, and also those children who experienced a more stressful environment, experience greater concurrent externalizing behavior problems. Similarly, a main effect was not found for global lab regulation, and interaction terms did not add significantly to the model.

Maternal Reported Reactivity. A significant and direct effect of life events was found on externalizing behavior problems at age 5 such that children who experience greater stressful life events also experience greater externalizing behavior problems concurrently (see Table 7). Maternal reported negativity, or reactivity, accounted for a significant amount of the variance in both internalizing and externalizing behavior problems at 5 and 7. Therefore, children whose mothers report that they are more emotionally reactive at age 4 experience greater short and long term internalizing and externalizing behavior problems. The interaction of negativity and life events also added significantly to the model (see Figure 1). The significant parent report negativity x life events interaction indicated that the association between stress at age 4 and externalizing problems at age 5 was different for those children who were more emotionally labile compared to those whose mothers indicated they were less emotionally reactive. Simple slopes analyses revealed that the line representing children who experience a high degree of stressful life events was significantly different from zero (b = 1.86, p =.001), whereas the line representing children who experience a low degree of stressful life events was not (b = 1.32, *ns*). This indicates that there was a positive association between children's

experiencing of stressors and their maternal reported negativity, but only for children who experienced greater stressful life events. Therefore, children who experienced a large number of stressors, and were more emotionally reactive experienced the greatest externalizing behavior problems, while children who experienced a low level of stressors experienced a similarly lower level of behavior problems, regardless of their reactivity.

Laboratory Assessed Reactivity. Similar to previous models, there were significant and direct effects of life events and contextual risk on externalizing behavior problems at 5 (see Table 8). Again, the greater the child's environmental stress and instances of stress, the greater their experiencing of externalizing behavior problems in the short term. A significant and direct effect of lab measured reactivity was found when predicting internalizing behavior problems at 5. Children who were more emotionally reactive at 4 had greater maternal reported internalizing behavior problems at 5. Reactivity did not account for the variance in long term internalizing behavior problems, nor did it account for short or long term externalizing behavior problems. Interaction terms did not add significantly to the amount of variance accounted for by the model.

Physiological Suppression. No direct effect of environmental stress at age 5 on internalizing behavior problems at age 5 or 7 was found; however, both life events and contextual risk accounted for a significant amount of the variance in externalizing behavior problems at 5 (see Table 9). As demonstrated earlier, children who experience a greater contextual stress, now both in the number of stressors and from living in a generally risky environment, are more likely to experience subsequent externalizing

behavior problems in the short term. Physiological suppression did not significantly contribute to the model and interaction terms did not add significantly to the amount of variance accounted for by the model.

CHAPTER VI

DISCUSSION

Although children face stressors throughout development, and may grow up in an environment that puts them at risk for contextual stress, many children emerge from these experiences without adjustment difficulties. Grant and colleagues' (2003) model of stressors and the etiology of psychopathology in children and adolescents posits that moderators such as child and environmental characteristics influence this relation. The goal of this study was to investigate these moderators and to explore the link between stressors and the experience of poor outcomes. It was hypothesized that emotion regulation would moderate the immediate and long term negative effects of experiencing environmental stress. More specifically, we predicted that children who were better regulators of their emotions and less negatively reactive would have the resources to effectively cope with environmental stress and show resilience to the negative effects of stress. It was hypothesized that children who effectively regulated their emotions, were more positively reactive at 4 years, and experienced a stressful life event or lived in a risky environment at 5 years would experience less negative outcomes (in terms of externalizing and internalizing behavior problems) at 5 and 7 years, while those children who were poor regulators of their emotions would experience more negative outcomes after experiencing a stressful environment.

Life events and contextual risk at age 5 had significant and direct effects on children's experiencing of concurrent externalizing behavior problems at the same time point. This indicates that a stressful environment poses risk for externalizing behavior problems. These findings, taken with the significant yet low correlation between stressful life events and the risk index, suggest that these measures assessed separate but related components of stress. While the life events measure assessed the effects of cumulative stressors, the risk index indicated how much environmental stress the child generally experiences. In other words, the former assessed how an accumulation of discrete events adversely impacts development, while the latter assessed how an environment of cumulative risk factors on a presumably daily basis impacts functioning. Given that discrete stressors and contextual stress are indices of theoretically different types of environmental stress (Moore et al., 2006) it is not surprising that these two types of stress may call upon different resources within the child. Interestingly, while stressors were predictive of behavior problems at age 5, they did not predict later behavior problems at age 7. This suggests that the experience of stress may be transient, or that children may develop adaptive strategies over time to exist within the demands of their environment. Research does suggest that, although coping strategies are largely consistent over time, age-related changes in children's coping are found (Losoya, Eisenberg & Fabes, 1998). Moreover, it is suggested that emotion regulation processes are not static and continue to be modified even in adulthood (Charles & Carstensen, 2007). Further research

identifying the persistence of economic disadvantage and children's adjustment to contextual risk could further explore these individual protective factors and how these processes adapt to environmental demands.

The hypothesis that emotion regulation would moderate the effects of environmental stress was supported by the interaction of maternal reported negativity and stressful life events. Simple slopes analyses confirmed that, when a child experienced greater stressful life events, their emotional reactivity was predictive of subsequent behavior problems. Children who experienced low levels of stress did not vary in behavior problems regardless of their reactivity. Those children who experienced greater stressors but were not as reactive had similarly low externalizing behavior problems as compared to those children who had less stressful life events. In comparison, children who experienced a great deal of stressors and were highly reactive experienced significantly greater behavior problems at age 5. Taken together, these results suggest that when an emotionally labile child experiences a stressor they are highly reactive to this stress and experience greater difficulties adjusting during that time, while reactivity has lesser impact on children who do not have to cope with a great number of stressors. These children face less environmental stress and thus their reactivity is not a factor because it is not as frequently elicited. These findings are a first step in discerning why some children function more adaptively to stressful events. If the child faces one or two normative stressors, for example they move to a new city and start a new school, they will likely find ways to effectively adjust to these changes that affect many of their peers,

regardless of their typical reactivity. If that same child is forced to deal with several stressors, perhaps they moved because their parents divorced which was brought on by the recent death of their grandparent, these findings suggest that the child will have more adjustment difficulties, particularly when the child is emotionally reactive and labile.

Contrary to expectations, internalizing behavior problems were largely not predicted by aspects of the model. Maternal reported emotional negativity was the only variable that predicted both short and long term internalizing outcomes. One explanation for this may be that, in controlling for previous behavior problems, both internalizing and externalizing, much of the variance in children's adjustment problems was already accounted for. Although this control allowed for more stringent data analysis, the experiences of children who were already having behavioral difficulties may have been excluded from our findings. A child who was already experiencing a great deal of anxiety or aggression at 4 years may actually be most susceptible to the effects of environmental stress; however, they may have experienced a ceiling effect in terms of later behavioral outcomes. So although these children may experience the most difficulty when coping with stress, they were already exhibiting behavior problems and therefore a significant increase in behavior is unlikely. Also, given that dysregulation is often conceptualized as lying on a continuum, where internalizing behavior problems may result from an over-regulation of emotion in response to demands in the environment, is it possible that our method in assessing emotion regulation is flawed (Beauchaine, 2001; Cole, Michel, & Teti, 1994, Mullin & Hinshaw, 2007). For example, recent research has

found that, in children whose mothers experienced greater symptoms of depression, higher levels of baseline RSA was predicted to be associated with greater regulation and less reactivity, when in fact lower levels were found to buffer children from negative effects of exposure to maternal depression (Blandon, Calkins, Keane, O'Brien., 2008). Given that this construct may lie on a continuum, it may be more appropriate to look at children who are both low and very high on emotion regulation measures and differentially predict behavior problems. In doing so, we could discern whether children who may be overregulated both behaviorally and physiologically may be experiencing their own distinct adjustment difficulties, and therefore may find compelling results for children with subsequent internalizing behavior problems.

Although internalizing behavior problems were largely unaccounted for, the predictive ability of maternal reported negativity, or reactivity, is an interesting finding. Negativity, as reported by mothers when children were 4, was the only variable that predicted both internalizing and externalizing behavior problems, at ages 5 and 7. These robust findings indicate that child whose mothers report that they are emotionally labile and reactive have greater behavior problems throughout development. Both in terms of bivariate correlations, and in terms of the linear regression models, the separate indices of emotion regulation yielded very different results. The two measures of reactivity, both maternal report and lab observation, were the only moderators to have a direct effect on behavior problems. Similarly, all bivariate correlations were found in the expected direction, but these associations were sporadically correlated with each other and with the

measures of stress. These findings provide further evidence that emotion regulation, both theoretically and methodologically, is a sum of distinct but related levels of functioning (Calkins & Hill, 2007; Cole, Michel, & Teti, 1994; Mullin & Hinshaw, 2007). By measuring emotion regulation through maternal report, physiological methods, and lab observation, separate but related aspects of this construct were able to be elucidated. Finally, these separate yet related indices of emotion regulation yield important implications for this research. That different measures of regulation had differential results suggests that, given the environmental demand, one facet of emotion regulation may be called upon over others.

The premise that environmental demand may differentially call upon levels of regulation may shed light on why suppression, which was used as a physiological index of emotion regulation aimed to tap into unobservable reactivity, did not predict later adjustment problems. Recent research has suggested that high physiological reactivity serves to buffer against the consequences of a negative environment (Blandon et al, 2008). Specifically, the *biological sensitivity to context theory* suggests that greater physiological reactivity may be adaptive given the context, and that biologically reactive individuals in highly stressful environments may benefit from increased physiological vigilance, and those in very low stress environments may benefit from more readily accessing resources and support (Boyce & Ellis, 2005; Ellis, Essex, & Boyce, 2005). Therefore, it is in environments where a child experiences moderate, normative levels of stress, where the traditional experience of high physiological reactivity in association

with poor outcomes is found. In conjunction with our findings, this once again suggests that emotion regulation is not clear cut and that, not only is there an optimal level of regulation, but that this optimal level is dependent on the child's environmental demands.

Given that the separate measures of emotion regulation yielded different effects, there are several explanations as to why this finding did not occur for other predicted variables. One rationale could be that negativity or reactivity is easier for mothers to assess as it describes an observable response to the environment, whereas regulation may not be as visible to parents. Further, the laboratory measures assessed were aimed to elicit frustration and distress in an isolated incident. Although they give us important information in how children regulate and respond to the environment, they provide less information regarding how children respond to ongoing stress which might be brought on by a stressful environment, or by stressful events that one must cope with over a long period of time, such a remarriage in a family.

Limitations

Several limitations in design may have affected the outcome of this research. First, our measure of suppression was obtained by assessing the difference between baseline vagal tone and vagal tone during a frustration task, and it is possible that baseline heart rate is a more appropriate indicator of children's physiological reactivity. Further, although the lab measures during which the heart rate was collected are successful in eliciting frustration in participants, they may not adequately elicit a response similar to that a child produces when dealing with contextual stress. In other

words, these measures assessed reactions to a discrete environmental stimuli and may not be adequate to assess how a child regulates their responses to ongoing stressors such as economic disadvantage. Also, although arguments have been made to look at the cumulative, aggregate effects of stress rather than assessing life stressors independently (see Forehand, Biggar & Kotchick, 1998), the Life Events measure only assessed whether certain stressors were present or absent over the past year. Subjective experiences of whether children or parents found these stressors to in fact be distressing were not able to obtained, and as such it had to be assumed that the stressors were experienced negatively for each participant.

Summary and Conclusions

Both stressful life events and contextual risk were predictive of subsequent adjustment difficulties. These findings extend the body of research that environmental stress is predictive of externalizing behavior over and above previous behavior problems. This research also suggests that both stressful events and a chronically stressful environment have an impact on children's adaptive functioning. This suggests that stressors may impact development through many different modes, providing further support for examining individual differences in the experience of stress Given that behavior problems in the subsequent year, but not in the long term, were implicated, this suggests that stress may be transient and future studies should assess the chronicity of stressors in conjunction with developmental outcomes. Further, life events and the risk composite differentially predicted externalizing problems, providing evidence that

different aspects of stress were captured through the two measures. Internalizing behavior problems were largely not accounted for by stress or by emotion regulation processes. Given that internalizing problems have been theorized to be a result of overregulation, our assessment of greater regulation and lesser reactivity being most adaptive may be oversimplified, and assessing children at both extremes may more effectively explain these trajectories.

Maternal reported reactivity predicted externalizing behavior problems, suggesting that a child who is highly negative and emotionally labile is more likely to experience behavior problems. The interaction of reactivity and life events was also significant, indicated that child experience the greatest behavior problems when they face multiple stressors and are highly reactive emotionally. Children who did not experience a large number of life events had fewer reported behavioral problems, regardless of their reactivity. These findings suggest that the intensity and lability of a child's emotional response is a robust indicator of adjustment difficulties. They also suggest that emotion regulation is a multi-faceted construct that is best assessed when broken down into its related but distinct components. Even further, by knowing that labile children are at the greatest risk for the effects of stress, they may best benefit from early intervention and assessment when their environmental stress becomes greater and more demanding of their resources.

Although there does appear to be a relation between emotion regulation and stress in children's adjustment, further research is necessary to obtain a clearer picture on this

association. While Gross and Thompson (2008) view coping and emotion regulation as concepts of the broader construct affection regulation, is emotion regulation necessary for coping to be able to take place, are they entirely separate, or rather is it that coping is a more sophisticated form of emotion regulation? Watson and Sinha (2008) have suggested that the distinction between coping and emotion regulation as distinct versus overlapping components is necessary, and this distinction may in fact prove beneficial in teasing apart how emotion regulation is related to stress. Given recent research that suggests that these constructs are separate but related in complex ways, measures assessing both regulation and coping may more effectively elucidate the relation between stressors and psychopathology.

Assessing both high and low emotion regulation may be theoretically advantageous to determine whether some children do in fact deal *too much* with stress or face poor outcomes as a result of hypervigilance. Additionally, stress may best be measured cumulatively; however, ensuring that the child subjectively rated them as negative may be a necessary first step. By doing so, it can be ensured that the event put the child in some distress, therefore utilizing their resources for regulation or coping. Finally, research that assesses the reciprocal influence of adjustment difficulties and the experience of stress suggests that there is a bidirectional effect where children who experience stress experience internalizing and externalizing problems and are also more likely to experience stress (Kim, Conger, Elder Jr., & Lorenz, 2003). In other words, while stress may lead to poor outcomes, children who have adjustment difficulties are

also more at risk for environmental and interpersonal stress. Future research should extend this model, assessing these reciprocal influences and determining whether this link can be broken.

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APPENDIX A. TABLES

Table 1

Descriptive Statistics for Demographic Measures

Variable	N	%	M	SD	Minimum	Maximum
Child Gender						
Male	83	41.9				
Female	115	58.1				
Ethnicity						
African American	55	27.8				
Caucasian	131	66.2				
Mixed	8	4				
Other	4	2				
Child Age (months)						
4 yr			53.33	3.48	44	63
5 yr			67.66	3	55	78
7 yr			92.33	4.11	82	109
Hollingshead (SES)						
4 yr			43	10.45	20	66
5 yr			43.03	10.4	14	66
7 yr			45.16	10.59	14	66

Table 2

Descriptive Statistics for Study Variables

Measure	***N***	***M***	***SD***	***Min***	***Max***
ERC-Reactivity	198	1.86	0.34	1.13	2.87
ERC-Regulation	198	3.29	0.32	2.13	4.00
Global Lab Reactivity	198	0.82	0.63	0.00	3.00
Global Lab Regulation	198	3.09	0.62	0.50	4.00
Suppression	198	0.28	0.55	-1.25	2.85
Life Events	198	1.10	1.11	0.00	5.00
Risk Index	198	0 .82	0.88	0.00	4.00
Internalizing 4 yr	198	3.77	4.03	0.00	22.00
Externalizing 4 yr	198	9.63	6.52	0.00	36.00
Internalizing 5 yr	198	4.43	5.08	0.00	29.00
Externalizing 5 yr	198	9.31	7.10	0.00	38.00
Internalizing 7 yr	198	4.09	4.71	0.00	36.00
Externalizing 7 yr	198	6.93	6.30	0.00	34.00

Table 3

Descriptive Statistics for Overall Sample

Measure	***N***	***M***	***SD***	***Min***	***Max***
ERC-Reactivity	376	1.89	0.36	1.13	3.07
ERC-Regulation	376	3.31	0.32	2.13	4.00
Global Lab Reactivity	369	0.87	0.64	0.00	3.00
Global Lab Regulation	368	3.07	0.63	0.50	4.00
Suppression	340	0.28	0.60	-1.45	2.85
Life Events	324	1.10	1.08	0.00	5.00
Risk Index	265	0 .88	0.89	0.00	4.00
Internalizing 4 yr	376	3.94	4.21	0.00	22.00
Externalizing 4 yr	376	10.42	6.73	0.00	36.00
Internalizing 5 yr	341	4.70	5.22	0.00	38.00
Externalizing 5 yr	341	10.24	7.59	0.00	38.00
Internalizing 7 yr	328	4.50	4.98	0.00	36.00
Externalizing 7 yr	328	7.60	6.34	0.00	34.00

Table 4

Zero Order Correlation Matrix for Independent Variables

Variable	1	2	3	4	5	6	7
1. ERC-Reactivity	-						
2. ERC-Regulation	-.36**	-					
3. Global Lab Reactivity	.20**	-.00	-				
4. Global Lab Regulation	.-.24**	.13	-.68**	-			
5. Suppression	.07	-.16*	.09	-.07	-		
6. Life Events	.14*	-.11	.02	-.17*	-.02	-	
7. Risk Index	.17*	-.24**	-.07	.01	.04	.22**	-

*$p < .05$; **$p < .01$

Table 5

Summary of Hierarchical Regression Analysis for Parent Report Emotion Regulation Predicting Behavior Problems (N = 198)

	Internalizing 5 yr			Internalizing 7 yr		
	β	R^2	ΔR^2	*β*	R^2	ΔR^2
Step 1		0.52			0.29	
Internalizing (4 yr)	0.90**			0.62**		
Step 2		0.53	0.01		0.29	0.00
ERC-Regulation	-0.37				0.05	
Life Events	0.32			-0.03		
Risk Index	0.22				0.04	
Step 3		0.53	0.00		0.29	0.00
ERC-Reg x Life Event	-0.37				-0.51	
ERC-Reg x Risk Index	0.53				0.24	
Life Events x Risk Index	-0.04				-0.13	

	Externalizing 5 yr			Externalizing 7 yr		
	β	R^2	ΔR^2	*β*	R^2	ΔR^2
Step 1		0.66			0.55	
Externalizing (4 yr)	0.89**			0.72**		
Step 2		0.69	0.03		0.55	0.00
ERC-Regulation	-1.20			-1.58		
Life Events	0.72**			0.07		
Risk Index	0.66			0.20		
Step 3		0.69	0.00		0.56	0.01
ERC-Reg x Life Events	-0.41				-0.28	
ERC-Reg x Risk Index	1.43				1.58	
Life Events x Risk Index	-0.02				-0.38	

*$p < .05$; **$p < .01$

Table 6

Summary of Hierarchical Regression Analysis for Lab Assessed Regulation Predicting Behavior Problems (N = 198)

	Internalizing 5 yr			Internalizing 7 yr		
	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1		0.52			0.29	
Internalizing (4 yr)	0.91**			0.62**		
Step 2		0.53	0.01		0.29	0.00
Lab Regulation	-0.69			-0.13		
Life Events	0.25			-0.05		
Risk Index	0.27			0.04		
Step 3		0.53	0.00		0.29	0.00
Lab Reg x Life Events	-0.13			-0.05		
Lab Reg x Risk Index	-0.11			-0.07		
Life Events x Risk Index	0.08			-0.03		

	Externalizing 5 yr			Externalizing 7 yr		
	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1		0.66			0.55	
Externalizing (4 yr)	0.89**			0.72**		
Step 2		0.69	0.03		0.55	0.00
Lab Regulation	0.02			-0.08		
Life Events	0.74**			0.08		
Risk Index	0.75*			0.33		
Step 3		0.69	0.00		0.55	0.00
Lab Reg x Life Events	0.02			-0.28		
Lab Reg x Risk Index	0.53			1.58		
Life Events x Risk Index	0.19			-0.38		

*$p < .05$; **$p < .01$

Table 7

Summary of Hierarchical Regression Analysis for Parent Report Negativity Predicting Behavior Problems (N = 198)

	Internalizing 5 yr			Internalizing 7 yr		
	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1		0.52			0.29	
Internalizing (4 yr)	0.91**			0.62**		
Step 2		0.55	0.03		0.31	0.02
ERC-Negativity	2.29**			2.48**		
Life Events	0.27			-0.09		
Risk Index	0.14			-0.08		
Step 3		0.55	0.00		0.32	0.01
ERC-Neg x Life Events	0.74			-0.33		
ERC-Neg x Risk Index	0.29			-0.09		
Life Events x Risk Index	0.17			0.02		

	Externalizing 5 yr			Externalizing 7 yr		
	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1		0.66			0.55	
Externalizing (4 yr)	0.89**			0.72**		
Step 2		0.69	0.03		0.57	0.02
ERC-Negativity	2.58*			3.51**		
Life Events	0.70**			0.05		
Risk Index	0.64			0.17		
Step 3		0.70	0.01		0.58	0.01
ERC-Neg x Life Events	2.28*			0.21		
ERC-Neg x Risk Index	0.50			-0.60		
Life Events x Risk Index	0.15			0.07		

*$p < .05$; **$p < .01$

Table 8

Summary of Hierarchical Regression Analysis for Lab Assessed Reactivity Predicting Behavior Problems (N = 198)

	Internalizing 5 yr			Internalizing 7 yr		
	β	R^2	ΔR^2	*β*	R^2	ΔR^2
Step 1		0.52			0.29	
Internalizing (4 yr)	0.91**			0.62**		
Step 2		0.54	0.02		0.29	0.00
Lab Reactivity	0.86*			-0.06		
Life Events	0.31			-0.03		
Risk Index	0.29			0.03		
Step 3		0.54	0.00		0.29	0.00
Lab React x Life Events	0.08			- 0.26		
Lab React x Risk Index	-0.06			0.35		
Life Events x Risk Index	0.11			-0.16		

	Externalizing 5 yr			Externalizing 7 yr		
	β	R^2	ΔR^2	*β*	R^2	ΔR^2
Step 1		0.66			0.55	
Externalizing (4yr)	0.89**			0.72**		
Step 2		0.69	0.03		0.55	0.00
ERC-Reactivity	-0.36			0.09		
Life Events	0.74**			0.09		
Risk Index	0.73*			0.33		
Step 3		0.69	0.00		0.56	0.01
Lab React x Life Events	-0.55			-0.61		
Lab React x Risk Index	-0.03			0.58		
Life Events x Risk Index	-0.04			-0.21		

*$p < .05$; **$p < .01$

Table 9

Summary of Hierarchical Regression Analysis for Physiological Regulation (Suppression) Predicting Behavior Problems (N = 198)

	Internalizing 5 yr			Internalizing 7 yr		
	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1		0.52			0.29	
Internalizing (4 yr)	0.91**			0.62**		
Step 2		0.53	0.01		0.29	0.00
Suppression	0.48			-0.01		
Life Events	0.33			-0.03		
Risk Index	0.23			0.04		
Step 3		0.54	0.01		0.30	0.01
Supp. x Life Events	0.82			0.02		
Supp. x Risk Index	0.74			0.90		
Life Events x Risk Index	0.07			-0.12		

	Externalizing 5 yr			Externalizing 7 yr		
	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1		0.66			0.55	
Externalizing (4 yr)	0.89**			0.72**		
Step 2		0.69	0.03		0.55	0.00
Suppression	0.92			0.08		
Life Events	0.76**			0.09		
Risk Index	0.73*			0.33		
Step 3		0.70	0.01		0.56	0.01
Supp. x Life Events	0.84			-0.87		
Supp. x Risk Index	-0.20			0.12		
Life Events x Risk Index	0.07			-0.14		

*$p < .05$; **$p < .01$

APPENDIX B. FIGURES

Figure 1

Interaction of maternal reported reactivity and life events in predicting externalizing behavior problems at age 5 on the CBCL.