DENIO, ERIN B., M.A. Vulnerability in the Context of Risk: Effortful Control and Maternal Depression. (2016)
Directed by Dr. Susan P. Keane. 76 pp.

Interactions between child and parent characteristics may result in the development of normal or abnormal behavior. In some contexts, these interactions may shape the likelihood that a child develops internalizing problems. Parent characteristics include maternal depression (MD), which has been associated with children's development of anxiety and depression. Likewise, temperament is a child characteristic associated with internalizing problems. One goal of this study was to clarify whether MD and child temperament (i.e., effortful control [EC]) contribute a common diathesis to the expression of anxiety and depression or differentially predict these outcomes. Studies suggest that subcomponents of EC (i.e., attentional control, inhibitory control) differentially relate to anxiety and depression in adults and older children. Attentional control has been associated with anxiety, whereas inhibitory control has been associated with depression. The current study examined the effect of children's attentional control at age 4 on anxiety at age 5 in addition to the effect of inhibitory control at age 4 and depression at age 5. Moreover, the moderating effect of attentional control on the relation between MD at 4 and anxiety at 5 was tested. Similarly, the potential moderating effect of inhibitory control on the relation between MD at age 4 and depression at age 5 was examined. Unexpectedly, a significant interaction between inhibitory control and MD indicated that maternal depression at 4 predicts child depression at 5 at moderate and high levels of inhibitory control. The implications of this potential exacerbating effect of inhibitory control in the context of MD are discussed.

VULNERABILITY IN THE CONTEXT OF RISK: EFFORTFUL CONTROL AND MATERNAL DEPRESSION

by

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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 Arts

Greensboro
2016

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CHAPTER I

INTRODUCTION

Internalizing disorders in children and adolescents present a formidable challenge for clinical psychologists, both practitioners and researchers alike. Characterized by dysfunction in mood and emotion, children diagnosed with anxiety and depression demonstrate significant impairment across multiple domains (e.g., emotional, academic, interpersonal) and are at greater risk for suicide attempts (Kovacs & Devlin, 1998). While historically studied in older children and adults, contemporary work suggests that children as young as age 3 can present with internalizing problems (Luby et al., 2002). Moreover, for the children who develop internalizing problems early in life, these psychological difficulties often persist and become more severe in later childhood and adolescence (Coyne & Thompson, 2011). Given that these problems can become more distressing as children develop, early identification of the risk and protective factors associated with internalizing disorders is an overarching goal for both researchers and clinicians (Calkins, Blandon, Williford, & Keane, 2007).

One obstacle to the identification of salient risk and protective factors associated with internalizing problems is the high co-occurrence rate among different forms of internalizing disorders. Specifically, rates for comorbid anxiety and depression in children from both community and clinical samples may span from approximately 16-62% (Brady & Kendall, 1992; Luebbe, Bell, Allwood, Swenson, & Early, 2010).

Similarly, measures of depression and anxiety symptomology tend to range in correlation from .40 to .50 (Luebbe et al., 2010). Given these high associations in both measurement and comorbid presentation, anxiety and depressive disorders present a distinct challenge to conceptualize and measure independent of each another. In fact, some researchers have asserted that anxiety and depression represent two different expressions of the same underlying condition (Dealy, Ishiki, Avery, Wilson, & Dunner, 1981). In contrast, more contemporary studies suggest that anxiety and depression should be considered distinct but related constructs (Snyder et al., 2009).

Theories attempting to conceptually differentiate between the two disorders often highlight disparities in presentation across different domains of functioning (e.g., affect, cognition, physiology). For instance, Clark and Watson's tripartite model of depression and anxiety suggests that both disorders share the common symptom of negative affect, however, depression is particularly characterized by deficits in positive affect, whereas anxiety is characterized by high physiological arousal (Clark & Watson, 1991). Others have extended this model to the cognitive domain, suggesting that depression is characterized by "depressive" negative cognitions (e.g., focusing on failure, negative self-evaluation) as well as a lack of positive thoughts. In contrast, anxiety is reportedly characterized by "anxious" negative cognitions (e.g., focusing on threat and intolerance of uncertainty). However, this distinction between anxious and depressive cognitions is less clear in children as compared to adults, most likely due to immature cognitive capacities (Alfano, Beidel, & Turner, 2002). It appears that for adults, at least, anxiety and depression are distinct constructs. Yet, due to the nature of internalizing disorders

(characterized by internally distressing thoughts and feelings as opposed to externally observable aggression and behavior problems), more work is needed to clarify if (and in what manner) anxiety and depression are differentiated for youth, especially younger children.

Adopting this idea of distinct disorders, it has been suggested that anxiety and depression are often co-occurring due to correlated or common etiological factors (Kovacs & Devlin, 1998). In fact, some of the overlap in diagnosis has been attributed to a common genetic "liability" as demonstrated in twin studies (Mash & Barkley, 2003). Other well-established risk factors linked to internalizing disorders include socioeconomic status, child temperament, family conflict, attachment, and parental depression (Hopkins, Lavigne, Gouze, LeBailly, & Bryant, 2013). Examination of the specificity of these risk factors for either anxiety or depression, at different stages of development, would aid researchers and clinicians in the design of prevention or intervention programs tailored to the disorder. However, the majority of the extant literature examining these risk factors in early and middle childhood has focused on internalizing symptomology in general, without distinguishing between anxiety and depression in the same study (Shanahan, Calkins, Keane, Kelleher, & Suffness, 2014; Tandon, Cardeli, & Luby, 2009; Wetter & El-Sheikh, 2012). Relatively few studies have investigated differential risk factors for symptoms of anxiety and depression (Hopkins et al., 2013). Even fewer have been able to employ a longitudinal design while investigating anxiety and depression specifically. Therefore, by examining these common risk/protective factors in combination and across stages of development, researchers may

come closer to detecting differential pathways for the emergence of anxiety and depression. That is, the analysis of risk and resilience factors from a developmental perspective will clarify whether these factors contribute a common diathesis to the expression of anxiety and depression or whether they differentiate between internalizing types as distinct constructs (Hopkins et al., 2013). Thus, these data will not only contribute to the theoretical understanding of anxiety and depression but may aid in further specificity of prevention and intervention programs for anxiety and depression by informing the tailoring of treatments to fit each disorder's specific etiological profile.

In order to comprehensively study how these internalizing disorders differentiate, it is essential to gain more understanding of the developmental processes that contribute to the emergence of anxiety and depression. A developmental psychopathology perspective emphasizes that disorder (as well as normal development) results from complex interactions between individuals and multiple domains at different points in time (Cicchetti & Toth, 2009). To address this complexity, there has been a push for researchers to assess factors at multiple levels of analysis within and outside the developing person (2009). That is, building off of Bronfenbrenner's ecological model (1994), Cicchetti and Toth argue that an individual's environment is comprised of many co-existing levels which vary in proximity and salience to an individual's development. As there may be ongoing, transactional relations between a multitude of internal and external levels, it is important to identify the stimuli most salient to children's development. Cicchetti and Toth assert that the two most proximal influences are exerted by 1) the child's immediate environment (i.e., the *microsystem* level) often

conceptualized as family characteristics and 2) individual factors within the child (i.e., the *ontogenic development* level) (Cicchetti & Toth, 1998). Specifically, Cicchetti and Toth's transactional model of child depression suggests that reciprocal transactions between these two ecological levels (parent and child characteristics) may function dynamically to increase or decrease the likelihood that a child will develop internalizing symptomology (1998). As mentioned above, several parent factors (e.g., maternal depression) and individual differences in children (e.g., temperament) have been suggested to contribute risk for the development of internalizing disorders (Hopkins et al., 2013). Although the study did not examine individual and parental behaviors within explicit interactions, the theoretical framework is consistent with transactional perspectives given that both parent and child behaviors are occurring within a dyad and each member of this dyad is liable to affect the behavior of the other. Specifically, the study aimed to identify how individual differences in temperament may function as a risk or resilience factor, when associated with maternal depression, to differentially predict childhood anxiety and depression.

Maternal Depression

Children of depressed mothers are known to be at greater risk for internalizing disorders and other psychological and social problems in comparison to the general population (Beardslee, Bemporad, Keller, & Klerman, 1983). In fact, there is substantial evidence for a relation between maternal depression (MD) and maladaptive child outcomes across stages of childhood and adolescence, including both externalizing and internalizing problem behaviors (Beardslee et al., 1983). Moreover, children of depressed

mothers are three to four times more likely to develop depression before adulthood (Beardslee, Versage, & Gladstone, 1998; Silk, Shaw, Skuban, Oland, & Kovacs, 2006) and up to 45% may have an episode of major depression by late adolescence (Beardslee et al., 1998; Brennan et al., 2000). Empirically, meta-analyses reveal small to moderate effect sizes for the relation between depression in mothers assessed via self-report and diagnostic interview and children's internalizing problems. For instance, Goodman and colleagues reported a weighted-mean correlation of .23 for this association after reviewing 121 studies (Goodman et al., 2011). Taken together, studies such as these indicate that the effects of this association may be statistically "small," but reliable.

A multitude of theories have been suggested to explain the mechanisms through which MD confers risk to children. For example, studies have identified indirect pathways via parenting styles, social learning, and added family stressors such as marital conflict, as well as more direct transmission via genetic vulnerability (Goodman et al., 2011). In relation to the literature on genetic transmission, twin and adoption studies have confirmed an increased risk for internalizing problems when depression exists in a biological relative (Mash & Barkley, 2003). However, it is important to note that heritable contributions to psychopathologies such as anxiety and depression operate in combination with environmental contributors across development (Cicchetti & Toth, 2009). For this reason, it is essential to conceptualize the risk posed by MD as a culmination of dynamic and interdependent processes that may or may not lead to maladaptive outcomes (2009). That is, the presence of MD in a family marks the presence of genetic, neurobiological, as well as social risk for child internalizing

problems. Despite these multiple processes of transmission, fortunately, not all children exposed to MD go on to develop such problems.

A substantial portion of the literature has focused on identifying moderators that account for these differences in susceptibility to internalizing problems when raised by a depressed mother (Goodman et al., 2011). One well-established moderator is child age or the child's developmental stage when MD is present. More specifically, the association between MD and maladaptive child outcomes appears to be strongest during early childhood (i.e., toddlerhood and preschool age), when mothers and children spend more time together (Goodman et al., 2011; Shaw, Winslow, Owens, & Hood, 1998). Meta-analyses suggest that children's age is negatively related to the magnitude of effect sizes for the relation between maternal depression and children's internalizing problems (β= -.0004, $p < .001$, studies reviewed = 120) (Goodman et al., 2011). Researchers suggest that the effect of MD may be particularly detrimental to younger children as they have less sophisticated coping skills to deal with negative emotions such as fear and sadness and thus are more dependent on mothers to provide support or to model effective coping strategies (Coyne & Thompson, 2011). In particular, preschool-age children are still developing the ability to regulate their own mood and require substantial guidance from parents to help them reengage in enjoyable activities or provide distraction even from small stressors. However, as depressive symptomology intensifies, mothers become less responsive to their children's distress and provide less feedback about emotions (Coyne & Thompson, 2011). Taken together, the presence of a depressed mother may be particularly concerning for the healthy emotional development of younger children.

With this literature in mind, it is clear that MD can have detrimental effects on young children's behavior, particularly internalizing problems. However, it is unclear whether this increased risk for depressive symptomology, anxiety symptomology, or the expression of both is equal for children with varying degrees of individual factors, such as child temperament. The current study intends to address this question and assessed a potential interaction between parental depression and a child-specific factor (i.e., temperament) as it relates to the later development of anxiety and depression in children. In the current study, it is argued that children who demonstrate a resilient temperament will be able to regulate negative emotions despite exposure to depressed mothers and thus will be less likely to develop anxiety and depression problems. One child characteristic that may promote resiliency in the context of maternal depression is effortful control, a dimension of temperament (Rothbart, 2007).

Temperament

Temperament has been defined as "constitutionally based individual differences in reactivity and self-regulation, in the domains of affect, activity, and attention" (Rothbart & Bates, 2006). Temperament is typically established by toddlerhood and considered to have biological origins (Nigg, 2006). According to Rothbart's model (2007), temperament is comprised of individual differences within two dimensions: reactivity and self-regulation. The reactive dimension refers to the speed, intensity, and duration with which emotions, motor activity, and attention are activated and endured when presented with an arousing stimulus. In contrast, the regulatory dimension of temperament pertains to how an individual uses effortful control, such as voluntary

shifting and focusing of attention to certain stimuli, or response inhibition, the ability to plan and suppress responses to stimuli, in order to regulate the reactions associated with an arousing stimulus (Rothbart & Bates, 2006). Both regulatory and reactive aspects are important in the conceptualization of individual differences that compose children's behavioral and emotional expressions. Although a large body of research has been dedicated to examining temperamental dimensions and their association with the development of maladaptive outcomes, such as psychopathology (e.g., Attention-Deficit/Hyperactivity Disorder, anxiety, depression, conduct problems) (Barkley, 2004; Berger, 2011; Muris & Ollendick, 2005; Nigg, 2006), it is less clear how temperament may interact with other variables of risk. A detailed understanding of how these dimensions of temperament reciprocally interact with other systems (e.g., parental symptomology), per Cicchetti and Toth's transactional framework (2009), will contribute to developmental psychologists' understanding of normal and abnormal child trajectories.

Effortful Control

As internalizing disorders are characterized by dysfunctions in the regulation of emotions, such as sadness and fear, the present investigation focused on the regulatory dimension of temperament, effortful control (EC). As previously introduced, EC is a superordinate construct consisting of a broad range of abilities and is defined as "the efficiency of executive attention—including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors" (Rothbart & Bates, 2006, p. 129). Typically assessed during early childhood, an individual's capacity for EC increases between the ages of 2 and 3, and reflects robust individual differences

by the age of 4 (Kochanska & Knaack, 2003; Nigg, 2006). In fact, EC is often considered a precursor to adult personality development (i.e., conscientiousness) and thus impacts an individual's behavior throughout the lifespan (Eisenberg et al., 2009).

According to Rothbart's model, there are three components of EC including: attentional control, inhibitory control, and activation control (Evans & Rothbart, 2007). Attentional control refers to the ability to shift and focus attention as needed. For example, a child high in attentional control may be able to shift his or her attention from distracting thoughts or remain focused on a boring task. Inhibitory control refers to the suppression of behavior, such as inhibiting the impulse to speak out in class. Lastly, activation control refers to the performance of an action despite a strong tendency to avoid it. For example, a child high in activation control may start doing his math homework despite a desire to continue to play videogames. These varied regulatory skills associated with EC may aid in an individual's coping with negative feelings such as sadness and anxiety (Eisenberg et al., 2009; Zhou, Chen, & Main, 2012). For example, a child high in temperamental EC may be better able to shift his or her attention away from distressing thoughts or inhibit behaviors (e.g., temper tantrums) that may be ineffective ways of coping with negative emotions. As the construct of activation control is thought to emerge in late childhood and adolescence (Putnam, Ellis, & Rothbart, 2001), the present study focused on the subcomponents of attentional control and inhibitory control.

Greater levels of EC have been linked to a host of positive outcomes, such as increased social competence, higher academic achievement, higher empathic ability, and lower rates of aggression and externalizing disorders with small to moderate effect sizes

(Berger, 2011). However, the relation between EC and internalizing disorders such as anxiety and depression is less consistent. For instance, some researchers have found that deficits in EC are associated with higher rates of internalizing problems, suggesting that higher levels of EC may be protective from the later formation of symptoms of anxiety and depression (Berger, 2011; Lengua, 2006; Oldehinkel, Hartman, Ferdinand, Verhulst, & Ormel, 2007; Yap et al., 2011). However, others have failed to find this association (Rydell, Berlin, & Bohlin, 2003). In contrast, other researchers have suggested that *high* levels of EC at ages 2 and 3 are associated with *greater* internalizing problems at age 4 (Murray & Kochanska, 2002). It may also be possible that the relation between internalizing symptomology and EC may change depending on the way EC is measured and the stage of development being studied (2009). Yet, most recent research has suggested a negative association between EC and internalizing difficulties. That being said, researchers tend to study internalizing disorders in general when assessing for an association with EC in both the child and adult literatures (Eisenberg et al., 2009).

In terms of differences in measurement, there are a variety of instruments available to assess EC. Most EC measures can be classified as observationally coded behavioral tasks or questionnaires. Observationally coded behavioral tasks are often used to assess EC in young children (i.e., from toddlerhood to kindergarten-age). Some of the most frequently employed behavioral measures come from Kochanska's effortful control battery (Kochanska, Murray, & Harlan, 2000). In Kochanska's battery, tasks assess five effortful control functions including: delaying, slowing down motor activity, suppressing/initiating activity to a signal, effortful attention, and lowering voice. All tasks

in Kochanska's battery require children to suppress a dominant response in favor of a subdominant response. For example, delaying tasks require children to suppress behavior and wait for a pleasant event (e.g., wait to get a piece of candy from under a cup). Slowing down tasks require children to slow down motor activity (e.g., asking children to walk as slowly as possible across a six-foot-long line). Tasks assessing the ability to suppress/initiate activity to a signal involve the production of a response to one stimulus and the inhibition of a response to another stimulus (e.g., performing the behavioral command of a "good" puppet and ignoring the behavioral command of a "bad" puppet). Tasks designed to assess effortful attention require children to ignore a dominant perceptual feature of a stimulus and focus on the subdominant feature. For instance, in the Shape Stroop task children are presented with large shapes (e.g., animals, circles, common objects) and each shape is filled with smaller objects. Children are then asked to name the smaller subdominant object. Finally, in lowering voice tasks children are asked to whisper the names of popular television characters (2000). These tasks tend to be intercorrelated (2000) and the reliability for the battery is especially high between the ages of 33 and 42 months (Kochanska & Knaack, 2003).

In contrast to observationally coded behavioral tasks, which are often employed with young children in laboratory settings, questionnaires can assess EC across the lifespan in many different contexts. For instance, Rothbart and colleagues have developed a series of parent and self-report questionnaires to assess effortful control and other aspects of temperament for infants (Infant Behavior Questionnaire, IBQ; Rothbart, 1981), toddlers (Early Childhood Behavior Questionnaire, ECBQ; Putnam, Gartstein, &

Rothbart, 2006), children (i.e., Children's Behavior Questionnaire, CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001), adolescents (Early Adolescent Temperament Questionnaire, EATQ; Capaldi & Rothbart, 1992), and adults (Adult Temperament Questionnaire, ATQ; Evans & Rothbart, 2007). For the infant and child versions, parents rate on a Likert scale how much a statement describes their child (e.g., "My baby looks at pictures in books and/or magazines for 5 minutes or longer at a time," "My child can easily stop an activity when s/he is told "no"). For the adolescent and adult versions, individuals rate on a Likert scale how much a statement describes themselves. Examples of items that assess EC include: "I pay close attention when someone tells me how to do something" and "I can easily resist talking out of turn, even when I'm excited and want to express an idea." These questionnaires yield subscales measuring specific subcomponents of EC (e.g., inhibitory control, attentional control) in addition to an EC composite score based on the average of these subscales.

Other self-report questionnaires used to assess EC in adolescents and adults include the Attentional Control Scale (ACS, Derryberry & Reed, 2002) and the Effortful Control Scale (ECS, Lonigan & Phillips, 2002). The ACS measures a subcomponent of EC (attentional control) and produces specific subscales including the Attention Shifting Subscale and the Attention Focusing Subscale in addition to a total Attentional Control score. The ECS questionnaire yields specific factor scores including a Persistence/Low Distractibility score and an Impulsivity score. Lonigan and Phillips suggest using the Persistence/Low Distractibility score as an index of EC (2002). In contrast to behavioral tasks, which are coded by trained raters, questionnaires such as the CBQ and ECS require

the reporter to have sufficient insight and awareness about specific behaviors. However, questionnaires elicit ratings of an individual's behavior across a wide range of contexts and are not constrained to behavior occurring on one day in one particular setting.

Given the different contexts in which these measures assess EC, it is not surprising that correlations between questionnaire and behavioral assessments are often only small to moderate in magnitude. For example, the correlation between the composite scores from Kochanska's battery and parent reports of inhibitory control on the Children's Behavior Questionnaire is .45 (Kochanska et al., 2000). Moreover, it is notable that the majority of research suggesting that EC protects individuals from developing internalizing problems (Lengua, 2006; Oldehinkel et al. 2007; Yap et al., 2011) relied on questionnaire measures of EC in older child or adolescent samples. In contrast, the study that found *high* levels of EC to be associated with *greater* internalizing problems assessed via maternal report on the Internalizing subscale on the Child Behavior Checklist (Achenbach & Edelbrock, 1983) used Kochanska's behavioral battery of tasks (Murray & Kochanska, 2002) with children between the ages of two and four. These results highlight the importance of considering EC measurement type and age of assessment when evaluating the separate associations between EC and anxiety or depression symptoms. More work is needed to clarify if EC is protective for internalizing symptoms such as anxiety and depression with younger children when using alternate methods of assessing EC.

This demonstrated inconsistency in the association between EC and internalizing symptomology may also be due in part to the heterogeneous conceptualization of this

construct. As described above, EC is an umbrella term used for a wide array of abilities considered to contribute to a unidimensional factor. However, recently researchers have suggested that it may be more informative to investigate how specific EC functions (rather than a broad composite score) may relate to behavior (Kim, Nordling, Yoon, Boldt, & Kochanska, 2013). For instance, Kim and colleagues present findings suggesting that inhibitory abilities assessed via behavioral delaying tasks are uniquely associated with maternal report of children's total behavioral problems on the Child Symptom Inventory—4 (CSI-4; Sprafkin, Gadow, Salisbury, Schneider, & Loney, 2002). Conversely, attentional skills assessed via Stroop-like tasks are linked with academic performance, which was captured by maternal ratings of math and reading proficiency on the MacArthur Health Behavior Questionnaire (Essex et al., 2002). Similarly, in a study examining the association between effortful control and social competence in toddlers, Spinrad and colleagues found different patterns for children high in inhibitory control as opposed to attentional control (Spinrad et al., 2007). That is, toddlers *high* in the ability to suppress dominant behavioral responses (i.e., inhibitory control) as assessed via maternal report and performance on a behavioral delay task, tended to demonstrate greater maternal reported inhibition in novel situations. In contrast, children *low* in attentional control via maternal report tended to demonstrate greater maternal reported inhibition in novel situations. The authors argue that this finding demonstrates the importance of measuring different aspects of effortful control when examining specific behaviors (2007). Thus, it may be useful to examine subcomponents of EC (i.e., attentional control, inhibitory control) separately rather than a composite score in relation to child outcomes.

There is also some theoretical support for examining the subcomponents of EC in relation to symptoms of anxiety and depression. The extant literature suggests that individuals with high levels of anxiety tend to notice more threatening stimuli in their environment and have a difficult time disengaging from the threatening stimuli as compared to non-anxious controls (Amir et al., 2009; Morrison & Heimberg, 2013). Researchers have posited that this bias to attend to threatening stimuli is associated with impairments in attentional control. For instance, according to Eysenck's attentional control theory, anxiety is suggested to impair an individual's attentional control in two ways. First, anxiety is proposed to weaken an individual's ability to regulate one's attention. For instance, a person high in anxiety may have difficultly effortfully disengaging his attention from a fear-inducing stimulus. Second, Eysenck adds that anxiety increases an individual's tendency to shift from one task to another, not necessarily in an efficient manner. For example, a person high in anxiety may shift his attention much more frequently in an attempt to detect potential threatening stimuli in the immediate environment (e.g., shifting attention away from a conversation to check potential exits in the room) (Eysenck, Derakshan, Santos, & Calvo, 2007). Although Eysenck and colleagues suggest that anxiety may cause impairment of attentional control processes, this effect may also operate in the opposite direction. That is, it may also be possible that vulnerabilities in one's attentional control may increase risk for developing anxiety (Nigg, 2006). Longitudinal studies may aid researchers in determining the directionality of this association.

The relation between inhibitory control and internalizing symptoms is less clear. That is, some researchers (Bufferd et al., 2014) have provided longitudinal evidence suggesting that low levels of inhibitory control measured via behavioral battery including delay tasks at age 3 predicted greater depression symptoms at age 6 assessed via a semi-structured diagnostic interview for preschoolers (The Preschool Age Psychiatric Assessment; Egger & Angold, 2004). Additionally, research with children between the ages of 9 and 13 has linked lower levels of inhibitory control assessed via self-report on the Early Adolescent Temperament Questionnaire (Capaldi & Rothbart, 1992) with depression-related memory deficits . They argue that individuals with depression have memory deficits due to lower levels of inhibitory control, which lead to an inability to inhibit irrelevant mental information. They claim that these deficits in inhibitory control are also linked to depression-related rumination (2010). Thus, it may be possible that lower levels of inhibitory control are associated with higher levels of depressive symptoms for both children and adults. However, this may not be true in all contexts. For instance, Degnan and Fox assert that for children high in behavioral inhibition, those who also display *high* levels of inhibitory control are more likely to focus on threatening stimuli and display internalizing symptoms (Degnan & Fox, 2007). Thus, it may be possible that higher levels of inhibitory control are associated with higher levels of depressive symptoms. These disparate findings highlight the importance of considering context when examining subcomponents of effortful control as they relate to specific internalizing outcomes.

Some preliminary empirical evidence from the older children and adult literature suggests differential associations between subcomponents of effortful control and symptoms of anxiety and depression. For example, Moriya and Tanno (2008) completed a study in which Japanese undergraduates reported on their own inhibitory control, activation control, attentional control via the Adult Temperament Questionnaire (Rothbart & Evans, 2007). The participants also reported on their own symptoms of anxiety and depression via the State Trait Anxiety Inventory –State Form (Spielberger, Gorsuch, & Lushene, 1970) and the Self-rating Depression Scale (Zung, 1965), respectively. Results suggest that when controlling for anxiety, inhibitory control was negatively correlated with self-reported symptoms of depression. Conversely, when controlling for symptoms of depression, attentional control was negatively correlated with self-reported symptoms of anxiety (2008). The authors assert that these results are consistent with the presentation of anxiety and depression symptomology. That is, individuals with anxiety may have difficulty shifting their attention from potentially threatening stimuli. In contrast, individuals with depressive symptoms might have difficulty inhibiting negative thoughts.

In a similar study completed with children between the ages of 9 and 13 (Verstraeten, Bijttebier, Vasey, & Raes, 2011), participants were asked to rate their effortful control via the Effortful Control Scale (ECS, Lonigan & Phillips, 2001) and the Attentional Control Scale (ACS, Derryberry & Reed, 2002). They also reported on their own symptoms of anxiety and depression via the Penn State Worry Questionnaire for Children (Chorpita, Tracey, Brown, Collica, & Barlow, 1997) and the Children's

Depression Inventory (CDI; Kovacs, 2003), respectively. Consistent with the adult findings, children's self-report of inhibitory control on the ECS was uniquely associated with depressive symptoms and children's self-report of attentional control on the ACS was uniquely associated with anxiety symptoms (2011). As these studies were cross-sectional, the directionality of this association remains unclear. However, longitudinal work may help to answer this question. Moreover, these unique negative associations between EC subcomponents and anxiety and depression symptoms have only been found when using self-report data in older children and adults. It remains to be seen whether these results would continue to be significant in a younger population using alternate reporters of symptoms and behavioral tasks as indices of effortful control.

Effortful Control in the Context of Maternal Depression

More broadly, relatively little is known concerning children's EC (or its subcomponents) in the context of maternal depression and later development of internalizing disorders. Although it has been suggested that EC may act as a protective factor in the development of externalizing disorders in the context of maternal depression (Choe, Olson, & Sameroff, 2014; Gartstein & Fagot, 2003), results regarding the impact on internalizing disorders are less clear. There is some evidence to suggest that EC may be protective for internalizing problems within more general contexts of risk. For example, in one study examining contextual risk factors and later adjustment problems, children's effortful control measured between the ages of 8 and 12 was suggested to longitudinally moderate the relation between contextual risk and later internalizing problems (Lengua, Bush, Long, Kovacs, & Trancik, 2008). More specifically, children

were assigned three cumulative risk scores pertaining to 1) socioeconomic risk (i.e., family income, maternal education), 2) maternal risk (maternal psychopathology, maternal legal problems, adolescent parent status), and 3) environmental risk (i.e., home environment quality, household density, and neighborhood quality). Results suggest that for children lower in EC, higher maternal and environmental risk scores were associated with increases in internalizing problems over time. The authors suggest that children low in EC may be less able to control their negative emotions and may fail to employ adaptive assessments of a situation when placed in contexts of risk (2008). Thus, there is evidence to suggest that in general, when placed in riskier environments, EC may protect children from developing symptoms of anxiety and depression.

In a similar study using the same sample as the current project, investigators assessed how cumulative risk and resilience factors longitudinally influenced patterns of behavioral problems in children from ages 2 to 5. A cumulative risk score was assigned to children based on the following factors: maternal psychopathology, socioeconomic status, parenting stress, physiology, and temperament. Interestingly, results indicated that for children with the highest cumulative risk scores at age 2, higher behavioral persistence (a skill associated with EC) was marginally related to lower levels of internalizing problems at age 5. With this result in mind, the researchers suggested that the persistent characteristic of temperament is important for appropriate emotion management, which in turn is related to fewer internalizing problems (Calkins et al., 2007). That is, when placed in contexts associated with poorer outcomes (e.g., lower SES, mothers with higher psychopathology), children with more effortful control

allowing them to persist on tasks may be buffered from increases in internalizing problems. Thus, in the sample for the proposed study, there is some evidence that higher levels of a regulatory temperament can act as a protective factor in the context of risk. One aim of the current study was to further specify whether this interaction remains significant for specific internalizing problems, i.e., anxiety and depression, within a particular context of risk (i.e., maternal depression) and a more specific component of regulatory temperament.

The current study aimed to address this question of specificity. It also builds upon the developmental psychopathology literature in regards to how risk factors such as maternal depression and protective factors such as temperament may interact to differentially and longitudinally predict internalizing symptoms.

Study Goals and Hypotheses

The aim of this study was to further elucidate the relation between effortful control and internalizing symptomology in the context of risk (i.e., maternal depression). Specifically, the goals of this study were twofold. First, this study tested whether subcomponents of effortful control measured at age 4 have differential associations with the outcomes of child anxiety and depression measured at age 5. Second, the study examined how these subcomponents of effortful control may also moderate the relation between maternal depression at age 4 and child anxiety or depressive symptoms at age 5.

Consistent with previous work suggesting the greater developmental salience of maternal depression for younger children (Goodman et al., 2011), child age 4 was considered as the optimal time point to assess the predictor variable of maternal

depression in this longitudinal design. Likewise, research suggesting that individual differences in effortful control become more apparent by preschool-age (Kochanska & Knaack, 2003; Nigg, 2006) indicated that age 4 would also be an appropriate age to assess the moderating variables of effortful control subcomponents. Moreover, as the overarching goal of this study is to identify potential relations between risk and protective factors for internalizing disorders earlier on in development, age 5 was chosen as the outcome measurement point. Consistent with previous findings in the literature, it is hypothesized that:

1) Higher levels of MD at age 4 will predict increases in anxiety and depression at age 5 (Goodman et al., 2011).
2) Lower levels of attentional control at age 4 will predict increases in anxiety at age 5.
3) Lower levels of inhibitory control at age 4 will predict increases in depression at age 5.

To assess the moderation model of differential risk linked with subcomponents of EC, MD, and childhood anxiety and depression, it is hypothesized that:

4) Attentional control at age 4 will moderate the relation between MD at child age 4 and child anxiety symptomology at age 5, such that children with the highest levels of attentional control and whose mothers have the lowest levels of MD will have the fewest anxiety problems.

5) Inhibitory control at age 4 will moderate the relation between MD at age 4 and child depression symptomology at age 5, such that children with the highest levels of inhibitory control and whose mothers have the lowest levels of MD will have the fewest depression problems.

The current study contributes to the extant literature by using a longitudinal design, a dimensional assessment of child temperament, and analyzing depression and anxiety symptomology specifically in the same study. Moreover, this study offers a more comprehensive conceptualization of the distinct individual mechanisms involved in the development of anxiety and depression in children exposed to risk.

CHAPTER II

METHOD

Participants

The current study utilized data from two cohorts of children who are part of an ongoing longitudinal study of social and emotional development. The goal for recruitment was to obtain a sample of children who were at risk for developing future externalizing behavior problems, and who were representative of the surrounding community in terms of race and socioeconomic status (SES). The cohorts were recruited through child day care centers, the County Health Department, and the local Women, Infants, and Children (WIC) program. Potential participants 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. This recruitment effort resulted in a total of 307 children. There were no significant demographic differences between cohorts with regard to gender, $\chi^2(1, N = 307) = .55$, $p = .46$, race, $\chi^2(3, N = 307) = 4.83$, $p = .19$, or two-year SES, $t(305) = .13$, $p = .90$.

Of the 307 originally selected participants, some families were lost to attrition. At 4 years of age, 263 families participated. Families lost to attrition included those who

were no significant differences between families who did and did not participate at age four in terms of gender, χ^2 (1, N = 307) = 1.55, p = .21, race, χ^2 (3, N = 307) = 1.66, p = .65, and two-year SES, t (305) = -.92, p = .81. At age 5, 233 families participated, including four that did not participate in the four-year assessment. Again, there were no significant differences between families who did and did not participate in terms of gender, χ^2 (1, N = 307) = 2.64, p = .10, race, χ^2 (3, N = 307) = 4.00, p = .26, and 2-year SES, t (305) = -1.28, p = .20.

The sample for the current study included 191 children (55% female) who participated in the 4 and 5-year assessments. Families were included in the current study if they completed a 4-year laboratory visit as well as maternal-report questionnaires at ages 4 and 5. Sixty-three percent of the sample was European American, thirty percent African American, four percent biracial, and three percent other. Families were economically diverse based on Hollingshead (1975) scores at the 4-year assessment, with a range from 19 to 66 (M = 44.35, SD = 10.69) thus representing families from each level of social strata typically captured by this scale. Hollingshead scores that range from 40 to 54 reflect minor professional and technical occupations considered to be representative of middle class.

Sensitivity analysis. To assess the sensitivity of this study given its sample size and a desired statistical power level of .8, a sensitivity analysis was conducted using the software package, G*Power (Erdfelder, Faul, & Buchner, 1996). The sample size of 191 was specified as well as a 7-predictor linear regression. Regression predictors include: 1) child sex, 2) SES, 3) Age 4 Anxiety or Depression, 4) Age 5 Anxiety or Depression 5)

MD, 6) EC subcomponent, and 7) the interaction of EC subcomponent x MD. The alpha level used for this analysis was $p < .05$. Given these parameters, the smallest effect size that would be detectable while maintaining statistical power of .8 is $d = .04$.

Procedures

Each child and one parent, usually the child's mother, participated in laboratory assessments at different ages. Assessments were conducted at the University of North Carolina at Greensboro at the 4 and 5 year visits. Assessments were led by trained graduate students and research assistants. Consent was collected by experimenters at each visit prior to the start of the assessments. During the participants' visits, children and their parents completed a series of tasks that were designed to elicit emotional and behavioral responses as well as interaction between the child and parent. These tasks were filmed and subsequently coded according to predetermined coding schemas. In addition to the above-mentioned measures, questionnaires were collected from parents in regards to the child's current functioning (including report on anxiety and depressive symptoms). Teacher report of children's current functioning was considered in the formulation of this study. However, review of the child psychopathology literature suggested teacher report scales significantly underestimate children's internalizing symptomology as compared with mother report, particularly for preschool-aged children (Berg-Nielsen, Solheim, Belsky, & Wichstrom, 2012). For this reason, mother reported child outcomes were retained in this study. Parents also completed questionnaires in regards to their own individual functioning. Data resulting from questionnaires and observational coding were utilized for analysis in the current study.

Materials

Maternal depression. MD is the predictor variable in this study and was measured at the child's 4-year visit. The current study assessed maternal depression using the Depression subscale from the 90-item Symptom Checklist-90-Revised (SCL-90R) (Derogatis, 1994). In the SCL-90R, adults rate how much distress each of the 90 items has caused them in the past 7 days on a 5-point scale. A response of "1" indicates "not at all," a response of "2" indicates "a little bit," a response of "3" indicates "moderately," a response of "4" indicates "quite a bit," and a response of "5" indicates "extremely." The Depression subscale assesses for symptoms of clinical depression, such as lack of interest/motivation, low energy, and feelings of hopelessness. See Appendix A for the complete list of items that comprise the SCL-90R Depression subscale. Standardized T-scores were calculated based on gender and age norms with a higher score indicating more symptoms of maternal depression. Cronbach's alpha for the Depression subscale collected is .88.

Child effortful control. EC is the moderating variable in the proposed study, and two subcomponents of this construct were measured at child age 4 via parent report and behavioral observation.

Parent report of attentional control was assessed via an average of the Attentional Shifting and Attentional Focusing subscales on the 195-item Children's Behavior Questionnaire-Long Form (CBQ-LF) (Rothbart, Ahadi, Hershey, & Fisher, 2001). In the CBQ-LF, caregivers rate items about their child's reaction to a variety of situations and decide to what extent each item is true or untrue. Each item is rated on a scale from 1 to

7, with the additional option of selecting "N/A" or "Not Applicable." A response of "1" indicates "Extremely Untrue," a response of "4" indicates "Neither True nor Untrue," and a response of "7" indicates "Extremely True." The Attentional Focusing subscale measures the child's tendency to remain focused on a task. See Appendix B for the complete list of items that comprise the Attentional Focusing subscale. The Attentional Shifting subscale measures the child's ability to shift away or transition to different activities. See Appendix C for items specific to the Attentional Shifting subscale. Scores were calculated by averaging the items within and across these two subscales. Thus, the Attentional Control score ranges from 0-7, with a higher score indicating greater Attentional Control (Cronbach's alpha = .63).

Assessment of inhibitory control was completed using behavioral coding of the puppet Stroop task developed by Kochanska and colleagues (Kochanska, Murray, & Harlan, 2000) and recorded at the participants' 4-year lab visit. In this task, a child is presented with two puppets and instructed to do what the nice Pig puppet says (e.g., "touch your nose") but to not act on the instructions from the mean Iguana hand puppet. In order to assess children's ability to use inhibitory control, the children's responses to the Iguana were included in these analyses. For coding, each response to the iguana puppet instruction (8-10 total) was scored ranging from 0 (fully completing the Iguana's instruction) to 3 (fully ignoring the Iguana's instruction). Scores on the Iguana instruction trials were averaged to result in an Inhibition mean score with higher scores reflecting a better capacity for inhibitory control. Raters were trained to reliably score the children's responses to each puppet instruction. At least 15% of all videos were consensus coded

and spot checks of reliability occurred throughout the coding process. Raters achieved reliability with an ICC = .90.

Child anxiety symptoms. Anxiety is one of the outcome variables for this study and was measured at child age 5 using the Anxiety subscale from the 160-item Parent Rating Scale of the Behavior Assessment System for Children (BASC-PRS) (Reynolds & Kamphaus, 1998). The Anxiety subscale assesses a child's frequency and level of perfectionism, nervousness, and feelings of worry and fear by asking caregivers to report on a 0 to 3 scale, with "0" indicating that the behavior never occurs, "1" indicating that the behavior sometimes occurs, "2" indicating that the behavior often occurs, and "3" indicating that the behavior almost always occurs. See Appendix D for the Anxiety subscale items. Standardized T-scores were calculated based on group norms related to gender and age, with a higher scoring indicating more symptoms of anxiety. (Cronbach's alpha = .81). To assess for change in symptomology over time, this measure was also collected when children were 4 years old and included in analyses as a covariate (Cronbach's alpha = .77).

Child depression symptoms. Depression is one of the outcome variables for this study and was measured at child age 5 using the Depression subscale in the 160-item Parent Rating Scale of the Behavior Assessment System for Children (BASC-PRS) (Reynolds & Kamphaus, 1998). The Depression subscale assesses a child's depressive symptoms such as crying easily, loneliness, feeling sad and pessimistic, and having the desire to harm or kill oneself by asking caregivers to report on a 0 to 3 scale, with "0" indicating that the behavior never occurs, "1" indicating that the behavior sometimes

occurs, “2” indicating that the behavior often occurs, and “3” indicating that the behavior almost always occurs. See Appendix E for the Depression subscale items. Standardized T-scores were calculated based on group norms related to gender and age, with a higher scoring indicating more symptoms of depression (Cronbach’s alpha = .77). To assess for change in symptomology over time, this measure was also collected when children were 4 years old (Cronbach’s alpha = .68).

CHAPTER III

RESULTS

Preliminary Analyses

Data from the CBQ-LF and SCL-90R were imputed at the single item level to account for missing items (e.g., a mother chose not to answer certain items, accidentally skipped items, or skipped a page of items). Imputation was completed by removing all cases with completely missing data and using the expectation maximization (EM) method to impute at the item level for the remaining participants. Descriptive statistics were examined to assess for normality. Data for all variables fell within normal limits. See Table 1 for a complete listing of descriptive information on the current study's variables.

T-tests were conducted to assess for potential sex differences across the study's variables. One significant sex difference was found such that girls were rated as possessing higher rates of attentional control than boys (t (189)= -2.80, p = .008). This is consistent with the literature suggesting that preschool-aged girls tend to have higher levels of effortful control than boys (Kochanska et al., 2000). Thus, sex was included in the following regression analyses as a covariate. No other sex differences were observed among study variables.

Correlations among variables were also examined (Table 2). Correlations with demographic variables indicate several significant differences for socioeconomic status (SES) and race. More specifically, significant correlations reveal that families reporting

lower SES had children with lower levels of inhibitory control and fewer symptoms child anxiety at age 4. Race was also significantly associated with the variables of SES and inhibitory control. Results from a one-way ANOVA reveal significant differences in race for SES ($F(3, 187) = 8.02$, $p = .000$) and inhibitory control ($F(3, 187) = 2.70$, $p = .047$). Additional analyses suggest that African American participants were observed to demonstrate less inhibitory control on average compared to Caucasian participants (African Americans: M=2.26, SD=.99; Caucasian: M=2.59, SD=.74). This is consistent with research examining symptoms of attention deficit hyperactivity disorder. That is, African American children tend to be rated as exerting less inhibitory control when compared to Caucasian children (Bussing et al., 2008; DuPaul et al., 1998). Additionally, African American families were more likely to report lower SES than Caucasian families (African Americans: M=41.23, SD=10.97; Caucasian: M=46.84, SD=9.43). Given the moderate correlation between SES and race (r=.31, $p = .000$) and the desire to maximize statistical power by limiting the amount of control variables, SES was selected as a covariate for the regression analyses listed below.

The remaining significant correlations were expected. Maternal depression at child age 4 was significantly positively correlated with child depression symptoms at ages 4 and 5. Similarly, maternal depression was also significantly positively correlated with child anxiety symptoms at ages 4 and 5. This indicates that greater levels of maternal depression when children were age 4 were associated with greater levels of child anxiety and depression symptoms at ages 4 and 5. Maternal depression was also significantly negatively correlated with child attentional control. This suggests that

greater rates of maternal depression when children were age 4 were associated with lower levels of children's attentional control. Consistent with research suggesting moderate to high correlations between anxiety and depression (Brady & Kendall, 1992; Luebbe et al., 2010), children's depression symptoms at age 4 were positively correlated with concurrent symptoms of child anxiety. Likewise, children's depression symptoms at 5 year were positively correlated with concurrent child anxiety. Moreover, children's anxiety symptoms appear to be relatively stable over time with positive significant correlations between 4 year anxiety symptoms and 5 year anxiety symptoms. Likewise, children's symptoms of depression at age 4 and age 5 were highly positively correlated. Consistent with the current study's conceptualization of effortful control as a protective factor, attentional control was significantly negatively correlated with children's anxiety and depressive symptoms when children are ages 4 and 5. This suggests that as maternal ratings of attentional control decrease at child age 4, ratings of children's depression and anxiety symptoms increase concurrently as well as one year later. See Table 2 for a complete listing of bivariate correlations between study variables.

Regression Analyses

Regression models examining maternal depression and attentional control in the unique prediction of children's anxiety symptoms. A hierarchical regression analysis was performed to test the hypotheses that child anxiety at age 5 will be predicted by 1) higher levels of maternal depression at age 4, 2) lower levels of attentional control at age 4, and 3) the interaction between maternal depression and attentional control. Continuous variables were centered prior to conducting the regression analysis. The

covariates of sex and SES were entered in the first step in order to account for the significant associations described above. Child anxiety assessed at age 4 was entered in the first step in order to assess for changes in anxiety symptoms. Additionally, concurrent child depression at age 5 was entered in the first step in order to assess the contribution of attentional control and maternal depression unique to 5-year child anxiety symptoms. Maternal depression and attentional control were entered in the second step to assess for main effects. The interaction term of maternal depression X attentional control was calculated by multiplying centered maternal depression with centered attentional control and was entered in the third step of the regression.

Consistent with previous literature, maternal depression significantly predicted changes in child anxiety symptoms from age 4 to 5 $t(186) = 2.10$, $p = .04$ (see Table 3). More specifically, as rates of maternal depression increased when children were four-years old, children were more likely to demonstrate an increase in anxiety symptoms between the ages of 4 and 5. However, this effect was no long significant after accounting for coexisting symptoms of depression at age 5 (see Table 4). There was no significant main effect for attentional control. Additionally, there was no significant moderation of the link between maternal depression and child anxiety by attentional control (see Table 5).

Regression models examining maternal depression and inhibitory control in the unique prediction of children's depression symptoms. A hierarchical regression analysis was performed to test the hypotheses that child depression at age 5 will be predicted by 1) higher levels of maternal depression at age 4, 2) lower levels of inhibitory

control at age 4, and 3) the interaction between maternal depression and inhibitory control. Continuous variables were centered prior to conducting the regression analysis. The covariates of sex and SES were entered in the first step in order to account for the significant associations described above. Children's depressive symptoms assessed at age 4 were entered in the first step in order to assess for changes in children's depression symptoms. Additionally, concurrent anxiety symptoms at age 5 were entered in the first step in order to assess the contribution of inhibitory control and maternal depression unique to children's depression symptoms at age 5. Maternal depression and inhibitory control were entered in the second step to assess for main effects. The interaction term of maternal depression X inhibitory control was calculated by multiplying centered maternal depression with centered inhibitory control and was entered in the third step of the regression.

Consistent with previous literature, maternal depression significantly predicted changes in child depressive symptoms from age 4 to 5 $t(186) = 4.84$, $p < .001$. More specifically, as rates of maternal depression increased at child age 4, children were more likely to demonstrate an increase in depressive symptoms between the ages of 4 and 5. This effect was robust and remained with all covariates entered in the model (see Table 6). There was no significant main effect for inhibitory control. However, there was a significant moderation of the link between maternal depression and child depression by inhibitory control ($t(183) = 2.34$, $p = .020$, $R^2 = .64$) (see Table 7). A simple slope analysis was conducted using the guidelines developed by Aiken and West (1991). Surprisingly, slope analyses revealed that children with both moderate ($t(183) = 4.37$, $p <$

.001) and high (one standard deviation above the mean) ($t(183) = 4.83$, $p < .001$) levels of inhibitory control and mothers with greater symptoms of depression were more likely to show increases in depression symptoms between ages 4 and 5 (see Figure 1).

CHAPTER IV

DISCUSSION

The current study tested whether children's attentional control at age 4 was uniquely associated with child anxiety at age 5 and whether children's inhibitory control at age 4 was uniquely associated with child depression at age 5. Furthermore, this study examined whether higher levels of attentional control and inhibitory control protected children from the development of anxiety and depression, respectively, in the context of maternal depression.

As expected, there was a positive main effect with maternal depression at child age 4 predicting increases in children's symptoms depression at age 5. Consistent with previous literature (Beardslee et al., 1998; Goodman et al., 2011; Silk et al., 2006), this indicates that as symptoms of maternal depression increase in early childhood, children are more likely to demonstrate increases in symptoms of depression at age 5. A positive main effect was also found for maternal depression at child age 4 predicting increases in children's symptoms of anxiety at age 5. However, the effect was no longer significant when co-occurring symptoms of children's depression at age 5 were taken into account. Thus, the current study provides further evidence that maternal depression is a risk factor for early symptoms of anxiety and depression even after controlling for previous levels of internalizing problems. However, the effect appears to be more robust for the prediction of children's depressive symptoms. This is consistent with previous research suggesting

that maternal depression has a stronger link to children's depressive symptoms compared to anxiety symptoms (Goodman et al., 2011). In contrast to the effect of maternal depression, temperament alone did not predict children's internalizing symptoms at age 5. Specifically, no support was found for a main effect between attentional control at age 4 and children's anxiety at age 5 when controlling for SES, sex, children's anxiety at age 4, and children's depression at age 5. Similarly, there was no association between inhibitory control at age 4 and children's depression at age 5. Furthermore, the interaction between attentional control and maternal depression predicting child anxiety was not significant.

There are several potential reasons for the lack of a main effect on anxiety and a lack of a significant interaction between attentional control and maternal depression when predicting children's anxiety. One explanation may be the current study's measurements. It may be possible that these null findings are due to single-reporter bias. That is, mothers reported on their own symptoms of depression, their children's attentional control, and their children's anxiety symptoms one year later. Mothers may not be the best reporters for all three variables. Relying on a single reporter for analyses assessing the moderating role of attentional control may have biased the results. Observational data are often employed to remove reporter biases and may be an effective way to assess attentional control in future studies. Other alternatives include using different informants' reports (e.g., teachers) or latent variables incorporating multiple forms of measurement. In regard to the interaction between attentional control and maternal depression, it is also possible that the moderating role of attentional control changes with age. That is, effortful control

abilities become more advanced with age (Murphy, Eisenberg, Fabes, Shepard, & Guthrie, 1999), thus attentional control's attenuation of maternal depression symptoms may increase in effectiveness as children get older. Another future direction would be to examine the interaction between early maternal depression and attentional control in middle childhood predicting anxiety symptoms in early adolescence.

In contrast to null findings, a significant interaction was found for maternal depression and inhibitory control, such that children with mean to high levels of inhibitory control and mothers with greater symptoms of depression were more likely to show increases in depressive symptoms between ages 4 and 5. This finding diverges from previous research suggesting that higher levels of inhibitory control are adaptive. However, it is possible that for children exposed to depressed mothers, greater levels of inhibitory control may lead to an "over controlled" approach to their environment. That is, without guidance from an emotionally functional mother to learn appropriate strategies to deal with negative emotions, children high in inhibitory control may attempt to suppress all behaviors and emotional responses. They may be characterized by inflexibility and inability to initiate behaviors to allow them to adapt to new or stressful situations. This over controlled behavior style may also deprive children from trying new experiences and gaining potential rewards, thus leading to feelings of sadness and possible depressive symptomology. In support of this suggested exacerbating role of inhibitory control, Degnan and Fox (2007) argue that inhibitory control effectively allows some children to control their thoughts and feelings, but for others inhibitory control may increase children's tendency to focus on negative environmental stimuli.

Another explanation for this significant interaction relates to the study's measurement of inhibitory control. More specifically, researchers such as Eisenberg and colleagues (2004) argue the importance of differentiating between voluntary self-regulation (i.e., effortful control) and more involuntary reactions (i.e., reactive control). According to Eisenberg, effortful control (including inhibitory control) refers to the regulation aspect of temperament or children's ability to consciously regulate behaviors and suppress dominant responses. In contrast, reactive undercontrol refers to the reactionary aspect of temperament or children's impulsivity or automatic reactions to stimuli. Likewise, reactive overcontrol refers to children's behavioral inhibition and is characterized by unconsciously rigid, inflexible, and withdrawn behaviors. This differentiation between reactive control and effortful control may be important to consider as Eisenberg also asserts that behavioral assessments of effortful control (e.g., the puppet Stroop task employed in the current study) may represent a combination of reactive control and effortful control (Eisenberg et al., 2004; Eisenberg, Spinrad, & Eggum, 2010).

Therefore, it is possible that the current study's measurement of inhibitory control did not differentiate between aspects of voluntary and involuntary control. For example, children could receive high scores on the puppet Stroop task if they lacked an impulsive, "knee-jerk" response to respond to the incorrect puppet. But children could also receive high scores if they had an impulsive response but were successfully able to suppress the behavioral response. Thus, scores on the puppet Stroop task may represent a child's ability to voluntarily suppress the incorrect response as well as a child's initial lack of an

impulsive response. If this is the case, children's lack of impulsivity may be driving the interactive effect. In fact, there is some empirical evidence suggesting that low impulsivity is related to children's depressive symptoms. For instance, Wang, Chassin, Eisenberg, and Sprinrad (2015) present longitudinal work suggesting that children with low impulsivity in early to middle childhood had higher levels of depression five years later, even after controlling for effortful control. The authors argue that children low in impulsivity are less motivated to engage in potentially rewarding situations and demonstrate constrained behavior, which eventually leads to more serious symptoms of depression (Wang et al., 2015).

Additionally, White et al. (White, McDermott, Degnan, Henderson, & Fox, 2011) report data suggesting that a combination of low reactive control and high effortful control may increase risk for internalizing problems. More specifically, they suggest that children both *high* in behavioral inhibition and *high* in inhibitory control are more likely to focus on threatening stimuli and display anxiety symptoms. The authors argue that these constructs represent two different control systems. White et al. suggest that a combination of high levels of both voluntary and involuntary control systems leads to excessive levels of rigidity and inflexibility which may in turn lead to increases in anxiety (2011). Although the findings described by White et al. relate to the outcome of child anxiety, it is possible that in combination with maternal depression (a risk factor highly associated with child depression), high levels of inhibitory control and/or reactive control exacerbate risk for depression symptoms. Overall, results from the current study emphasize the need to examine children's individual differences in inhibitory control

(and potentially reactive undercontrol) when considering the risk posed by maternal depression in predicting children's depressive symptoms. Moreover, high inhibitory control in combination with high maternal depression appears to be a risk factor specific to child depression but not anxiety.

There are some limitations to be considered in this study. For instance, as pointed out by Eisenberg et al. (2004) behavioral measures of temperament may assess a combination of effortful control and reactive control. Thus, it is possible that the current study's assessment of inhibitory control also captured children's impulsivity. Some researchers have addressed this issue by measuring reactive control and effortful control separately and controlling for the other in statistical analyses (Wang et al., 2015). More work is needed to effectively disentangle the voluntary control system and involuntary control system in terms of measurement.

Another limitation of the study concerns the current study's reliance on maternal report to assess maternal depression and child internalizing symptomology. This use of mother reporters may have led to inflated reports of children's symptoms of anxiety and depression. According to the depression-distortion hypothesis, individuals experiencing greater levels of depression tend to exhibit negative perceptual biases of their surroundings. Thus, it is possible that mothers reporting depressive symptoms may perceive their children's behavior as more problematic than other reporters (Richters & Pellegrini, 1989). In fact, multiple studies using several reporters on children's internalizing and externalizing problems suggest that mothers reporting depressive symptoms tend to over report child adjustment problems (Gartstein, Bridgett, Dishion, &

Kaufman, 2009; Maoz et al., 2014; Ringoot et al., 2015). However, results also suggest that maternal ratings are not completely invalid (Richters & Pellegrini, 1989). Even when using alternate reporters of children's symptoms, there is a significant association between maternal depression and child internalizing symptomology (Ringoot et al., 2015). The longitudinal nature of this study helped to partially address this limitation. That is, there was a significant gap in time between mother's ratings of their depression (assessed when children were four-years-old) and the children's symptoms of anxiety and depression (assessed when children were five-years-old). It is possible that mothers' perceptions of their children's behavior were not "distorted" when they rated their five-year-olds' symptoms. Additionally, one strength of the study was its usage of a behaviorally coded task to assess inhibitory control. In this way, potential maternal "distortion" was eliminated from the measurement of children's inhibitory control. Future studies may wish to address the limitation posed by potential "depression-distortion" by including alternate reports of children's depression and anxiety symptoms such as diagnostic interviews with examiners and father report of child internalizing problems.

Another aspect of this study that may warrant more attention is the sample makeup. Notably, participants in this study came from a community-based sample. Thus, the number of children rated with clinically significant internalizing symptomology was relatively small. More specifically, 22 children (11.5% percent of the entire sample) fell in the clinically significant range (T-Score $\geq$ 65) for anxiety symptoms at age 5. Only 10 children (5.2%) fell in the clinically significant range for depressive symptoms at age 5. It is possible that the components of inhibitory control and attentional control may operate

differently when predicting clinical levels of anxiety and depression. Additionally, it is possible that the current study's hypotheses concerning the protective nature of attentional control and inhibitory control in the context of maternal depression may be confirmed in a sample of families with clinically depressed mothers. That is, mildly depressed mothers may be somewhat able to shield their symptoms from friends and family. However, when mothers reach clinically significant distress, they may be less able to engage with their children and to adequately teach them about emotions. Thus, children equipped with skills that allow them to better deal with negative emotions, despite having a clinically depressed mother, may be protected from experiencing increases in anxiety and/or depression. Future investigations could address this limitation by examining mothers and/or children with diagnoses of depression or anxiety.

Despite these limitations, the current study offers new and important insight into early temperament facets that interact with maternal depression to contribute to increases in children's depressive symptoms. Support was found for a link between maternal depression at age 4 and children's symptoms of anxiety and depression one year later. These results underscore the importance of interventions aimed at identifying depressed parents and intervening with support and counseling. Research confirms that helping mothers deal with depression improves both the mother and the child's wellbeing. For instance, a recent meta-analysis reveals that psychological treatment of mothers with depression is not only effective in decreasing symptoms of maternal depression but also decreasing children's mental health problems (Cuijpers, Weitz, Karyotaki, Garber, & Andersson, 2015). Child-focused interventions may also contribute some protective

function in the context of maternal depression. In fact, researchers such as Herba and colleagues have found that earlier entry into group-based childcare programs between the ages of 5 and 60 months tended to buffer the negative effect of maternal depression on children's internalizing problems (Herba et al., 2013). As the current study advocates for a transactional approach to the conceptualization of development, the application of treatment at the mother and child level would likely be the most effective in ameliorating disorder.

Results from this study also suggest that an aspect of child temperament may place children with depressed mothers at increased risk for depression. Children with moderate to high levels of inhibitory control appear to be at greater risk for developing early symptoms of depression when exposed to maternal depression at age 4. The identification of this individual vulnerability factor and its relation to depression specifically (as opposed to broad internalizing problems) is of great value. That is, this study offers insight into possible factors that lead to the emergence of depression symptoms specific to the preschool age period. In terms of clinical implications, empirical work investigating prevention strategies suggest that universal prevention programs are unlikely to be effective due to limited resources (Beekman, Smit, Stek, Reynolds, & Cuijpers, 2010). Thus, it is essential to identify the subsets of children of depressed mothers who are at highest risk for the development of psychopathology (e.g., children with moderate to high levels of inhibitory control). By targeting a smaller group of children at greater risk within the context of maternal depression, individually designed prevention and intervention programs have greater chance of being effectively

implemented (Goodman et al., 2011). Future work could focus on developing strategies to identify children of depressed parents who also display moderate to high levels of inhibitory control. For this smaller group of children, programs aimed at promoting flexible coping in stressful situations in addition to appropriate ways to express negative emotions may be most effective in decreasing children's risk for early depression symptoms

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APPENDIX A

SYMPTOM CHECKLIST-90-REVISED (SCL-90R)
DEPRESSION SUBSCALE

0 = Not at all, 1 = A little bit, 2= Moderately, 3= Quite a bit, and 4= Extremely

How much are you bothered by:

5. Loss of sexual interest or pleasure	0	1	2	3	4
14. Feeling low in energy or slowed down	0	1	2	3	4
15. Thoughts of ending your life	0	1	2	3	4
19. Poor appetite	0	1	2	3	4
20. Crying easily	0	1	2	3	4
22. Feeling of being trapped or caught	0	1	2	3	4
26. Blaming yourself for things	0	1	2	3	4
29. Feeling lonely	0	1	2	3	4
30. Feeling blue	0	1	2	3	4
31. Worrying too much about things	0	1	2	3	4
32. Feeling no interest in things	0	1	2	3	4
54. Feeling hopeless about the future	0	1	2	3	4
71. Feeling everything is an effort	0	1	2	3	4
79. Feelings of worthlessness	0	1	2	3	4

APPENDIX B

CHILDREN'S BEHAVIOR QUESTIONNAIRE—LONG FORM (CBQ-LF)
ATTENTION FOCUSING SUBSCALE

1 Extremely Untrue	2 Quite Untrue	3 Slightly Untrue	4 Neither True nor Untrue	5 Slightly True	6 Quite True	7 Extremely True	N/A Not Applicable

My Child…

16. When picking up toys or other jobs, usually keeps at the task until it's done	1	2	3	4	5	6	7	N/A
38. When practicing an activity, has a hard time keeping her/his mind on it (R)	1	2	3	4	5	6	7	N/A
47. Will move from one task to another without completing any of them (R)	1	2	3	4	5	6	7	N/A
125. When drawing or coloring in a book, shows strong concentration	1	2	3	4	5	6	7	N/A
144. When building or putting something together, becomes very involved in what s/he is doing, and works for long periods	1	2	3	4	5	6	7	N/A
160. Has difficulty leaving a project s/he has begun	1	2	3	4	5	6	7	N/A
171. Is easily distracted when listening to a story (R)	1	2	3	4	5	6	7	N/A
186. Sometimes becomes absorbed in a picture book and looks at it for a long time	1	2	3	4	5	6	7	N/A
195. Has a hard time concentrating on an activity when there are distracting noises (R)	1	2	3	4	5	6	7	N/A

(R) = Reverse Coded

APPENDIX C

CHILDREN'S BEHAVIOR QUESTIONNAIRE—LONG FORM (CBQ-LF)
ATTENTION SHIFTING SUBSCALE

1 Extremely Untrue	2 Quite Untrue	3 Slightly Untrue	4 Neither True nor Untrue	5 Slightly True	6 Quite True	7 Extremely True	N/A Not Applicable

My Child…

6. Is hard to get his/her attention when s/he is concentrating on something (R) 1 2 3 4 5 6 7 N/A

29. Can easily shift from one activity to another 1 2 3 4 5 6 7 N/A

95. Has a lot of trouble stopping an activity when called to do something else (R) 1 2 3 4 5 6 7 N/A

180. Has an easy time leaving play to come to dinner 1 2 3 4 5 6 7 N/A

184. Sometimes doesn't seem to hear me when I talk to her/him (R) 1 2 3 4 5 6 7 N/A

(R) = Reverse Coded

APPENDIX D

BEHAVIOR ASSESSMENT SYSTEM FOR CHILDREN, PARENT RATING SCALES (BASC-PRS)
ANXIETY SUBSCALE

PRESCHOOL VERSION ITEMS

N = Never, S = Sometimes, O = Often, and A = Almost Always

3. Is too serious	N	S	O	A
14. Worries about what parents think	N	S	O	A
24. Is afraid of dying	N	S	O	A
36. Says, “I’m not very good at this.”	N	S	O	A
47. Says, “I’m afraid I will make a mistake.”	N	S	O	A
57. Gets very upset when things are lost	N	S	O	A
69. Is nervous	N	S	O	A
80. Worries about things that cannot be changed	N	S	O	A
90. Worries	N	S	O	A
102. Worries about what teachers think	N	S	O	A
113. Says, “It’s all my fault.”	N	S	O	A
123. Is fearful	N	S	O	A

CHILD VERSION ITEMS

N = Never, S = Sometimes, O = Often, and A = Almost Always

3. Worries	N	S	O	A
15. Is too serious	N	S	O	A
38. Worries about what parents think	N	S	O	A

50. Says, “I get nervous during tests” or “tests make me nervous.”	N	S	O	A
61. Tries too hard to please others	N	S	O	A
73. Is afraid of dying	N	S	O	A
85. Worries about things that cannot be changed	N	S	O	A
96. Worries about what teachers think	N	S	O	A
107. Says, “I’m afraid I will make a mistake.”	N	S	O	A
119. Says, “I’m not very good at this.”	N	S	O	A
130. Worries about schoolwork	N	S	O	A

APPENDIX E

BEHAVIOR ASSESSMENT SYSTEM FOR CHILDREN, PARENT RATING SCALES (BASC-PRS)
DEPRESSION SUBSCALE

PRESCHOOL VERSION ITEMS

N = Never, S = Sometimes, O = Often, and A = Almost Always

6. Says, "Nobody likes me."	N	S	O	A
17. Holds a grudge	N	S	O	A
26. Cries easily	N	S	O	A
39. Is sad	N	S	O	A
50. Pouts	N	S	O	A
59. Says, "That's not fair."	N	S	O	A
64. Complains about being teased	N	S	O	A
72. Complains of being tired	N	S	O	A
83. Says, "I want to be alone" or "I liked being alone."	N	S	O	A
92. Is easily upset	N	S	O	A
105. Changes moods quickly	N	S	O	A
116. Says, "I want to die" or "I wish I were dead."	N	S	O	A
125. Whines	N	S	O	A

CHILD VERSION ITEMS

N = Never, S = Sometimes, O = Often, and A = Almost Always

7. Says, "I don't have any friends."	N	S	O	A
19. Says, "I want to kill myself."	N	S	O	A

29. Cries easily	N	S	O	A
42. Says, “Nobody understands me.”	N	S	O	A
54. Is easily frustrated	N	S	O	A
64. Is easily upset	N	S	O	A
77. Complains about not having friends	N	S	O	A
89. Changes moods quickly	N	S	O	A
99. Says, “I want to die” or “I wish I were dead.”	N	S	O	A
123. Is sad	N	S	O	A
133. Says, “I’m so ugly.”	N	S	O	A

APPENDIX F

TABLES AND FIGURES

Table 1

Means and Standard Deviations of Primary Measures and Covariates

Variable	Mean	SD	Min.	Max.	Variance	Skewness	Kurtosis
Hollingshead at age 4	44.35	10.69	19.00	66.00	114.25	-0.51	-0.46
Maternal Depression	50.80	9.54	34.00	81.00	91.00	0.03	-0.38
Inhibitory Control	2.47	0.86	0.00	3.00	0.74	-1.84	2.18
Attentional Control	4.14	0.59	2.66	5.89	0.35	-0.08	0.26
Anxiety at age 4	47.73	9.93	32.00	80.00	98.66	0.73	0.31
Depression at age 4	46.83	10.38	26.00	79.00	107.77	0.66	0.29
Anxiety at age 5	49.96	11.59	30.00	98.00	134.22	0.92	1.68
Depression at age 5	46.92	10.94	29.00	97.00	119.77	1.46	3.80

Table 2

Correlation Coefficients for Independent and Dependent Scale Variables

Measure	1	2	3	4	5	6	7	8	9
1. Hollingshead Score at age 4	--								
2. Race	.31**	--							
3. Maternal Depression	-.05	.05	--						
4. Inhibitory Control	.20**	-.17*	-.06	--					
5. Attentional Control	-.01	-.02	-.20**	.09	--				
6. Anxiety at age 4	.17*	-.05	.32**	.11	-.19*	--			
7. Depression at age 4	.14	-.06	.43**	.01	-.30**	.63**	--		
8. Anxiety at age 5	.01	-.06	.32**	.04	-.16*	.61**	.43**	--	
9. Depression at age 5	-.06	.06	.52**	-.01	-.33**	.50**	.62**	.66**	--

Note. *$p < .05$, **$p < .01$

Table 3

Maternal Depression Predicts Increases in Child Anxiety at age 5

Variable	β	R^2	ΔR^2
Step 1		.38**	
Hollingshead at age 4	-.11		
Sex	-.55		
Child Anxiety at age 4	.73**		
Step 2		.39*	.02*
Maternal Depression	.15*		

*Note. *p <.05, **p < .01*

Table 4

Child Anxiety at age 5 Regressed on Maternal Depression after Controlling for Child Depression at 5

Variable	β	R^2	ΔR^2
Step 1		.54**	
Hollingshead at age 4	-.03		
Sex	-.21		
Child Anxiety at age 4	.45**		
Child Depression at age 5	.49**		
Step 2		.55	.003
Maternal Depression	- .08		

Note. ***p* < .01*

Table 5

Child Anxiety at age 5 Regressed on Maternal Depression and Attentional Control at Age 4

Variable	β	R^2	ΔR^2
Step 1		.54**	
Hollingshead at age 4	-.03		
Sex	-.57		
Child Anxiety at age 4	.46**		
Child Depression at age 5	.55**		
Step 2		.55	.008
Maternal Depression	-3.99		
Attentional Control	1.47		
Step 3		.55	.001
Maternal Depression X Attentional Control	-.08		

Note. *$p < .05$, **$p < .01$

Table 6

Maternal Depression Predicts Increases in Child Depression at age 5

Variable	β	R^2	ΔR^2
Step 1		.59**	
Hollingshead at age 4	-.10		
Sex	-.32		
Child Depression at age 4	.37**		
Child Anxiety at age 5	.41**		
Step 2		.62**	.037**
Maternal Depression	.25**		

Note. ***p* < .01*

Table 7

Child Depression at age 5 Regressed on Maternal Depression and Inhibitory Control at Age 4

Variable	β	R^2	ΔR^2
Step 1		.59**	
Hollingshead at age 4	-.09		
Sex	-.21		
Child Depression at age 4	.38**		
Child Anxiety at age 5	.42**		
Step 2		.63**	.04**
Maternal Depression	.25**		
Inhibitory Control	-.10		
Step 3		.64*	.01*
Maternal Depression X Inhibitory Control	.13*		

Note. *$p < .05$, **$p < .01$

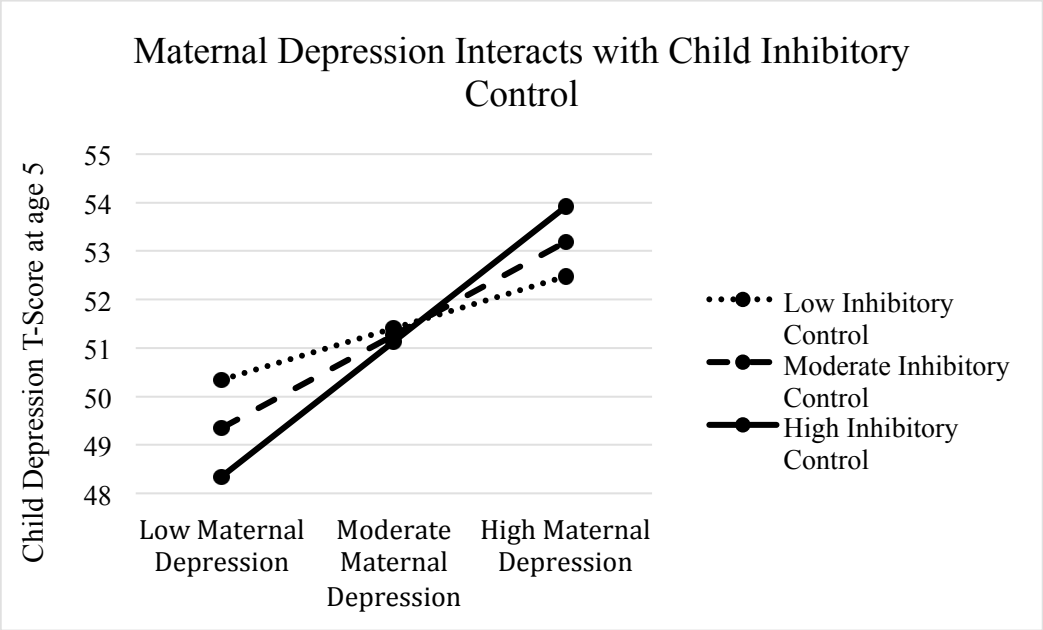

Figure 1. Maternal Depression Interacts with Child Inhibitory Control to Predict Children's Depression Scores