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The University of Southern Mississippi

A MODERATIONAL MODEL INVESTIGATING CHILD TEMPERAMENT,  
EXECUTIVE FUNCTIONING, AND CONTEXTUAL PREDICTORS OF  
EXTERNALIZING BEHAVIORS IN PRESCHOOLERS

by

Ferne Arlene Pinard

A Dissertation  
Submitted to the Graduate School  
of The University of Southern Mississippi  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy

August 2011

## ABSTRACT

### A MODERATIONAL MODEL INVESTIGATING CHILD TEMPERAMENT, EXECUTIVE FUNCTIONING, AND CONTEXTUAL PREDICTORS OF EXTERNALIZING BEHAVIORS IN PRESCHOOLERS

by Ferne Arlene Pinard

August 2011

Child externalizing behavioral problems (e.g., ADHD symptoms and aggressive behaviors) often appear early in life, are relatively stable, and are associated with maladaptive outcomes in many domains of functioning. Research has shown that, for a subset of children who demonstrate these early behavioral patterns, the course is often more pervasive and persistent. Consequently, a better understanding of externalizing behavioral problems during the preschool period is essential. The current study examined whether biologically-based correlates (i.e., child temperament and executive functioning/neurocognitive attention; EF/Attention) would moderate the relation between the contextual correlates (i.e., socioeconomic status and parenting practices) and externalizing behaviors (i.e., ADHD symptoms and aggressive behaviors) in a community sample of 138 preschoolers, approximately half of which attended Head Start. Contrary to prediction, socioeconomic status (SES) was not related to child externalizing behaviors. However, consistent with the hypotheses, more negative parenting practices, as well as higher levels of problematic child temperament dimensions and poor EF/Attention, were related to higher levels of externalizing behaviors. Additionally, the results provided partial support for the hypothesis that biologically-

based characteristics would moderate the relation both between SES and child behavior problems and between negative parental practices and child behavior problems. That is, difficult temperament or poor EF/Attention served as a risk factor for externalizing behaviors among children. Early identification of the correlates of externalizing behaviors in preschoolers—particularly in complex models considering multiple factors—is an important first step in recognizing children who might be at-risk for these maladaptive behaviors and can facilitate the development and implementation of preventative care.

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## CHAPTER I

### INTRODUCTION

According to the American Psychiatric Association (2000), between 3% and 7% of school-aged children are diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD), between >1% and 10% are diagnosed with Conduct Disorder (CD), and approximately 2% to 16% are diagnosed with Oppositional Defiant Disorder (ODD). Symptoms of these disorders include disruptive, defiant and aggressive behaviors, as well as inattention, hyperactivity and impulsivity. These symptoms, collectively referred to as externalizing behavior problems, are often first noted in the home, but may later generalize to the school setting (APA, 2000; Gartstein & Fagot, 2003). The current study examines predictors of two kinds of externalizing behaviors problems ADHD symptoms (i.e., inattention and hyperactivity) and aggressive behaviors in preschoolers. For a subset of children exhibiting these early behavioral problems, the course is more stable, persistent, and severe (Patterson, DeBaryshe, & Ramsey, 1989). These early behavioral problems can be precursors for many disabilities and associated problems (e.g., academic underachievement, antisocial behavior and psychological disorders; APA, 2000; Masten et al., 2005; Patterson et al., 1989) and can ultimately be quite costly for individuals, their families, and society at large. Nevertheless, psychological diagnoses are usually not given until the elementary school years (APA, 2000). As a result, many of these symptoms may remain untreated during the preschool years, potentially exacerbating a possible pervasive and chronic course. Therefore, the current study seeks to identify predictors of externalizing behavior among at-risk preschoolers and to address those amendable variables that can serve as protective factors against the early development of behavior problems.

Research has demonstrated that the factors influencing the development of early behavioral problems are multi-faceted and complex, including both contextually-based (e.g., parental) factors (e.g., Patterson et al., 1989; van Aken, Junger, Verhoeven, van Aken, & Deković, 2007) and biologically-based (e.g., child) factors (Belsky, 1984; Moffitt, 1993). The cumulative nature of risk factors can worsen the maladaptive outcomes for children, particularly those who live in an economically disadvantaged environment (Atzaba-Poria, Pike, & Deater-Deckard, 2004; Deater-Deckard, Dodge, Bates, & Pettit, 1998). Although various parenting practices and biologically-based child factors have been linked to child behavioral problems, there are certainly children who thrive even in adverse conditions. Thus, more research is needed to understand the complex interrelations of these variables and to illuminate possible risk and resiliency factors that should be considered when designing and implementing mental health interventions. Thus, the current study examined specific contextual factors (SES and negative parenting practices), specific biologically-based child characteristics (temperament and EF/Attention), and the complex relation which exists between them to predict child externalizing behavior (ADHD symptoms and aggressive behaviors). In the current study, aggressive behavior was operationalized as aggressive acts (e.g., hitting others), oppositional/defiant behaviors (e.g., losing temper easily & blaming others) and argumentativeness.

### Theories of Child Development

Child development is multiply determined. External influences as well as intra-familial factors affect the capacity of families to foster the healthy development of their children. Numerous theories have focused on examining influences of healthy child

development as well as when development becomes maladaptive. Three of these theories are considered in the overall theoretical framework for the current study; they are the theories of (a) Belsky (1984); (b) Patterson et al. (1989); (c) Moffitt (1993).

Belsky (1984) explained that a child's cognitive competence and healthy socioemotional development are fostered by attentive, warm, stimulating, responsive, and nonrestrictive caregiving. He reasoned that these tasks could only be achieved by adults who are mature and psychologically healthy. A longitudinal study by Jaffee, Caspi, Moffitt, Belsky and Silva (2001) reported that mothers' age at first birth was negatively associated with adverse offspring outcomes (i.e., early school leaving, long-term unemployment, early parenthood and violent offending). Additionally, children born to teen mothers were more likely to have experienced higher levels of deviant mother-child interactions, as well as inconsistent and harsh discipline. Jaffee et al. (2001) reported that teen mothers, compared to older mothers, had lower IQ and reading ability, less school certification, lower SES, and lower scores on family goal orientation, family relationship style, and parent-child relationship quality. These findings support Belsky's claim that both a lack of psychological and emotional preparation for parenting and a lack of resources to provide adequately for the needs of one's child relate to higher levels of defiant mother-child interactions and inconsistent and harsh discipline.

Belsky (1984) also presumed that there exists a link between parents' personality, psychological well-being, and their parental functioning. Additionally, Belsky argued that the child's characteristics (e.g., temperament) work to either facilitate or impede parenting. He reasoned that characteristics of children that make them more difficult to care for may adversely affect the amount and type of care they receive. The caregivers of

children with more difficult temperament may be less affectionate and responsive to their needs and may employ more negative parenting practices. At the other end of the spectrum, child characteristics which make them easier to handle ensures warm-sensitive-stimulating parenting. Furthermore, Belsky maintained that any analysis of the influences of parenting should include the context in which the parent-child interaction takes place. Thus, he identified contextual sources of stress and support that can work to directly and/or indirectly impact the psychological well being and mental health of parents and, ultimately, influence their parenting and child outcomes.

Belsky (1984) highlighted the contextual factors, parental characteristics and child characteristics that influence parenting and, inadvertently, child development. Likewise, Patterson et al. (1989) examined the role of contextual factors and their impact on parenting, but these researchers focused on explaining how these factors lead to the development of an early-onset persistent type of delinquency/antisocial behavior. These authors contend that, in early childhood, poor parental discipline and monitoring can lead to the development of conduct problems. The first stage of Patterson et al.'s model, Basic Training, occurs during the preschool period and is most applicable to the current study. In this Basic Training stage, the initial learning of coercive interactions between the child and others in his/her social environment takes place. Coercive interactions occur due to parents' noncontingent use of positive reinforcement or punishment. This inconsistency reinforces coercive child behaviors, either through positive reinforcement (attend, laugh or approve) or through escape-conditioning contingencies. Since the child successfully utilizes these contingencies to control family members' behavior through coercive means, the behavior is reinforced. Patterson et al. (1989) explain that these

maladaptive family management practices are the result of antisocial parents and grandparents, family demographics (e.g., race, SES, parental education) and family stressors (e.g., unemployment, family discord).

Although trained for deviant behaviors, Patterson et al. (1989) propose the child receives little or no training in prosocial skills. Furthermore, prosocial acts are ignored or receive inappropriate attention. Patterson et al. suggest that, in addition to having antisocial symptoms, the child is socially unskilled. This hinders adjustment as maladaptive strategies may generalize to other settings, for example school. Therefore, these early conduct problems negatively impact development during middle childhood; the child is rejected by their normal peer group and he/she also exhibits high levels of academic failure. The researchers proposed that noncompliance and disruptive behaviors may hinder academic achievement. Academic failure and rejection by the normal peer group leads to an identification with and commitment to deviant peer groups in late childhood and adolescence. The end result, then, is a severe and persistent course of delinquency throughout the life span (Patterson et al., 1989). Thus, deviant training and a lack of social skills exacerbates the course of these early behavioral problems leading to antisocial behaviors in latter childhood and adolescence. The end result, then, is a severe and persistent course of delinquency throughout the life span (Patterson et al., 1989).

Moffitt's theory (1993) of life-course-persistent offending also highlights the role of parenting practices in the production of early-onset aggression and delinquency, but unlike Patterson et al. (1989), Moffitt's theory highlights the role of biological factors. Moffitt proposes that prenatal and perinatal disruptions lead to impairments in neuropsychological functioning, specifically in executive and verbal functioning.



Furthermore, psychological characteristics such as temperament, behavioral development and cognitive abilities are influenced by anatomical structures and physiological processes within the nervous system. Therefore, neurological variations may lead to children with irritable temperaments, poor behavioral regulation, and deficits in verbal and executive functioning. Moffitt stated that deficits in these three areas have been related to problems such as overactivity, temper tantrums, poor attention and aggressive behaviors—all of which have been linked to ODD, CD, and later delinquency. At-risk infants—those with difficult temperaments and impaired cognitive abilities—are more often born to disadvantaged families, which are ill-equipped to adequately cater for a difficult child due to lack of financial resources, poor parenting skills, and high levels of stress. As a result, the parent likely responds negatively to the child behaviors; such maladaptive responses aggravate the child's behavior problems. Thus, biological deficits and disrupted social environments interact leading to the development and maintenance of early child behavior problems. The presence of biological and environmental risk factors increases the likelihood that early behavior problems will persist, increase in severity and produce the early-onset persistent offender.

Based on these theories of healthy and maladaptive child development, and as stated earlier, the current study examined specific contextual factors (SES and parenting practices), biologically-based child characteristics (temperament and EF/Attention), and the complex relation which exists between them to predict early externalizing behavior (ADHD symptoms and aggressive behaviors) in preschoolers. Discussion of these specific variables as they relate to child externalizing behaviors are further discussed below.

## The Impact of Socioeconomic Factors

Socioeconomic factors include family income, parents' occupations, parents' levels of educational attainment, parents' ages, parents' marital status, and the number of individuals living in the home (Ataba-Poria, et al., 2004; Deater-Deckard et al., 1998). An individual's socioeconomic status (SES) is usually determined by considering one or more of these factors. Many researchers have demonstrated an inverse relation between family SES and externalizing behavior problems (e.g., Amone-P'Olak, Burger, Ormel, Huisman, Verhulst & Oldehinkel, 2009; Barry, Dunlap, Cotten, Lochman, & Wells, 2005; Feldman, Hancock, Rielly, Minnes, & Cairns, 2000; Kim-Cohen, Moffitt, Caspi, & Taylor, 2004; McGee & Williams, 1999). Silva, Measelle, Armstrong, and Essex (2005) reported that children from lower SES families either had externalizing problems that increased more quickly or decreased more slowly from kindergarten through the third grade. Family SES uniquely predicted externalizing trajectories from kindergarten through the third grade. In addition to early behavior problems in preschoolers, low SES has been associated with ongoing conduct problems, even through adolescence, as well as impaired performance in academics (DuBois, Felner, Meares, & Krier, 1994; Lahey et al., 2008) and lower IQ scores (Cohen et al., 2004). Moreover, Amone-P'Olak et al. (2009) reported that low socioeconomic status was associated with an increased risk of all adolescent mental health problems, particularly aggression, delinquency, attention problems, and externalizing behaviors. Thus, socioeconomic disadvantage has been linked to more serious problems of psychopathology (e.g., ADHD, Pineda et al., 1999; CD, Steiner & Dunne, 1997). Even when children are targeted for treatment for problems, such as inattention, opposition/defiance, and aggression, SES relates to

treatment efficacy (Rieppi et al., 2002). Specifically, when parents have lower educational levels (and thereby lower SES), children tend to respond less favorably to treatment.

Individually, socioeconomic factors also predict child outcomes. Low parental education levels have been associated with an increased risk for an ADHD diagnosis (St. Sauver et al., 2004). Likewise, poverty has been associated with externalizing behaviors, cognitive development and language development (National Institute of Child Health and Human Development Early Child Care Research Network; NICHD, 2005). Furthermore, the NICHD concluded that the duration, rather than the timing of poverty, was the most consistent predictor of school readiness, cognitive development, and language development of children. Mothers' age at first birth has been negatively associated with an increased risk for adverse offspring outcomes (e.g., early school leaving, long-term unemployment, early parenthood, and violent offending) and higher levels of deviant mother-child interactions, as well as inconsistent and harsh discipline (Belsky, Bell, Bradley, Stallard, & Stewart-Brown, 2007; Jaffee et al., 2001; Scaramella, Neppl, Ontai, & Conger, 2008). Jaffee et al. (2001) also reported that teen mothers, compared to older mothers, had lower IQ and reading ability, less school certification, lower SES, and parent-child relationship quality. Thus, it may be that these negative correlates associated with being a teenage mother contribute to the problematic discipline strategies and interactions that teenage mothers have with their children.

The evidence, therefore, suggests that disadvantages cluster in families. Thus, a cumulative risk model and its relation to child outcomes in highly vulnerable samples has been examined. Appleyard, Egeland, Van Dulmen and Sroufe (2005) revealed that

cumulative risk (in this case, child maltreatment, inter-parental violence, family disruption, maternal stress, and SES) experienced in early childhood better predicted externalizing behaviors in adolescence than did cumulative risks present in middle childhood. Specifically, early cumulative risk predicted more externalizing problems, particularly in children experiencing two or more risk factors. These findings, which are consistent with those reported by other researchers (e.g., Ataba-Poria et al., 2004; Deater-Deckard et al., 1998), highlight the importance of cumulative risk, irrespective of the specific type of risk, in predicting problem behaviors, and also illustrates intricate relations which work to affect both parenting and child outcomes. Examination of these complex relations will lead to a better understanding of these factors. For example, the NICHD (2005) reported that the quality of the home environments and maternal sensitivity toward the child (i.e., mothers' sensitivity to the child's needs, positive regard and lack of intrusiveness) were the mechanisms through which poverty was related to cognitive skills and language development in children. Therefore, examining questions about child externalizing behaviors in children who are already at-risk for maladaptive outcomes due to their SES and who are underrepresented in the literature is paramount. The current study addressed this need by examining cumulative risk within a sample preschoolers which included children participating in a Head Start program who qualify for the program due to low SES. Furthermore, the current study examined SES as a specific contextual factor within the model.

#### Negative Parenting Practices and Child Externalizing Behaviors

As underscored in the aforementioned theories, particularly Patterson et al. (1989), another potential risk factor for the development of externalizing behaviors is the

use of negative parenting practices. Indeed, the quality of parenting is one of the most significant elements of young children's social environment (van Aken et al., 2007). A prolific body of research (e.g., Bailey, Hill, Oesterle, & Hawkins; 2009; Belsky, Hsieh, & Crnic, 1998; Scarmella et al., 2008) has supported the utility of parenting practices in predicting child externalizing behaviors. Belsky, Hsieh, and Crnic (1998) found that negative parenting in the second and third year of the child's life was associated with increased levels of externalizing behaviors. Additionally, specific negative parenting practices (e.g., poor parental monitoring, use of corporal punishment or coercion, and inconsistent discipline) increases the likelihood of child externalizing behaviors.

Common discipline methods linked to the development of child externalizing behaviors include harsh/punitive discipline (i.e., yelling, nagging, threatening), physical aggression (hitting, beating), and spanking (Stormshak, Bierman, McMahon, Lengua, & the Conduct Problems Prevention Research Group, 2000). Harsh discipline/harsh parenting (i.e., verbal and physical aggression) and parental coercive behaviors (i.e., the use of physical restraint, criticism and directives) increased the risk of externalizing behaviors (Gartstein & Fagot, 2003; Hughes & Ensor, 2006; Scarmella et al., 2008; Wakschlag & Keenan, 2001). Pardini, Fite, and Burke (2008) examined the relation between parent and teacher ratings of conduct problems and parenting practices using a longitudinal sample of boys assessed from 6 to 16 years of age. Results revealed that physical punishment uniquely predicted changes in both teacher and parent ratings of conduct problems from age 6.5 to 16.5, controlling for age, ethnicity, and prior conduct problems. The effects of harsh parenting on child behavior can be observed as early as toddlerhood. Hughes and Ensor (2006) reported that harsh parenting uniquely predicted

child behavior problems in two-year-olds. Relations between discipline methods and narrowband measures of child externalizing behaviors have also been noted. Stormshak et al.'s (2000) study revealed that punitive discipline and spanking uniquely predicted children's oppositional, aggressive and hyperactive behaviors, whereas severe physical aggression by the parent (i.e., throwing objects at the child, hitting the child with objects, directly hitting, pushing, grabbing, or shoving the child, and threatening to do those behaviors) uniquely predicted child aggressive behaviors only.

Psychological control, a term used to refer to disciplinary techniques such as verbal punishment and withdrawal of attention and/or affection when a child misbehaves (van Aken, Junger, Verhoeven, van Aken, & Deković, 2008), has also been associated with behavior problems. Pettit, Laird, Dodge, Bates and Criss (2001) revealed that higher levels of psychological control were associated with higher levels of delinquent behavior. Interestingly, these researchers found that mothers who utilized harsh and punitive discipline strategies in early childhood were more likely to be psychologically intrusive and manipulative in their children's early adolescent years.

Moreover, research has established an association between the inconsistent use of discipline and externalizing behaviors. Inconsistent discipline predicted higher levels of child externalizing behaviors (Lengua & Kovacs, 2005) and conduct problems in childhood (Frick, Christian, & Wootton, 1999). Inconsistent discipline has also emerged as a significant predictor of conduct problems in children of divorce (Lengua, Wolchik, Sandler, & West, 2000). Additionally, Stanger, Dumenci, Kamon and Burstein (2004) utilized path models to examine the relation between negative parenting and children's rule-breaking behavior, aggressive and oppositional behavior and attention problems for

families with a drug-dependent parent. The results revealed that, even after controlling for child's age, gender and ethnicity and the gender of the substance abusing parenting, inconsistent parenting explained a significant amount of unique variance in children's rule-breaking behavior, aggressive and oppositional behaviors, and attention problems.

Poor parental monitoring and poor parental supervision—usually referring to a parent's lack of or very limited knowledge regarding their children's activities, associates/friends or whereabouts—also have been associated with increased risk for externalizing behavior problems. High levels of parental monitoring have been associated with lower levels of delinquent behaviors (Griffin, Botvin, Scheier, Diaz, & Miller, 2000; Pettit et al., 2001) and child externalizing behaviors (Bailey, Hill, Oesterle, & Hawkins, 2009). Moreover, Frick, Christian and Wootton (1999) revealed that among children aged 9 to 17 years old, parental monitoring and supervision consistently predicted conduct problems and other externalizing behaviors in children (Bailey, Hill, Oesterle, & Hawkins, 2009; Frick, Christian, & Wootton, 1999). Poor parental monitoring is not only predictive of conduct problems; it has also been associated with exacerbating the course of these problems. Ehrensaft et al. (2003) reported that poor parental monitoring and involvement was related to the worsening course of sons' behavior problems in a sample of boys at risk for antisocial behavior, over and beyond the effects of maternal conduct disorder, and parent-child conflict. Pardini, Fite and Burke (2008) also revealed that poor parental monitoring uniquely predicted increases in both parent and teacher rated conduct problems from 6.5 to 16.5 years, after controlling for age, ethnicity, and prior conduct problems. These results revealed that poor

monitoring leads to an increasing severity of broad measures of externalizing behaviors, as well as more narrowband constructs such as aggressive behaviors and delinquency.

In addition to being linked to inappropriate discipline strategies (i.e., punitive discipline, physical aggression, and spanking), inconsistent discipline and poor monitoring, externalizing behaviors have been associated with other parenting practices. Stormshak et al. (2000) reported that low parental warmth and involvement consistently predicted oppositional behavior in children. In addition, low levels of responsive parenting (Wakschlag & Keenan, 2001) and hostile-controlling behavior (Marchand, Hock, & Widaman, 2002) also increase the risk of disruptive behaviors. A longitudinal study by Rubin, Burgess, Dwyer, and Hastings (2003) revealed that maternal negativity (hostile affect, negative control, and punishment rejection orientation) significantly predicted preschoolers' externalizing problems and was a risk factor in the relation between early child conflict-aggressive initiations and later child externalizing problems. Thus, for the toddlers of mothers who were more negative in their parenting, there was a significant association between observed conflict-aggression exhibited at age two and maternal reports of externalizing problems at age four.

Consistent with Patterson and colleagues' coercive family process model (Patterson, 1982; Patterson et al., 1989; Patterson, Reid, & Dishion, 1992), the research reviewed previously posits that more negative parenting practices predict higher levels of behavior problems. During the first stage of Patterson et al.'s (1989) model, Basic Training, which was discussed previously, the initial learning of coercive interactions between the child and others in his or her social environment takes place. The Basic Training Stage occurs during the preschool period and is most applicable to the current



study. The remaining stages of Patterson et al.'s (1992) model span development through adulthood and emphasize the detrimental effects of antisocial behavior across numerous settings, such as school, work, and home.

A large body of research has supported that negative parenting predicts child externalizing behaviors; however, contradictory findings have been reported. Fite, Colder, Lochman, and Wells (2006) examined the mutual influence between parenting and boys' externalizing behaviors from 4<sup>th</sup> to 8<sup>th</sup> grade. Fite et al. reported that parenting did not influence levels of externalizing behaviors over and beyond the stability of boys' behaviors. These researchers explained that, in middle childhood and early adolescence, psychosocial factors other than parenting, such as peer relations, may play a more prominent role in the maintenance of problem behavior. Furthermore, Fite et al. posit that at younger (or older) ages parenting may be a more strong influence on children's behavior. Thus, these researchers caution about generalizing the findings to earlier (or later) developmental periods. Similarly, Silva et al. (2005) reported that negative parenting did not significantly predict teacher-rated externalizing behaviors in kindergarten. Silva et al. reasoned that the use of independent sources to describe parenting practices and children's behavior problems, may have led to inconsistencies, which limited the predictive utility of maternal reports of parental practices in determining teacher-rated child externalizing behaviors. These researchers go on to explain that, at this early stage of development and within a community sample, parenting behaviors may relate more consistently with externalizing behavior expressed in the home, rather than those expressed at school.

Overall, negative parenting practices are both theoretically and empirically associated with child externalizing behaviors and may be particularly important during the toddler years when the interactive cycle between parents and children is newly developing. As such, parenting practices are an important contextual variable to consider in the examination of child externalizing behaviors during this developmental period. The current study examined how negative parenting practices (inconsistent discipline, poor parental monitoring/supervision, and use of punitive parenting) relate to child externalizing behaviors in preschoolers.

Although a preponderance of literature suggests the importance of contextual factors in the development of child behavior problems, as the theory espoused by Moffitt (1993) describes, biologically-based characteristics of the child, which may be linked to neurological variations, have also been shown to relate to child externalizing behaviors. The current study focused on two specific biologically-based child characteristics: temperament and EF/Attention.

Biologically-Based Child Characteristics: Child Temperament and Executive Functioning

While the association between EF and externalizing behaviors has been established in the school years and adulthood, far less is known about neuropsychological functioning and behavioral outcomes in the preschool period (Seidman, 2006), especially in at-risk, low SES, minority preschoolers. Moreover, many of the studies examining temperament and EF in the preschool period are conducted on predominantly white, middle-class individuals from intact families. Unfortunately, these studies are not representative; thus, they are limited in their generalizability and ability to inform interventions. This highlights the need for more research on at-risk samples and those

from diverse SES, racial, and family backgrounds. The current study aims to add to existing literature by examining temperament and EF/Attention in a diverse sample, which includes preschoolers at-risk for externalizing behaviors given their low SES.

### *Child Temperament*

Derryberry and Rothbart (1984) defined temperament as relatively stable, primarily biologically-based individual differences in reactivity (e.g., excitability or arousability) and self-regulation (e.g., attention, approach, avoidance, and inhibition). Self-regulatory processes identified by these researchers serve to modulate reactivity. Rothbart does not conceptualize temperament as “difficult” or “easy” but, rather, looks at dimensions of temperament. Rothbart, Ahadi, Hershey, and Fisher’s (2001) factor analysis of the Child Behavior Questionnaire (CBQ) consistently revealed three factors: (a) Negative Affectivity (tendency to display distress and negative affect such as anger, fear and sadness to environmental stimuli and difficulty being soothed); (b) Surgency (also referred to as extraversion; tendency to be sociable, easy going, adaptable to change but also to be impulsive); and (c) Effortful Control (the ability to manage and regulate attention and inhibit impulses). These three factors were employed to operationally define temperament in the current study.

Temperament has been related to development and psychopathology. Therefore, some evidence for the biological basis of temperament can be found in neurobiological and genetic studies, as well as studies examining the neurobiology of psychopathology. Whittle, Allen, Lubman, and Yücel (2006) reviewed evidence for the neurobiological basis of temperament. Based on their review of the literature, evidence linking negative affectivity, positive affectivity and constraint (affective temperamental dimensions) to

specific neural networks was presented. Specifically, negative affectivity seem to be associated with a network of regions linking the hippocampus, dorsolateral prefrontal cortex (right side specifically) and dorsal anterior cingulate cortex to the ventral anterior cingulate cortex and amygdala. Positive affectivity also appears to be linked to the dorsolateral prefrontal cortex (left side specifically) and dorsal anterior cingulate cortex to subcortical structures including the amygdala and nucleus accumbens. On the other hand, the temperamental dimension of constraint appears to be associated with a neural network linking the orbitofrontal cortex, dorsolateral prefrontal cortex and dorsal anterior cingulate cortex to the nucleus accumbens and amygdala. Thus, not only is there evidence linking temperament to specific neural networks, but also these neural networks vary depending on the dimension of temperament examined.

Evidence has also been presented for the genetic basis of temperament (Goldsmith, Buss, & Lemery, 1997; Goldsmith, Lemery, Buss, & Campos, 1999). In a study of infant twins, Goldsmith et al. (1999) reported that both genetic influences and/or environmental factors accounted for twin similarity on temperamental traits. Goldsmith et al. (1997) explained that environmental factors can be either shared or unshared by relatives. Shared environmental factors/effects refer to the likeness between twins and other family members, over and beyond that explained by common genes. Shared environmental variance also accounts for similarity of genetically unrelated individuals who were raised together. On the other hand, nonshared/unshared environmental factors/effects refers to the remaining variance not accounted for by genes or shared environment. This includes the effects of experiences that are unique to the individual. Goldsmith et al. (1999) reported that variability in the negative affectivity factor was

accounted for by genetic influences but not shared environmental factors. On the other hand, with regard to the positive affectivity factor, genetic factors as well as shared environment accounted for variability among twins. Based on the data, the researchers stated that genetic, shared and nonshared environmental factors accounted for positive affectivity, but only genetic and nonshared environmental factors accounted for negative affectivity. Varying influence of genes and environment was also observed for specific scales. The data revealed no genetic influence for soothability and a lack of a common environment effect for the scales measuring distress to limitations, distress to novelty, and activity level.

Schmidt, Fox, Perez-Edgar, and Hamer (2009) also provided evidence for the biological basis of temperament by exploring the role of a gene-endoenvironment interaction (i.e., an interaction between the dopamine D4 receptor, or DRD4 gene, and resting frontal electroencephalogram, EEG, asymmetry) in predicting child temperament. At 9 months of age, measures of frontal EEG activity were collected and groups with relative left and right frontal asymmetry were formed. When the children were 48 months old, mothers completed ratings of their children's temperament, and buccal cells were collected from the children. DNA was extracted from these cells and genotyped for the short (2–5 repeats) and long (6–8 repeats) allele of the DRD4 gene. According to Schmidt et al., the DRD4 long allele moderated the relation between resting frontal EEG asymmetry and regulation and attention. Specifically, children with the DRD4 long allele and who exhibited left frontal EEG asymmetry were significantly more soothable than children with the DRD4 long allele and who exhibited right frontal EEG asymmetry or those with the short allele and exhibited either left or right frontal EEG asymmetry.

Children who possessed the DRD4 long allele and who exhibited right frontal EEG asymmetry encountered more difficulty focusing and sustaining attention than children with the DRD4 short allele and who exhibited right frontal EEG asymmetry; they also had the lowest soothability scores. However, resting frontal EEG asymmetry did not influence temperament in the absence of the DRD4 long allele.

The stability of temperamental traits and their relatively early emergence also provides some evidence of innateness. Askan and colleagues (1999) reported that temperamental characteristics can consistently distinguish temperamental types in infants as early as one month of age. Jong, Kao, Lee, Huang, Lo, and Wang (2010) investigated whether temperament can be understood at birth by examining the relation between the pain cries of neonates at 3–5 days and maternal ratings of temperament at 1 month of age. Jong et al.'s results revealed that neonates whose cries were rated as more agitated and of greater intensity before the regulatory period appeared to have a more positive mood quality, whereas those exhibiting lower intensity pain cries before the regulatory period and higher intensity cries after the regulatory period had a higher activity temperament score at 1 month of age. Based on these results, the researchers concluded that temperament can be understood at birth and neonatal pain cry variables are valid biological measurement of temperament.

Researchers (e.g., Askan et al., 1999; Fish, Stifter, & Belsky, 1991; Matheny, Wilson, & Nuss, 1984; Akker, Deković, Prinzie, & Asscher, 2010), provided evidence that aspects of temperament remain relatively stable and consistent at different ages and across settings. Pedlow, Sanson, Prior, and Oberklaid (1993) reported that approach, irritability, inflexibility, persistency, rhythmicity, and cooperation/manageability showed

continuity from infancy to 8 years of age. Lemery, Goldsmith, Klinnert, and Mrazek (1999) reported that during the toddler-preschooler period (2 to 4 years), distress-anger, fear and activity level yielded a very stable pattern. However, considerable change in temperament during infancy was observed. Rothbart and Derryberry (1981) explained that there are periods of temperamental instability where new regulative systems can be seen as maturing, but there are also long periods of relative stability of basic temperamental characteristics. The relative stability and consistency of temperamental characteristics directly and indirectly influence later developmental outcomes, providing further evidence for its biological basis.

#### *Executive Functioning (EF)*

Executive functioning (EF), a subset of cognitive functioning traced to the prefrontal cortex, has also been associated with developmental outcomes and functional impairments in academic, social and behavioral domains. Attentional processes, impulse control, cognitive flexibility and planning, and the initiation and monitoring of action, including self-monitoring are the foundation of EF (Bayless & Stevenson, 2007). Thus, lesions in the prefrontal cortex result in loss of working memory, forgetfulness, distractibility, poor concentration, impulsivity and/or perseveration, and disorganization (Arnsten & Li, 2005).

Research has also indicated that the prefrontal cortex is extremely sensitive to its neurochemical environment (Arnsten & Li, 2005). According to Arnsten and Li, slight modifications in the catecholamines of prefrontal cortex cells can greatly impact the ability of the prefrontal cortex to guide behavior. For example, optimal levels of norepinephrine acting at postsynaptic  $\alpha$ -2A-adrenoceptors and dopamine acting at D1

receptors are essential to prefrontal cortex function. Blockage of norepinephrine  $\alpha$ -2A-adrenoceptors in prefrontal cortex noticeably weakens prefrontal cortex function, resulting in impulsivity and locomotor hyperactivity, core symptoms of ADHD. Faraone et al. (1999) reported an association between ADHD and the 7-repeat allele of the D4 dopamine receptor gene (DRD4\*7) in families ascertained through ADHD adults. DRD4\*7 is a defective gene found in about 30% of the general population and about 50% to 60% of the population with ADHD. The 7-repeat allele of the DRD4 was associated with novelty-seeking and people with high levels of this personality trait are impulsive, exploratory, excitable and quick tempered—all of which are well-known features of ADHD. Adults with ADHD have abnormally low DOPA decarboxylase activity in the prefrontal cortex, particularly in the medial and left lateral areas (Adler & Chua, 2002).

Low birth weight (Böhm, Katz-Salamon, Smedler, Lagercrantz, & Forsberg, 2002) and premature birth have also been linked to EF deficits. Bayless and Stevenson (2007) reported significant cognitive and EF impairments in a sample of children between 6 and 12 years old, who were born before 32 weeks of gestation. The pre-term intellectual abilities, as measured by the Wechsler Intelligence Scale for Children (WISC-III), were low average to average, and significantly below those of the full-term born group, whose scores were average to high average. In addition, compared to full-term babies, pre-term children also demonstrated significant, although not clinically significant, impairment in EF and attention. Disruption of development of the fetal brain (Moffitt, 1993), particularly damage in subcortical areas and damage to connections between prefrontal and striatal areas may account for these deficits (Bayless & Stevenson, 2007).



Results of twin studies have also revealed a genetic/heritably component of EF. Lessov-Schlaggar, Swan, Reed, Wolf, and Carmelli (2007) examined longitudinally the contribution of environmental and genetic influences on the performance and decline of EF in a sample of elderly male twins. EF measures were administered at three time points, when the twins were 59-70 years old, and 9- and 13-year follow-up. Results showed that genetic factors account for a significant proportion of phenotypic variability in performance on the EF tasks at each assessment. Additionally, the majority of this genetic variance was shared across repeat assessments, suggesting substantial stability of genetic influences over time. Genetic influences in EF decline were also observed.

Coolidge, Thede and Young (2000) studied the behavior of child and adolescent twins to decide the relative contributions of genetic and environmental factors to the heritability and comorbidity of ADHD, CD, ODD, and EF deficits. Results of structural equation modeling revealed sizable individual scale heritability coefficients ADHD (.82), CD (.74), ODD (.61) and EF deficits (.77). Thus an estimated 82% of the variance in ADHD, 74% of the variance in CD, 61% of the variance in ODD and 77% of the variance in EF deficits was attributed to additive genetic influences. The remaining variance was accounted for by nonshared environmental influences. Interestingly, these researchers found no evidence of shared environmental influences on ADHD, CD, ODD, or EF. Additionally, there were sizable comorbid heritability estimates for ADHD with CD, ODD, and EF deficits, suggesting that the comorbidity of ADHD with CD, ODD, and EF deficits is largely attributable to genetic influences. Again, the evidence did not support the contribution of shared environmental factors to the comorbidity among these behavioral characteristics. Based on these results, Coolidge et al. concluded that a

common genetic vulnerability underlies a number of childhood behavioral and cognitive problems. Coolidge et al. explained that their findings are consistent with larger twin studies that have demonstrated substantial genetic influences on externalizing disorders. Additionally, these researchers stated that their results—which indicated no evidence of shared environmental influences on ADHD, CD, ODD, or EF—is consistent with the literature. Based on these findings, the researchers concluded that family, school, and peer influences do not appear to contribute significantly to the variability in these behavioral characteristics. Although these results are consistent with the literature, Coolidge et al. cautioned that the small number of twins included in the study, the use of community based samples, and the complete reliance on maternal ratings of child behavior may impact the replicability and generalizability of their results. To increase the current study's replicability and generalizability, the study was conducted on a diverse community sample which included a group of preschoolers from low SES backgrounds. The current study did not rely exclusively on parent report of child behavior. Teacher ratings were also obtained to provide information from a different source observing the child in a different environment.

Although the research reviewed thus far has considered children's temperament and EF separately, the two constructs may interface quite a bit. As discussed previously, Rothbart et al. (2001) identified three dimensions of temperament: Negative Affectivity, Surgency and Effortful Control. Effortful control is comprised of various aspects of temperament (i.e., attention focusing, inhibitory control, pleasure from low-intensity stimulation, and perceptual sensitivity) and it is viewed as a regulatory component of temperament in that it allows children to shift their attention away from threatening

stimuli and to orient their attention toward soothing stimuli (Rothbart et al., 2001). Chang and Burns (2005) posit that the temperamental dimension Effortful Control is the most significant for understanding attentional skills in children as it likely involves EF (Zhou et al., 2007). Despite some similarity between Effortful Control and EF, Chang and Burns explained that these are two distinct constructs. These researchers posit that Effortful Control, not attention networks, has been shown to regulate more reactive emotional aspects of temperament such as Negative Affectivity. In addition, Chang and Burns explain that the method of measuring Effortful Control and EF further demonstrates their difference. Effortful Control has been measured behaviorally by utilizing delay of gratification tasks or through questionnaires. The focus of questionnaires assessing Effortful Control is similar to the behavioral indexes. On the other hand, EF is assessed via performance tasks that measure children's reaction time and accuracy to a series of stimuli.

The literature reviewed provides substantial support for the biological basis of temperament and EF. Individually and in combination with other factors (e.g., contextual factors), these biologically-based child characteristics work to influence child behavior. The influence of child temperament and EF on child behavior and the interaction of child temperament and parenting will be discussed in detail in the following sections.

#### Relation of Child Temperament to Parenting and Child Externalizing Behaviors

##### *Child Temperament and Child Externalizing Behaviors*

Research examining the relation of temperament to child behavior has either conceptualized temperament dichotomously (easy versus difficult) or dimensionally (temperamental traits). Thomas and Chess (1977) popularized and validated the

“difficult,” “easy,” and “slow to warm up” temperamental categories. These researchers operationally defined “difficult temperament” as “irregularity in biological functions, negative withdrawal responses to new stimuli, non-adaptability or slow adaptability to change, and intense mood expressions which are frequently negative” (p. 23). Many researchers influenced by Thomas and Chess have examined temperament dichotomously (i.e., “easy” and “difficult” temperaments).

Although researchers’ conceptualizations of what constitutes “difficult” temperament and how it should be defined and measured differ, it has been widely accepted that infants with more “difficult” temperaments are more likely to exhibit externalizing behaviors (Copland, Bowker, & Cooper, 2003; Eisenberg et al., 2010; Lengua & Kovacs, 2005; Rubin et al., 2003). Additionally, both parents and teachers reported a greater frequency of attention problems, thought problems, aggressive behaviors, and externalizing behavior problems in the clinical range during childhood among children who had been classified as having a difficult temperament at 1.5 years (Guerin, Gottfried, & Thomas, 1997).

Nevertheless, research employing a dimensional view of temperament is becoming increasingly popular. Eiden, Edwards, and Leonard (2007) reported that Effortful Control measured in preschoolers of alcoholic families was associated with externalizing behaviors measured concurrently and when they were in kindergarten. Specifically, higher Effortful Control at both time points were associated with lower levels of externalizing behaviors (both parent and teacher report), even after variance attributable to initial levels of externalizing behaviors was controlled.

In line with this, Zhou et al. (2007) longitudinal study of children between the ages of 5 and 10 revealed that children with high and stable Effortful Control (i.e., attention focusing and attentional and behavioral persistence) displayed low and stable externalizing problems across time. However, variety emerged among children with low and/or less stable trajectories of Effortful Control. Specifically, some children with this profile displayed moderate to high and relatively concurrent externalizing problems, which remained relatively stable over time, whereas others exhibited low levels of externalizing problems during childhood, but marked increases in behavior problems were evident through the elementary school years. Based on these findings, Zhou et al. concluded that deficits in Effortful Control may be differentially manifested as increases in externalizing behaviors at different developmental periods.

Other dimensions have also been related to child externalizing behaviors. Karreman, de Haas, van Tuijl, van Aken, and Dekovic (2010) revealed that higher scores on the temperamental traits of Impulsivity and Anger are associated with more externalizing behavior problems in preschoolers. Likewise, Rubin et al. (2003) reported that the temperamental dimension Behavioral and Emotional Undercontrol (anger-frustration, low effortful control, and low social fear) measured at age 2 predicted externalizing behaviors at age 4; higher rates of externalizing behaviors were observed in children high on Behavioral and Emotional Undercontrol. Martel et al. (2009) also reported that the temperamental dimension Low Reactive Control (defined as being restless and fidgety; reacting and moving quickly) predisposes children to the development of inattention/hyperactivity. In addition, Caspi, Henry, McGee, Moffitt, and Silva (1995) revealed that the temperament dimension, Lack of Control (a composition of

emotional lability, restlessness, short attention span and negative affect), assessed at age 3, 5, 7, and 9 years, was positively correlated with teacher and parent reports of Inattention, Hyperactivity, and Antisocial Behavior at ages 9 and 11 as well as through mid-adolescence. In addition to being linked to externalizing behavior problems, lack of control measured during infancy and childhood has been associated with more severe forms of psychopathology and criminal convictions in adulthood (Henry, Caspi, Moffitt, & Silva, 1996). Specifically, those participants who had higher scores on lack of control as children were more likely to have been convicted for violent crimes and also had more total convictions.

In addition, the affective components have been associated with child externalizing behaviors (Nigg, Goldsmith, & Scahek, 2004). Individuals who display higher levels of Negative Affectivity are also more likely to engage in antisocial behavior (Stice & Gonzales, 1998). Interestingly, Nigg et al. also proposed that the affective component of temperament may also be related to ADHD symptoms, particularly for children with comorbid ADHD and aggressive or oppositional behaviors. It is likely that the regulatory and reactive domains of temperament may both be important contributing factors, especially when considering ADHD with comorbid conditions. Nigg et al. proposed that these children, typically characterized by low levels of effortful control, are vulnerable to a reactive temperament and, hence, are at greater risk for comorbid disorders. The high rates of comorbid externalizing behaviors associated with ADHD makes this argument plausible. Eisenberg et al. (2005) provides additional support for the theory that low levels of Effortful Control and high emotionality (i.e., negative emotionality) contribute to externalizing behaviors in children. Like the other dimensions

of temperament, Surgency/Extraversion has been associated with externalizing behaviors and ADHD (Rettew & McKee, 2005). Rettew and McKee propose that the relation between Surgency/Extraversion and ADHD may be a function of the comorbidity between ADHD and other disruptive disorders. However, there is a paucity of research examining the relation between Surgency/Extraversion and ADHD and other disruptive behaviors. Rettew and McKee explain that this can partly be attributed to the tendency of early research to focus on “difficult” temperaments.

Finally, in a study examining temperament and its relation to ADHD symptoms and aggressive behaviors among Head Start preschoolers, Pinard (2007) reported that the temperament dimensions of Surgency and Negative Affectivity uniquely predicted parent report of child aggressive behaviors. Additionally, all three dimensions of temperament (i.e., Surgency, Negativity and Effortful Control) uniquely predicted parent ratings of child ADHD symptoms, but Effortful Control was the only unique predictor of teacher ratings of child ADHD symptoms. Higher levels of Surgency and Negative Affectivity were related to higher levels of parent ratings of ADHD symptoms, whereas lower levels of Effortful Control were associated with higher levels of both parent and teacher ratings of ADHD symptoms.

The research presented in this section suggests that various dimensions of temperament may differentially relate to externalizing behaviors and subsequent negative outcomes. Thus, these and other studies underscore the importance of considering narrowband measures of externalizing behaviors as they relate to temperamental dimensions, a specific goal of the current study.

### *Temperament as a Moderator*

In an effort to understand the intricate relation between parental practices and child externalizing behaviors, researchers have examined child temperament as a possible moderator and mediator in the relation between contextual factors (including parenting practices) and child behaviors. For example, Paterson and Sanson (1999) found a moderating influence for temperamental inflexibility; specifically, punitive parenting predicted higher levels of externalizing behaviors only in the presence of high levels of temperamental inflexibility. This finding illustrates a temperament by parenting interaction in the development of externalizing problems. Additionally, Belsky et al. (1998) found that parenting was more predictive of both externalizing problems and inhibition for children who were high in negative affectivity as infants when compared to those who demonstrated low levels of negativity.

Van Aken et al. (2007) examined longitudinally the additive and interactive effects of child temperament and maternal parenting on externalizing behaviors, in a sample of boys. Difficult temperament (composite formed by aggregating the reversed scores on Inhibitory Control and Soothability and scores on Frustration and Activity level) measured at time one (17 months of age) predicted concurrent levels of externalizing behaviors. In addition, child difficult temperament also moderated the link between maternal negative control and maternal sensitivity and externalizing behaviors measured at time two (23 months of age). Particularly, maternal negative control was related to an increase in externalizing behaviors for children low on Inhibitory Control, and those who were high on Frustration and Activity Level. On the other hand, lack of maternal sensitivity was related to an increase in externalizing behaviors only for children



with a difficult temperament. Likewise, maternal negative control only led to higher levels of externalizing problems for children with difficult temperaments. With regard to specific dimensions of temperament, lack of maternal sensitivity led to an increase in externalizing behaviors for children high on Activity Level and those Low of Soothability.

The evidence reviewed highlights that a lack of maternal sensitivity is related to the development of behavior problems, but only for children with difficult temperaments. Mesman et al. (2009) provided evidence of temperament moderating the relation between maternal sensitivity and child externalizing behaviors. These researchers revealed that higher maternal sensitivity was related to a stronger decrease of externalizing problems, but only for children with difficult temperaments. Lahey et al. (2008) also reported a significant interaction between temperament and parenting, measured during the first year of life, in predicting repeated measures of conduct problems across ages 4 to 13 years. This interaction revealed that maternal responsiveness was an inverse predictor of childhood conduct problems, but only among infants low in fearfulness, thus providing evidence of temperament as a moderator in the relation between parenting and externalizing behaviors. Furthermore, Ramos, Guerin, Gottfried, Bathurst, and Oliver (2005) and Whiteside-Mansell, Bradley, Casey, Fussell, and Conners-Burrow (2009) presented evidence that temperament moderates the relation between family conflict and child behavior problems. Specifically, family conflict was associated with increased levels of externalizing behaviors, but only for children with more “difficult temperaments.” Pinard (2007) provided additional evidence for the moderating role of temperament between parenting factors and child externalizing behaviors. The results of

Pinard's study revealed that parents reporting the use of more negative parenting practices were more likely to have children who displayed higher levels of aggression but only if the children were predisposed to more negative affectivity. Teachers also reported higher level of aggression for children whose parents reported using lower levels of negative parenting practices, when the children were prone to high levels of negative affectivity.

Additionally, the interaction between temperament, parenting and family variables has been shown for adolescents. Leve, Kim, and Pears (2005) revealed significant interactions of temperament and family variables in predicting externalizing behaviors at age 17 years; sex differences were also apparent. For example, harsh parenting at age 5 predicted higher externalizing behavior at age 17 but only for girls who were low on fear/shyness and those who high on impulsivity. These results suggest that temperament may be a stable risk or protective factor. In addition, adolescent temperament has been found to moderate the relation of parenting to antisocial behavior and substance use. Stice and Gonzales (1998) reported that parental control showed stronger relations to adolescent antisocial behavior and illicit substance use, for adolescents with high levels of Behavioral Undercontrol. Negative Affectivity also moderated the relation between parental support and control and adolescent substance use, such that lower levels of parental support was associated with substance use, but only at lower levels of negative affectivity. Adolescent temperament also moderates the impact of family risk factors, such as parent-child conflict and parental substance abuse, on adolescent substance use (Wills, Sandy, & Yeager, 2001).

Temperament has also emerged as a significant risk/protective factor in the relation between other contextual factors and externalizing behaviors. Crockenberg and Leerkes (2005) reported that long hours in non-parental care were associated with more externalizing behaviors for children who had been described as easily frustrated at 6 months of age. Temperament also moderated the link between perceived neighborhood quality and behavior problems over time (Colder, Lengua, Fite, Mott, & Bush, 2006). Specifically, poor neighborhood quality was positively associated with antisocial behaviors, but only for children who were characterized in infancy as demonstrating high positive affect and low fear, and children characterized by low positive affect and high fear.

The role of temperament as a moderator (risk/protective factor) is not surprising. According to Rothbart's interactive view of temperament, temperament exists within the person, but its manifestation depends on the environment, that is the level of stimulation and regulation provided by that environment. Thus, expressed temperament will affect other individuals within the child's environment directly, and temperamental influences on an individual's social strategies will affect others indirectly. Moreover, given the biological underpinnings of temperament, it may serve to exacerbate or buffer negative child outcomes, such as externalizing behaviors, in the presence of problematic parenting. The current study addressed this possibility.

#### Executive Functioning, Neurocognitive Attention, and Child Externalizing Behaviors

In addition to temperament, other biologically-based child characteristics, such as neuropsychological functioning, have been associated with child externalizing behaviors. One specific neuropsychological construct that emerges repeatedly in the child

externalizing behaviors literature, as noted earlier (e.g., Coolidge et al., 2000) is EF. This is not surprising given that EF regulates behavior and includes impulse control, cognitive flexibility and planning, the initiation and monitoring of action and attentional processes (Bayless & Stevenson, 2007). Attention has been defined as “a complex set of mental operations that includes focusing on or engaging a target, sustaining the focus over time using vigilance, encoding stimulus properties, and disengaging and shifting the focus” (Seidman, 2006, p. 469).

EF has been associated with externalizing behavior problems (e.g., impulsivity and aggression) and psychopathology across the lifespan. Adults who performed poorly on tests of EF tended to be more aggressive (Hoaken, Shaughnessy & Pihl, 2003; Lau and Pihl, 1996). In addition, Villemarette-Pittman, Stanford and Greve (2002) examined EF of college students who displayed impulsive aggressive (IA) outbursts. Compared to a control group, impulsive aggressive individuals obtained lower scores on measures of EF. Thus the researchers concluded that executive dysfunction contributes significantly to the development and persistence of the hostile, aggressive, and antisocial behaviors displayed by impulsive aggressors.

Similar results were found in studies conducted with clinical populations. Dolan and Anderson (2002), examined relations between impulsivity, aggression and EF in a sample of personality disordered offenders. According to Dolan and Anderson’s results, offenders demonstrating high levels of impulsivity and aggression displayed marked impairment in EF, even after controlling for the effects of IQ. Interestingly, this pattern of EF deficits was not observed for those offenders who displayed low levels of impulsivity and aggression. Serper, Beech, Harvey, and Dill (2008) explored the relation between EF,

psychiatric symptomatology, and aggressive behavior in psychiatric inpatients. Serper et al. revealed that impairment in executive function was directly related to aggressive behavior. Moreover, executive dysfunction significantly predicted psychiatric symptomatology, which in turn contributed to the expression of aggressive behavior.

A meta analysis by Morgan and Lilienfeld (2000) examined the relation between antisocial behavior (antisocial personality disorder, CD, and psychopathy) and EF. The results indicated a robust and statistically significant relation between antisocial behavior (ASB) and EF deficits. A medium to large effect size was observed for EF deficits of groups demonstrating antisocial behavior. Nevertheless, the researchers concluded that the results should be interpreted cautiously as significant variation within this effect size estimate was found. Some of which was accounted for by differences in the operationalizations of ASB (e.g., psychopathy vs. criminality) and the measures of EF employed. Additionally, Morgan and Lilienfeld's study did not control for or examine the influence of ADHD.

Impaired EF has also been associated with aggression (Ellis, Weiss, & Lochman, 2009), CD (Giancola, Messich, & Tarter, 1998), and ODD (Speltz, DeKlyen, Calderon, Greenberg, & Fisher, 1999) in children and adolescents. LeMarquand et al. (1998) examined longitudinally the relation between executive functions and disinhibition (errors of commission) in a sample of stable aggressive and nonaggressive adolescent males. Results revealed that stable aggressive individuals made more commission errors than nonaggressive individuals. LeMarquand and colleagues posit that the findings point to more global impairments in behavioral inhibition in aggressive individuals, suggesting that disinhibition is an important characteristic of individuals with

a history of aggressive behavior.

Attention processes (e.g., inhibition and sustained attention) have been associated with externalizing behavior problems in children. The NICHD Early Child Care Research Network (2003) revealed that children with lower scores on measures of both sustained attention (errors of omission) and inhibition of impulsive responding (errors of commission) exhibited higher levels of externalizing behaviors. Moreover, Hughes, White, Sharp, and Dunn (2000) found that hyperactive and aggressive preschool children performed worse than controls on tasks tapping planning, inhibition, and flexibility of attention. However, after controlling for background factors (e.g., social class and verbal IQ), only group differences on the inhibition task remained significant.

Speltz et al. (1999) examined executive functioning in a clinic-referred group of preschool boys who met criteria for early onset ODD with and without ADHD. Compared to normally developing boys of similar social and family background, preschoolers with ODD alone and those with ODD and ADHD had lower EF scores. However, when EF of the clinic referred group was compared; the ODD and ADHD group demonstrated significantly more impairment in EF than the ODD only group. Thorell and Wåhlstedt (2006) investigated the relation between EF and symptoms of ADHD and ODD in children between the ages of 4 to 6. These researchers noted that children with higher levels of ADHD symptoms evinced more executive dysfunctions; this relation remained significant even after controlling for symptoms of ODD. However, children with high levels of ODD symptoms did not differ in EF performance from those with low levels. Only inhibition was related to ODD symptoms, but once ADHD symptoms were controlled for, this relation was no longer significant. Based on their

results, Thorell and Wåhlstedt explained that the huge overlap between symptoms of ADHD and ODD likely explains the association between ODD symptoms and EF. This is congruent with Pennington and Ozonoff's (1996) findings that children with both ADHD and CD exhibit EF deficits, but those with CD-only do not. Overall, although research has established a link between EF and externalizing problems (e.g., antisocial behavior, impulsivity, aggression) in the adult population, research examining the relation of EF to aggressive behaviors and ODD in children has been inconsistent. In contrast, a more robust link between EF and attention problems and ADHD has been established.

Berwid, Kera, Marks, Santra, Bender, and Halperin (2005) examined whether children between 3 and 6 years old, rated as inattentive and hyperactive (ADHD Symptoms) by their teachers would reveal deficits in inhibitory control and sustained attention. Results affirmed that, compared to their low-risk counterparts, preschoolers with higher levels of ADHD symptoms committed more errors of commission and omission, again suggesting deficits in inhibitory control and sustained attention. These high risk children also exhibited longer and more variable reaction times than low-risk children, leading the researchers to conclude that the difficulties exhibited by the high-risk children do not seem to be specific to either sustained attention or inhibitory control problems. It is likely that deficits in other EF areas may account for this. Nevertheless, other researchers (e.g., Sonuga-Barke, Dalen, Daley, & Remington, 2002) have also reported that deficits in inhibition were associated with increased levels of ADHD symptoms during the preschool period.

Furthermore, EF deficits have been linked to ADHD. Biederman et al. (2004) reported that EF deficits were more common among children with ADHD than among

controls. Congruent with this, Hinshaw, Carte, Sami, Treuting, and Zupan (2002) reported that compared to an age and ethnicity matched comparison group, girls with ADHD had significant executive function impairments (spanning self-regulation, planning, response organization, set maintenance requiring both long- and short-term memory, vigilance, and inhibitory control). Hinshaw et al. also reported that girls with Attention-Deficit/Hyperactivity Disorder-Combined Type (ADHD-C) showed a more persistent pattern of deficits, whereas those with ADHD-Inattentive Type showed less severe EF deficits.

Additionally, children diagnosed with ADHD also evince more EF impairments compared to published test norms (i.e., lower performance than same-aged peers). Muir-Broaddus, Rosenstein, Medina and Soderberg (2002) compared EF among children with ADHD to published norms accompanying EF measures. Muir-Broaddus et al.'s study revealed significant weaknesses among a sample of children with ADHD on EF measures tapping attention span, sustained attention, and working memory, as well as on some of the measures of response inhibition relative to published test norms. These executive dysfunctions are correlates of ADHD, irrespective of gender or age (Seidman, 2006), and the deficits observed in children with ADHD appear to be permanent. For example, Hinshaw, Carte, Fan, Jassy, and Owens (2007) reported that girls with ADHD continued to demonstrate impairments in EF in adolescence, five years after being initially assessed.

However, Brocki, Eninger, Thorell, and Bohlin (2010) provided evidence that EF differentially predicts symptoms of ADHD. Brocki et al.'s longitudinal study examined the interrelations between three core EF components (simple and complex inhibition, selective attention, and working memory) measured at ages 5 and 6 years and their



relations to ADHD symptoms at age 7 years. The results indicated EF significantly predicted ADHD symptoms; however, the EF components better predicted symptoms of inattention rather than hyperactivity/impulsivity. In addition, evidence also has been presented to support developmental changes in the relation between EF and ADHD. Brocki and Bohlin (2006) reported that the EF component, disinhibition, was most clearly related to ADHD symptoms among younger children. In contrast, for older children, the later developing and more complex executive functions, such as working memory and fluency, relate to ADHD symptoms—specifically inattention. These researchers concluded that, consistent with previous research (e.g. Sonuga-Barke et al., 2002), it is measures of inhibitory control, rather than other EF measures, that relate to ADHD symptoms in the preschool and early school period.

Although, the association between EF and ADHD has been established in the school years and adulthood, far less is known about neuropsychological functioning and ADHD in the preschool period (Seidman, 2006), especially at-risk, low SES, minority preschool populations such as those attending Head Start. There is definitely a paucity of research examining the neuropsychological/executive functioning correlates of externalizing behaviors (ADHD symptoms and aggressive behaviors) in preschoolers. Several factors may be responsible for this. One factor may be the unclear diagnostic picture of ADHD during the preschool period. In addition, Marks and colleagues (2005) explained that neuroimaging techniques may be less able to tap into functional/neurocognitive impairments in the preschool population because they are difficult to use with preschool children due to the confounding effects of the movement artifact. Furthermore, these researchers stated that many of the neuropsychological

measures used to evaluate executive dysfunction are inappropriate for use with preschoolers because they are often too long, insufficiently engaging, or require reading skills that these children have not yet developed. Immature frontal lobe development in preschoolers means that significant aspects of executive functioning and other neuropsychological capabilities are not expected to develop fully until school age or later (Speltz et al., 1999), thus this may also hinder research in the area.

Despite these methodological challenges, the neuropsychological study of preschoolers is imperative, as such studies allow the investigation of a child's executive, cognitive and language abilities before formal schooling have begun, thus enabling researchers to identify the neuropsychological/executive functions most closely related to the genesis of persistent behavior problems (Speltz et al., 1999). Research on this sample is imperative given the theoretical importance of this period and impairments in EF in relation to ADHD. Based on Barkley's (1997) model, executive dysfunction (especially inhibitory deficits) should be associated with ADHD during the preschool years, as well as in later stages of development. Nevertheless, few studies have addressed this issue (Sonuga-Barke et al., 2002). There is also a limited body of research examining the relation of EF and aggressive behaviors in the preschool population. Studies of this nature are essential given the high comorbidity between ADHD and behavior disorders involving aggression, such as ODD and CD (American Psychiatric Association, 2000; Biederman et al., 1990). The current study aimed to fill this gap in the literature by examining the relation of EF to narrowband measures of child externalizing behaviors (i.e., ADHD symptoms and aggressive behaviors) in preschoolers, including some who are at risk for developing behavior problems, given their low SES.

## CHAPTER II

### SUMMARY AND CURRENT STUDY

Research has established a link between SES and externalizing behaviors, such as ADHD, aggressive behaviors, CD and ODD, (e.g., Barry et al., 2005; Feldman, Hancock, Rielly, Minnes, & Cairns, 2000; McGee & Williams, 1999), such that individuals from lower SES evinced higher levels of externalizing behaviors. More negative parenting practices have also been associated with higher rates of externalizing behaviors (Belsky et al., 1998; Gartstein & Fagot, 2003; Stormshak et al., 2000; Wakschlag & Keenan, 2001).

In addition to these contextual factors, biologically-based child factors (i.e., temperament and executive functioning/neurocognitive attention) have been related to child externalizing behaviors. It has been widely accepted that infants with more “difficult” temperaments are more likely to exhibit externalizing behaviors (Copland, Bowker, & Cooper, 2003; Lengua & Kovacs, 2005; Rubin et al., 2003). Additionally, various temperamental dimensions have also been related to externalizing behaviors. For example, effortful control influences developmental trajectories of externalizing behaviors (Zhou et al., 2007). Moreover, the affective components (i.e., negative affectivity) and surgency have been associated with child externalizing behaviors. Individuals who display higher levels of negative affectivity are also more likely to engage in antisocial behavior (Stice & Gonzales, 1998). Impairments in EF and neurocognitive attention are also related to broadband measures of externalizing behavior problems (Hughes et al., 2000), aggression (Hoaken et al., 2003), and ADHD (Biederman et al., 2004).

The research linking contextual factors (i.e., SES and negative parenting) to child externalizing behaviors has also been supported by theorists, such as Belsky (1984), Patterson et al. (1989), and Moffitt (1993). Belsky theorized that adverse contextual factors (e.g., stress), parental characteristics, and child factors (e.g., temperament) work to influence parenting and inadvertently child outcomes. This view highlights the role of both contextual and child factors in the child development. Patterson et al. proposed a more specific theory than that of Belsky. Patterson and colleagues posit that negative parenting practices (e.g., inconsistency) reinforce coercive child behaviors. Patterson et al. (1989) explain that these maladaptive family management practices are the result of antisocial parents and grandparents, family demographics (e.g., race, SES, parental education) and family stressors (e.g., unemployment, family discord). Whereas, Belsky addresses biologically-based child characteristics, specifically the child's temperament working to influence parenting, Patterson and his colleagues emphasized the role the parenting practices and parent-child interactions in the development of an early-onset persistent type of delinquency/antisocial behavior as well as how contextual factors influences this relation.

Moffitt (1993) also proposed a theory explaining the development and progression of antisocial behavior. Like Belsky, Moffitt examined contextual factors and highlighted the role of the child's temperament, but he also discussed another biologically-based factor (i.e., executive functioning) in the development of antisocial behavior. Moffitt proposed that prenatal and perinatal disruptions lead to impairments in neuropsychological functioning, specifically in executive and verbal functioning. These, in turn, may lead to children with irritable temperaments, poor behavioral regulation, and

deficits in verbal and executive functioning. Deficits in these areas are manifested as overactivity, temper tantrums, poor attention and aggressive behaviors; all of which have been linked to later antisocial outcomes. At-risk infants, those with difficult temperaments and impaired cognitive abilities, are often born to disadvantaged families, which are ill-equipped to adequately cater for a difficult child. Thus, biological deficits and disrupted social environments interact to produce the early-onset persistent offender.

Although more research examining temperament and externalizing behaviors in the preschool period has emerged, few studies have examined the correlates of externalizing behaviors in the preschool years and even fewer have examined the relations in low-SES and ethnic minority preschoolers (e.g., Stormshak et al., 2000; Wakschlag & Keenan, 2001), who are particularly at-risk for developmental psychopathology given their low SES (Wakschlag & Keenan, 2001). In fact, the majority of studies are conducted with predominately Caucasian (e.g., Pettit et al., 2001), middle to high SES groups (e.g., Silva et al., 2005) from maritally intact families (e.g., van Aken et al., 2007). Even Belsky's (1984) theory (which is the theoretical basis for the current study as described previously) was examined predominantly in first-born males of maritally intact, Caucasian families. The current study is different in this regard; the participants in this study represented a diverse racial, SES, and family background. Moreover, research examining the influence of ethnicity, SES, and parenting practices on preschoolers is typically conducted with individuals from large metropolitan areas. However, children considered at-risk and living in large cities may differ from at-risk children living in smaller cities. For example, larger city children may be exposed to more dangerous neighborhood influences (e.g., violence) which may, in turn, impact a

caregiver's parenting practices and exacerbate maladaptive outcomes for children. As a result, such studies may not be generalizable to individuals from smaller cities.

Additionally, many researchers examining the correlates of externalizing behaviors in preschoolers employed broadband measures of child externalizing behaviors, thus limiting the ability to determine the etiologies of various narrowband child behavioral outcomes (Paterson & Sanson, 1999). The current study aimed at filling this gap in the literature by exploring correlates of narrowband externalizing behavior problems. Indeed, this is the first known study to examine this set of both contextually- and biologically-based factors as they relate to behavioral outcomes in a community sample, which included some preschoolers at-risk for externalizing behaviors given their low SES. Moreover, inconsistencies exist in research findings examining EF/Attention and externalizing behaviors in preschoolers, particularly aggressive behaviors. The relation of intelligence and EF/Attention, and how this should be treated in research examining EF/Attention also add to inconsistencies in the literature. Some researchers (e.g., Barkley, 1997; Wåhlstedt, Thorell, & Bohlin, 2008) have not controlled for intelligence when examining the relation between EF and ADHD, because it has been argued that controlling for intelligence might remove some of the variance of interest. However, others (e.g., Bernier et al. 2010; Ellis et al. 2009) have controlled for intelligence in an attempt to obtain a cleaner measure of EF.

The current study examined specific contextual factors (SES and negative parenting practices), specific biologically-based child characteristics (temperament and executive functioning/attention), and the complex relation which exists between them to predict child externalizing behaviors (ADHD symptoms and aggressive behaviors) in a

community sample and a sample of Head Start preschoolers. First, the relation between specific contextual factors (SES, negative parenting practices) and biologically-based child characteristics (temperament and executive functioning/attention) and externalizing behaviors (ADHD symptoms and aggressive behaviors) was examined. Second, whether or not SES, negative parenting practices and child characteristics relate to externalizing behaviors in an additive or multiplicative fashion was also explored. Specifically, interaction effects was investigated to determine if temperament or EF/Attention moderated (i.e., exacerbate or ameliorate) the relation between SES and negative parenting practices and child outcomes. The literature has supported a complex interrelation among the various factors examined in the current study. Thus, the investigation of simple relations, although informative, provides limited information; inspecting complex interrelations, including moderation effects, provides a more complete picture.

### Hypotheses

Based on previous literature, it was first hypothesized that lower SES, more negative parenting practices, as well as higher levels of problematic child temperament dimensions and lower levels of executive functioning/attention, would be related to higher levels of child externalizing behaviors (ADHD symptoms and aggressive behaviors). The unique contribution of these predictors, controlling for the other predictors, was also explored. Second, it was hypothesized that biologically-based child characteristics would moderate the relation between SES and negative parenting practices and child behaviors. That is, it was expected that SES and negative parenting practices

would be more strongly associated with child externalizing behaviors for children with more difficult temperaments and/or lower levels of executive functioning/attention.



## CHAPTER III

### METHODOLOGY

#### Participants

A total of 138 preschoolers attending PACE Head Start ( $n = 64$ ) and other non-Head Start ( $n = 74$ ) preschools in Hattiesburg, Mississippi, and one of their parents or primary caregivers and preschool teachers participated in the current study. Participants in this study were part of a larger grant-funded study investigating positive parenting as a protective factor for children at risk for externalizing behaviors. The 138 preschoolers (70 male, 68 female), ranged in age from 3 to 6 years of age ( $M = 4.03$ ,  $SD = 0.71$ ). Only one 6 year old participated in this study. This participant celebrated his 6<sup>th</sup> birthday less than one month prior to participating and was still attending preschool at the time of the study. The race distribution was 47.8% African American, 46.4% Caucasian, 0.7% Hispanic/Latino, 1.4% Asian American, 0.7% classified as “other” and 2.9% did not respond to this item. Only children without major developmental disabilities were eligible for participation in the current study. All participants met this criterion. As a group, this sample’s prenatal and early developmental history was unremarkable. Less than 2% of parents endorsed using drugs or alcohol during their pregnancy and approximately 9% reported tobacco use. Approximately 15% of preschoolers were born premature and 18% were identified by their parents as having a medical problem. The most common medical conditions endorsed were asthma and allergies. Mental health problems were also uncommon in this sample. Two preschoolers (i.e., less than 2%) in this sample were identified as being diagnosed with ADHD, mild Autism, and/or infant-onset Bipolar Disorder. Mainly mothers (92.8%), who were married (49.3%), participated in this study (Table 1).

Table 1

*Caregiver's Relation to Participants and Their Marital Status*

Caregiver's Relation to Participants	
Biological Mothers	92.8%
Biological Fathers	1.4%
Grandmothers	1.4%
Foster Mothers	0.7%
Did Not Respond	3.6%
Caregiver's Marital Status	
Married	49.3%
Single	29.7%
Common Law Union	5.8%
Separated	5.8%
Divorced	8.0%
Widowed	0.7%
Did Not Respond	0.7%

Approximately 65% of participants were raising the child with their spouse or significant other, 18.8% were raising the child alone, 15.2% were raising the child with the help of family members and 0.7% did not respond to this item. More than 95% of parents graduated high school and greater than 65% completed at least some college. Refer to Table 2 for additional information about parent's/caregiver's educational attainment.

Table 2

*Caregiver's Educational Level*

Educational Level	Mothers/ Female Caregivers	Fathers/ Male Caregivers
Less than High School	2.9%	3.1%
High School Diploma/GED	21.3%	22.7%
Some College, but no degree	21.3%	19.6%
Associate Degree	11.0%	11.3%
Bachelor's Degree	24.3%	26.8%
Master's Degree	15.4%	7.2%
Ph.D. or higher	2.2%	8.2%
Specialized/Vocational Training	1.5%	1.0%

The sample represented a diverse socioeconomic status background. Scores on the Hollingshead Four Factor Index of Social Status ranged from 14 to 66 ( $M = 39.15$ ,  $SD = 15.08$ ) indicating that average family socioeconomic status fell between the skilled craftsmen,/clericalworkers/sales workers and medium business owners/minor professionals/technical workers strata. Additional information about how this variable was coded is provided in the measures section. Income was coded on a categorical scale, with values ranging from 1 to 13 defined as follows: 1 (earns no income/dependent on welfare), 2 (earns less than \$10,000), 3 (income \$10,000 - \$14,999), 4 (income \$15,000 - \$19,999), 5 (income \$20,000 - \$24,999), 6 (income \$25,000 - \$29,999), 7 (income \$30,000 - \$34,999), 8 (income \$35,000 - \$39,999), 9 (income \$40,000 - \$49,999), 10 (income \$50,000 - \$59,999), 11 (income \$60,000 - \$74,999), 12 (income \$75,000 - \$99,999) and 13 (earns over \$100,000). The total household yearly income for the current

sample ranged from “earns no income/dependent on welfare” to “earns over \$100,000” ( $M = 7.12$ ,  $SD = 4.39$ ). Thus, the average income per family fell between \$30,000 and \$39,999.

Post-hoc analysis comparing children in Head Start to children in non-Head Start preschool centers revealed that the two groups significantly varied on the Hollingshead Index ( $M = 27.40$ ,  $SD = 9.56$  and  $M = 49.31$ ,  $SD = 11.04$ , for Head Start and non-Head Start, respectively),  $t(136) = 12.36$ ,  $p < .001$ , and family income (average category rating  $M = 3.59$ ,  $SD = 2.47$  and  $M = 10.01$ ,  $SD = 3.40$ , for Head Start and non-Head Start, respectively),  $t(129) = 12.12$   $p < .001$ . The sample also differed on ethnicity and age. The Head Start sample was older and from ethnic minority (mostly African American) backgrounds. However, they did *not* vary on the composite of either ADHD symptoms ( $M = 52.29$ ,  $SD = 7.29$ , and  $M = 52.48$ ,  $SD = 8.40$ , for Head Start and non-Head Start, respectively),  $t(118) = 0.90$ ,  $p = ns$ , or aggressive behaviors ( $M = 52.86$ ,  $SD = 8.81$ , and  $M = 52.21$ ,  $SD = 7.77$ , for Head Start and non-Head Start, respectively),  $t(122) = 0.66$ ,  $p = ns$  (Table 3).

Table 3

*Differences between Head Start and Non-Head Start Groups on Demographics and Variables of Interest*

	Head Start ( <i>n</i> =64) Mean (S.D)	Non Head Start ( <i>n</i> =74) Mean (S.D)	t-test
Gender (% male)	50.0%	51.4%	-0.16
Ethnicity (% white)	9.4%	78.4%	-12.45***
Age (in years)	4.22 (.65)	3.86 (.73)	-2.99**
Income	3.59 (2.47)	10.01 (3.40)	12.12***
SES	27.40 (9.56)	49.31(11.04)	12.36***
Negative Parenting Practices	0.17 (.98)	-0.14 (.68)	-2.20*
EF/Attention	0.12 (.62)	-0.14 (.77)	-1.91 <sup>†</sup>
Surgency	4.79 (.73)	4.60 (.69)	-1.59
Negative Affectivity	3.88 (.73)	3.90 (.69)	.12
Effortful Control	5.27 (.68)	5.47 (.64)	1.77 <sup>†</sup>
Aggressive Behavior – <i>Parent</i>	49.87 (10.24)	48.34 (6.84)	-1.03
Aggressive Behavior – <i>Teacher</i>	55.76 (12.26)	55.71 (12.14)	-0.02
Aggressive Behavior – <i>Composite</i>	52.86 (8.81)	52.21 (7.77)	-0.44
ADHD Symptoms – <i>Parent</i>	51.16 (8.37)	50.94 (8.51)	-0.15
ADHD Symptoms – <i>Teacher</i>	53.51 (8.62)	52.99 (10.06)	-0.32
ADHD Symptoms – <i>Composite</i>	52.29 (7.29)	52.48 (8.40)	-0.13

Note. <sup>†</sup> Trend,  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

## Measures

### *Demographic Questionnaire*

A demographic questionnaire was used to obtain socioeconomic and socio-cultural information about the child and his or her family (Appendix A). This questionnaire addressed basic information about the caregiver, the child and other persons residing in the house including age, gender, ethnicity, primary language spoken, family size, employment status, and household income. Information was also collected about the child's prenatal, perinatal, and developmental history and the child's and family's mental health history. Additionally, parents were required to report on their marital status, highest level of education, place of employment and occupation/job position in order to calculate a socioeconomic status score using the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975).

The Hollingshead Four Factor Index of Social Status is based on an individual's education, occupation, gender, and marital status. Following the procedures described by Hollingshead, each parent's education was coded into one of seven categories defined as follows: 1 (less than 7<sup>th</sup> grade), 2 (junior high school, 9<sup>th</sup> grade), 3 (partial high school, 10<sup>th</sup> or 11<sup>th</sup> grade), 4 (high school graduate) 5 (partial college—at least one year—or specialized training), 6 (standard college or university graduation) and 7 (graduate professional training; graduate degree). Each parent's occupation was coded into one of nine categories defined as follows: 1 (farm laborers, menial service workers and individuals dependent on welfare), 2 (unskilled workers), 3 (machine operators and semiskilled workers), 4 (owners of smaller businesses valued at less than \$25,000, skilled manual workers, craftsmen, and tenant farmers), 5 (clerical and sales workers; owners of

small farm and business valued at \$25,000 to \$50,000), 6 (technicians, semiprofessionals, and owners of businesses valued at \$50,000 to \$75,000), 7 (owners of small businesses valued at \$75,000 to \$100,000), 8 (administrators, lesser professionals, proprietors of medium-sized businesses valued between \$100,000 and \$250,000) and 9 (higher executives, proprietors of large businesses valued at \$250,000 and more, and major professionals). Each education code was multiplied by a weight of 3, and each occupation code was multiplied by a weight of 5. For single individuals, the weighted education scores and weighted occupation scores were summed to determine the Hollingshead Index. For married couples with both spouses working, the weighted education scores and the weighted occupation scores were summed separately for each spouse, then added together, and then divided by 2 to determine the Hollingshead Index. If only one spouse worked, the two spouses' weighted education scores were summed and then divided by 2. This family weighted education score was then summed with the weighted occupation score from the working spouse to determine the Hollingshead Index. The Hollingshead Four Factor Index of Social Status is coded as a categorical variable with values ranging from 8-66 defined as follows: 8-19 (unskilled laborers and menial service workers); 20-29 (machine operators and semiskilled workers); 30-39 (skilled craftsmen, clerical, & sales workers); 40-54 (medium business, minor professionals, & technical workers) and 55-66 (major business and professionals). In the current study, the Hollingshead Index (i.e., SES) ranged from 14-66 ( $M = 39.15$ ,  $SD = 15.08$ ). Hollingshead Index scores less than 14 were not possible because no parent's education level was coded with a 1 or 2 due to the nature of the parental education question on the demographic questionnaire. Specifically, parents with less than a high school education were coded with a 3, given

that specific grade level finished before quitting school was not differentiated—the latter of which would be required to code education with a 1 or 2. For the current, socioeconomic status was a predictor variable, therefore its relation to ADHD symptoms and aggressive behaviors was explored.

*Alabama Parenting Questionnaire – Preschool Revision (APQ-PR; Clerkin, Marks, Policaro, & Halperin, 2007; Appendix B)*

This adapted measure is based on the Alabama Parenting Questionnaire (Frick, 1991; Shelton, Frick, & Wootton, 1996) designed to tap the dimensions of parenting shown to be associated with disruptive behavior disorders in school-age children. The original APQ consists of 42 items that load onto five subscales: poor parental monitoring and supervision, inconsistent discipline, corporal punishment, positive parenting, and parental involvement. Some of the 42 items measured other discipline practices that did not load on one of the five scales. Parents indicate on a 5- point Likert scale, ranging from 1 (*Never*) to 5 (*Always*), the frequency of using various parenting practices. Shelton et al. reported adequate internal consistency for involvement, positive parenting, and inconsistent discipline (alphas ranging from .67 to .80) but low internal consistency for corporal punishment ( $\alpha = .46$ ). Moreover, the Positive Parenting and Involvement scales were highly correlated ( $r = .85$ ); therefore, these may not be measuring unique constructs.

Clerkin et al. (2007) adapted the original measure to create the Alabama Parenting Questionnaire – Preschool Revision (APQ-PR) by eliminating 17 items (ten items deemed inappropriate for preschool-aged children and seven items due to loadings less than .40 on all factors). The psychometric properties of the APQ-PR were examined in a sample of hyperactive-inattentive preschool children and non-impaired controls. Principal



factor analysis of the APQ-PR revealed a three-factor solution: Positive Parenting (based on items from the APQ Positive Involvement and Positive Parenting scales), Negative/Inconsistent Parenting (based on items from the APQ Poor Monitoring/Supervision and Inconsistent Discipline scales), and Punitive Parenting (based on items from the Corporal Punishment scale with the inclusion of two items, “You ignore your child when he/she is misbehaving” and “You yell or scream at your child when he/she has done something wrong,” which were other discipline items that did not load on a subscale in the original APQ).

In this study, participants were administered all 42 items of the original APQ. However, scales of interest were created using Clerkin and colleagues (2007) method. Based on the study by Clerkin and colleagues and since negative parenting practices were the focus of the current study, raw scores for the Inconsistent Parenting and Punitive Parenting scales were calculated. These scales were significantly correlated,  $r = .41$ ,  $p < .001$ ; therefore, the scale raw scores were converted to  $z$ -scores and averaged to create the Negative Parenting Composite that was used in subsequent analyses. The role of negative parenting as a predictor of externalizing behaviors was explored in the current study; specifically, whether higher levels of negative parenting was related to higher levels of ADHD symptoms and aggressive behaviors in preschoolers.

The APQ-PR has been used previously in a study conducted with Head Start preschoolers (Pinard, 2007). In the current sample, internal consistency was  $\alpha = .73$  for the Inconsistent Parenting scale and  $\alpha = .36$  for the Punitive Parenting scale. Internal consistency for the Negative Parenting Composite was  $\alpha = .72$ . Item-total correlations

were examined, and all items appeared to relate similarly to the total. That is, deletion of any one item or set of items would not improve internal consistency.

*Child Behavior Questionnaire-Short Form (CBQ-SF; Rothbart et al., 2001; Appendix C)*

The CBQ is a caregiver report measure designed to provide a detailed assessment of temperament in children 3 to 7 years of age. In the CBQ, parents are asked to rate their child on a 7-point scale ranging from 1 (*extremely untrue of your child*) to 7 (*extremely true of your child*). Parents are also provided with a “Not Applicable” response option when the child has not been observed in the situation described. This measure was designed to provide a highly differentiated assessment of the temperament of children from 3 to 8 years old. The standard form of the CBQ contains 195 items and measures 15 primary temperament characteristics. Internal consistency estimates for the standard CBQ scale ratings for 4 and 5-year-olds ranged from .64 to .92, with a mean of .73. Rothbart et al. (2001) reported that the standard CBQ scales tended to show consistency across samples and across time. Rothbart et al.’s (2001) factor analysis of the standard CBQ consistently revealed three factors: *Negative Affectivity* (defined by positive loadings for the scales of Discomfort, Sadness, Fear, Anger/Frustration, and negative loadings for Falling Reactivity/Soothability), *Surgency/Extraversion* (defined as positive loadings on the dimension of Impulsivity, High Intensity Pleasure, Activity Level, Approach/Positive Anticipation, and negative loadings for the Shyness scale), and *Effortful Control* (Positive loadings for the scales of Low Intensity Pleasure, Smiling/Laughter, Inhibitory Control, Perceptual Sensitivity, and Attentional Control) .

A short form of the CBQ (i.e., CBQ-SF) was used in the current study. The CBQ-SF contains 94 items and measures the same 15 temperamental characteristics, as well as

the three dimensions, as the standard CBQ. Rothbart and Putnam (2006) reported that, on the short form, 11 of the 15 scales achieved alphas over .70, the alphas for 3 of the 15 scales ranged from .65 to .69, but the alpha for the Sadness scale was .61. For the CBQ-SF, internal consistency estimates of the scales were lower when analyses were restricted to African American and low income samples; however, the majority of scales continued to demonstrate alphas higher than .60, considered to be the threshold for acceptable internal consistency (Putnam & Rothbart, 2006). In addition, the Very Short form version of the CBQ (CBQ-VSF), which contains 36 items and only taps the three broad dimensions, was a reliable measure in African American and low income samples, thus the lower reliabilities should not be interpreted as unsuitability of the CBQ-Short Form for African American and low income samples, particularly if the broad dimensions are used (S. P. Putnam, personal communication, September 29, 2006). Moreover, aggregating across scales should enhance the internal consistency of the three global factors, making it more appropriate for use in this sample. An acceptable internal consistency was obtained for the current sample for all three dimensions of temperament, with Cronbach's  $\alpha = .79$  for Surgency, Cronbach's  $\alpha = .78$  for Negative Affectivity, and Cronbach's  $\alpha = .87$  for Effortful Control. Item-total correlations were examined, and all items appeared to relate similarly to the total. That is, deletion of any one item or set of items would not improve internal consistency.

In the current study, the temperament dimension of Negative Affectivity was formed by finding the average of the raw scores of Discomfort, Sadness, Fear, Anger/Frustration, and the reversed scored Reactivity/Soothability scales. Similarly, the Surgency dimension was formed by averaging raw scores of the Impulsivity, High

Intensity Pleasure, Activity Level, Approach/Positive Anticipation, and the reversed scored Shyness scales. Finally, the Effortful Control dimension was created by averaging raw scores of the Low Intensity Pleasure, Smiling/Laughter, Inhibitory Control, Perceptual Sensitivity, and Attentional Control scales. The creation of these three temperament dimensions is consistent with the scoring guidelines for the measure (Rothbart et al., 2001). Analyses for the current study were conducted on the three dimensions of temperament, Negative Affectivity, Surgency, and Effortful Control, reported by Rothbart et al. (2001). These three dimensions of temperament were treated as moderator variables in this study. The dimensions of temperament were investigated to determine whether they moderated the relation between predictor variables (SES and negative parenting practices) and child externalizing behaviors.

*Behavior Assessment System for Children-2-Parent Rating Scale and Teacher Rating Scale (BASC-2-PRS and BASC-2-TRS; Reynolds & Kamphaus, 2004)*

The BASC-2 is a multi-dimensional assessment system that measures both adaptive and problem behaviors of children both in school (BASC-TRS) and in home settings (BASC-PRS). The BASC-TRS and the BASC-PRS for preschoolers aged 2 to 5 years was utilized in the current study to obtain measures of child behavior in different contexts (home and school). The items are scored on a 4-point scale ranging from *Never* to *Almost Always*. The BASC-PRS consists of 134 items, whereas the BASC-TRS comprises 100 items. Both forms yield four composite scores (Internalizing Problems, Externalizing Problems, Adaptive Skills, and the Behavioral Symptoms Index) and eight clinical scores (Aggression, Anxiety, Attention Problems, Atypicality, Depression, Hyperactivity, Somatization, and Withdrawal). Also, the adaptive scores of Activities of

Daily Living (parent only), Adaptability, Functional Communication, and Social Skills are available. The BASC-2 has demonstrated good reliability. Reynolds and Kamphaus (2004) reported internal consistencies for the composites, with alpha coefficients ranging from .87 to .96 (BASC-TRS) and .85 to .93 (BASC-PRS). Alpha coefficients for the subscales range from .75 to .93 (BASC-TRS) and .77 to .87 (BASC-PRS). Median inter-rater reliabilities have been reported as .74 and .65 on the BASC-TRS for the composites and subscales, respectively. On the BASC-PRS, median inter-rater reliabilities have been reported as .71 and .74 for the composites and subscales, respectively.

For current study, the Aggression, Attention Problems, and Hyperactivity subscales were the criterion variables of interest. These subscales were operationalized as narrowband measures of externalizing behaviors in children. Aggression as measured on the BASC-2 does not only assess aggressive acts such as hitting others. Rather, this subscale consists of aggressive behaviors as well as oppositional/defiant behaviors and argumentativeness. Argues with others, bullies, teases, hits, threatens, and blames others are examples of the items that comprise the BASC-2 Aggression subscale. The Attention Problems subscale consists of items such as does not complete work, has difficulty concentration and attending, forgets things, and does not listen to directions. Examples of the items which make up the Hyperactivity subscale include: acts impulsively, interrupts others, has tantrums, is restless, leaves seat, and climbs on things. Parent-only data and teacher-only data were analyzed to determine if differences in relations between variables exist whether the child's behavior is considered in school or home setting. All subscales were converted to T-scores (based on a general norm group) to adjust raw scores for age of child and to obtain a score that describes the sample relative to a normative population.

Initial correlational analyses were conducted to determine the interrelations of the scales of each composite prior to forming the respective composites (ADHD Symptoms and Aggressive Behavior). Specifically, results revealed significant positive correlations between the Attention Problems and Hyperactivity *T*-scores based on parent report,  $r = .67, p < .001$ , and teacher report,  $r = .67, p < .001$ . Separate Parent-rated ADHD Symptoms and Teacher-rated ADHD Symptoms Composite were created by averaging the Attention Problems and Hyperactivity *T*-scores for the respective rater. The parent and teacher reports of Attention Problems and Hyperactivity were also significantly correlated,  $r = .50, p < .001$  and  $r = .43, p < .001$ , respectively. Likewise, the parent-rated ADHD Symptoms Composite and teacher-rated ADHD Symptoms Composite were significantly correlated,  $r = .54, p < .001$ . Therefore, an ADHD Symptoms composite was created by averaging the Attention Problems and Hyperactivity *T*-scores from both raters. Finally, the parent and teacher reports of Aggression were significantly correlated,  $r = .23, p < .01$ . Thus, an Aggressive Behavior Composite was created by averaging the Aggression *T*-scores from both raters. For multi-informant composites, the composite was not created if one of the scales loading on the composite was missing.

In the current study, internal consistency for the three subscales of interest ranged from very good to excellent based on both parent and teacher ratings, with Cronbach's  $\alpha = .74$  and  $\alpha = .92$  for Aggression, Cronbach's  $\alpha = .83$  and  $\alpha = .91$  for Attention Problems, and Cronbach's  $\alpha = .81$  and  $\alpha = .90$  for Hyperactivity, for parent and teacher, respectively. Internal consistencies for the composites were as follows: parent-rated ADHD Symptoms, Cronbach's  $\alpha = .88$ ; teacher-rated ADHD Symptoms, Cronbach's  $\alpha =$

.93; ADHD Symptom Composite, Cronbach's  $\alpha = .94$ ; and Aggressive Behavior Composite, Cronbach's  $\alpha = .85$ .

*Statue and Auditory Attention subtests from the Neuropsychological Assessment of Children - II (NEPSY- II; Korkman, Kirk, & Kemp, 2007)*

The NEPSY-II is an updated version of the NEPSY (Korkman, Kirk, & Kemp, 1998). The NEPSY-II was designed specifically to provide researchers and clinicians with a psychometrically sound instrument for studying typical and atypical neuropsychological development in preschool and school-age children. There are two batteries: a core battery and a full battery, each with separate forms for children ages 3 to 4 years and children ages 5 to 12 years. The NEPSY assesses the child's neuropsychological status across six functional domains: attention and executive functioning, language, memory and learning, sensorimotor, social perception and visuospatial processing.

For the current study, two subtests from the NEPSY-II, attention and executive functioning domain, Statue (a measure of motor persistence and inhibition) and Auditory Attention (a measure of selective auditory attention and vigilance and the ability to sustain auditory attention) were of interest. For the Statue subtest, the child is required to stand still with his/her eyes closed for a 75-second period, during which the examiner presents various noise distracters (e.g., dropping a pencil, coughing). To perform successfully on this task, the child must stand still and inhibit the impulse to respond to these noise distracters. For Auditory Attention, the child is instructed to respond only to a target word (i.e., red) by touching the red circle while listening to a series of words. Other colored circles are provided and other color words appear in the series of words, but the

child is instructed to not respond to any color other than red. Scores from the Statue and Auditory Attention subtests were used in the creation of an EF/Attention composite. Further details about the creation of the composite are provided below. EF/Attention was a moderator variable in this study. Thus EF/Attention was investigated to determine whether it moderated the relation between predictor variables (SES and negative parenting practices) and child externalizing behaviors.

The NEPSY-II was standardized on a sample of children representative of the 2003 U.S. Census data. Reliability coefficients were obtained by utilizing split-half and alpha methods. For the Attention/Executive Functioning domains, the average reliability coefficient for children aged 3 to 4 years was 0.82, and the average reliability coefficients across age group for children aged 5 to 12 years ranged from .59 to .96. The majority of the functional and subtest domains of the NEPSY demonstrate adequate to good reliability.

*Day-Night Task (Diamond, Kirkham, & Amso, 2002)*

The day-night task is a Stroop-like task which measures response inhibition and working memory in young children. This task requires the child to say “day” when shown a picture of moon and “night” when shown a picture of the sun. In the current study, the experimenter showed the participants sixteen cards in a fixed order. A control condition was administered to ensure that the participants adopted a set of prepotent responses. In the control, participants were required to say “day” when the card with the sun was shown and “night” when the card with the moon was shown. In the experimental condition, the rules were reversed; the participants were required to say “day” when the card with the moon was shown and “night” when the card with the sun was shown. A



practice trial was administered in each condition, with a maximum of three trials. The participant's responses were scored as 1 for correctly providing the counter-intuitive response or 0 for incorrectly providing the related response. Total scores were the proportion of correct responses out of 16 trials. Scores from the day-night task were used in the creation of an EF/Attention composite, which is a moderator variable in this study. Further details about the creation of the composite are provided below.

*Grass-Snow Task (Carlson & Moses, 2001)*

The grass-snow task is another Stroop-like task similar to the Day-Night task, but it requires the participants to respond by pointing instead of speaking. This task requires the child to point to a green card when the researcher says "snow" and to a white card when the researcher says "grass." In the current study, the participants were given sixteen trials in a fixed order. A control condition was administered to ensure that the participants adopted a set of prepotent responses. In the control, participants were required to point to the green card when the researcher said "grass" and the white card when the researcher said "snow." In the experimental condition, the rules were reversed; the participants were required to point to the green card when the researcher said "snow" and the white card when the researcher said "grass." A practice trial was administered in each condition, with a maximum of three trials. The participant's responses were scored as 1 for correctly providing the counter-intuitive response or 0 for incorrectly providing the related response. Total scores were the proportion of correct responses out of 16 trials. Scores from the grass-snow task were used in the creation of an EF/Attention composite, which is a moderator variable in this study.

According to Bayless and Stevenson (2007), EF regulates behavior and includes impulse control, inhibition, cognitive flexibility and planning, the initiation and monitoring of action and attentional processes. EF and attention overlap quite a bit and it is difficult to separate these two constructs. In addition, the research reviewed previously linked both EF and attentional processes to ADHD and aggressive behaviors. For these reasons, the current study used an EF/Attention composite in order to capture the processes subsumed under the broad heading of EF. To create the EF/Attention composite correlational analyses were conducted to determine the relation between the total scores of the Day-night task, Grass-snow task, Auditory Attention, and Statue subtests (Table 4).

Table 4

*Correlations among Executive Functioning and Neurocognitive Attention Subtests*

	<b>2</b>	<b>3</b>	<b>4</b>
1. Day-nigh Stroop	.39***	.33**	.36***
2. Grass-Snow Stroop	-	.38***	.15
3. Auditory Attention	-	-	.33**
4. Statue			-

*Note.*  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

The raw scores of the Day-night task, Grass-snow task, Auditory Attention, and Statue subtests were converted to  $z$ -scores and averaged to compute the EF/Attention Composite. Thus, EF/Attention composite was a measure of motor persistence and inhibition, selective auditory attention, sustained auditory attention, response inhibition, and working memory. In the current sample, internal consistency for the EF/Attention Composite was  $\alpha = .65$ , which, although acceptable, is a bit low. This is likely due to the

diversity of the subtests which comprise the EF/Attention Composite. These subtests are related, but they each contribute unique information as well.

*Brief Intellectual Ability subtests from the Woodcock-Johnson Test of Cognitive Abilities III (WJ-III COG; Woodcock, McGrew, Mather, & Shrank, 2003)*

The WJ-III COG measures general and specific cognitive functions designed for individuals from 2 to 90 years old. The WJ-III COG was normed on a large group of individuals representative of the North American population. Internal consistencies range from .80s to .90s for individual tests and are in the 90s for clusters. Test-retest reliabilities range from good to excellent (.70s to .90s). A standard and extended battery exists for this measure. Two indices of general intelligence can be obtained: the General Intellectual Ability (GIA) score and the Brief Intellectual Ability (BIA) score. The BIA was used as an estimate of intelligence in the current study, as it allows for a highly reliable measure of intelligence in a short testing time.

The BIA is comprised of three subtests. First, the Verbal Comprehension subtest (a measure of language development and word knowledge) requires the child to identify pictures and respond correctly to synonyms, antonyms and verbal analogies. Second, the Concept Formation subtest (a measure of fluid reasoning) requires the child to determine the rule for presented stimulus sets. Third, the Visual Matching subtest (a measure of processing speed) requires the child to quickly identify two identical shapes or numbers. Intellectual functioning (BIA) was a control variable in the current study.

## CHAPTER IV

### PROCEDURE

The researcher obtained IRB approval (Appendix D) for the current study, before participant recruitment began. To obtain participants for the current study, the researcher attended Parent-Teacher Organization (PTO) meetings at various Head Start Centers and preschools to inform teachers and parents about the study. Parents were also recruited through various announcements posted in the school as well as flyers and consent forms sent home with the children.

Parents consented to participate by signing a written informed consent (Appendix E) and returning it to the researcher. Those who signed and returned the written informed consent were given the option of completing the packet of questionnaires independently or obtaining help from a research assistant. All the participants chose to complete their questionnaires independently. The consent form clearly outlined the research procedures and participants' rights and how the information collected would be used. In particular, confidentiality was discussed and participants were told that the Head Start Center or preschool would not receive feedback based on what they reported. Although distress was not anticipated as a result of the current study, participants were provided with phone numbers of referral sources and the number of the principal investigator's supervisor. These numbers were to be used if questions arose or if participants were distressed as a result of the study. Parents were also given the option of obtaining general feedback about their child's performance.

Upon consenting, parents received a packet containing the demographic questionnaire, APQ, BASC-PRS, and CBQ-SF. Parents who signed consent forms at PTO meetings were given these materials directly. However, measures were sent home

(through the teachers) to parents who returned consents through their children's teachers. The complete set of measures took approximately one hour for parents to complete. Parents were instructed to return these completed forms in a provided sealed envelope to their child's teacher within two weeks from the time it was received. Parents received a \$10 Walmart gift card after completing the packet. Teachers were also asked to participate in the current study. Like parents, teachers provided written informed consent to the researcher (Appendix F). Once the teachers had signed and returned their consent forms to the researcher, they were given a BASC-TRS to complete for each child in their class for whom parents had returned completed informed consents and questionnaires. That is, teachers were not asked to complete measures on any child until the parent had both consented and participated. The child must have been in the setting/class for at least 4 weeks before teachers completed the BASC-TRS for the child. The BASC-TRS took approximately 10 minutes per child in the study, and teachers received a \$5 Walmart gift card for each BASC-TRS completed.

Also following parental consent, testing for the child (BIA, neuropsychological battery) was scheduled at either the Head Start Center, preschool, or The University of Southern Mississippi research offices (depending on parent and center preference). The BIA (brief IQ test) was administered in the first testing session and the neuropsychological subtests were administered in subsequent sessions. Since participants in this study were part of a larger grant-funded study an extensive battery of neuropsychological tests, which included the BIA, Statue, Auditory Attention, Day-night task and Grass-snow task, were administered. Testing session ranged from approximately 2 to 3 hours per child. Testing was broken up in several short sessions across different

days to minimize both fatigue for the child and disruption in the child's school day. The child was given stickers throughout the testing session and a small prize (approximately \$5 in value) for completion of the tests.

To maximize data collection/retrieval, the researcher sent home reminders to the parents who had not returned packets within the two-week allotted period. The researcher called parents who did not respond to the reminders in the evening to determine if they were still interested in participating in the study, whether they still possessed the forms, and to obtain a specific time when it would be convenient for them to return these forms to their child's teacher. If the parents misplaced the forms but were still interested in the study, additional forms were sent to them.

## CHAPTER V

## RESULTS

## Missing Data

A total of 138 participants took part in the current study. However, missing data affected the creation of certain composites and sample sizes available for the various analyses. While still maintaining rigorous, planned controls of possible confounding variables, sample size was maximized for each analysis. Since the sample size included in each analysis changed depending on the variables, the sample size is reported in the respective table of results for each analysis. It is particularly important to note that testing data were collected on 102 of the 138 children and, after listwise deletion for model variables in the various regression analyses, the *ns* ranged from 90 to 99. However, which of the 90 to 99 children may have varied depending on the combination of variables, and all 102 of the children tested were included in at least one of the regression analyses. Importantly, the 102 children included in the regression analyses did not differ from the 36 children excluded from these analyses on any of the main demographic variables based on independent samples *t*-tests and using continuous or dichotomous categorical dependent variables. These included child's age,  $t(136) = -1.65, p = ns$ , child's gender,  $t(136) = -1.06, p = ns$ , child's ethnicity,  $t(132) = 0.89, p = ns$ , parent's age,  $t(132) = -0.26, p = ns$ , SES (Hollingshead Index),  $t(136) = 0.47, p = ns$ , and Head Start versus non Head Start status,  $t(136) = -1.44, p = ns$ .

## Relation With Demographic Variables

Alpha was set for .05; thus, only results with  $p < .05$  are considered statistically significant in all subsequent analyses. However, given the complexity of the regression models and the potentially small effect size of the interactions, marginally significant

trends ( $p < .10$ ) are noted and discussed. Doing so provides a more comprehensive picture of how these variables may interrelate; however, any marginally significant findings were interpreted tentatively.

Once composites were formed, descriptive statistics were calculated for all variables of interest (Table 5).

Table 5

*Means, Standard Deviations and Ranges for Variables of Interest*

	<i>N</i>	Mean	Std. Dev.	Minimum	Maximum
Hollingshead SES	138	39.15	15.08	14.00	66.00
Negative Parenting <sup>a</sup>	138	.01	.84	-2.02	2.82
Surgency	136	4.69	.71	3.04	6.25
Negative Affectivity	136	3.90	.70	1.97	5.90
Effortful Control	136	5.38	.67	3.29	6.63
EF/Attention <sup>a</sup>	103	-.01	.71	-1.93	1.13
ADHD Symp Composite <sup>b</sup>	120	52.39	7.87	38.75	79.25
ADHD Symp Parent	134	51.04	8.41	34.50	81.50
ADHD Symp Teacher	130	53.24	9.36	37.00	80.50
Agg Beh Composite <sup>b</sup>	124	52.52	8.26	39.00	80.00
Agg Beh Parent	134	49.04	8.55	36.00	82.00
Agg Beh Teacher	129	55.74	12.15	42.00	99.00

*Note.* Std. Dev. = Standard Deviation; SES = Socioeconomic Status; ADHD Symp = ADHD Symptoms; Agg Beh = Aggressive

Behavior. <sup>a</sup> Composite score based on an average of z-scores. <sup>b</sup> Composite score based on an average of parent and teacher ratings.



Correlational analyses were then conducted examining the relation between child's age, child's gender, child's ethnicity, BIA and parent's age with the ADHD Symptoms Composite, parent-rated ADHD Symptoms, teacher-rated ADHD Symptoms, Aggressive Behavior Composite, parent-rated Aggressive Behavior and teacher-rated Aggressive Behavior (Table 6).

Table 6

*Correlations between Demographic Variables, Child Aggressive Behaviors, and ADHD Symptoms*

	Child's Age	Child's Gender <sup>b</sup>	Child's Ethnicity <sup>c</sup>	Child's BIA	Parent's Age <sup>d</sup>
ADHD Symp Composite <sup>a</sup>	-.08 (120)	-.34*** (120)	.01 (118)	-.34** (90)	-.02 (116)
ADHD Symp Parent	-.01 (134)	-.24** (134)	-.01 (130)	-.30** (98)	.02 (130)
ADHD Symp Teacher	-.14 (129)	-.36*** (129)	.02 (126)	-.24* (100)	-.05 (125)
Agg Beh Composite <sup>a</sup>	-.05 (124)	-.26** (124)	.01 (122)	-.18 <sup>†</sup> (94)	-.02 (120)
Agg Beh Parent	.10 (130)	-.17* (134)	-.01 (130)	-.24* (98)	.04 (130)
Agg Beh Teacher	-.11 (124)	-.21* (128)	.01 (126)	-.06 (99)	-.05 (124)

*Note.* BIA = Brief Intellectual Ability score; ADHD Symp = ADHD Symptoms; Agg Beh = Aggressive Behavior. *Ns* for each cell are noted in parentheses. <sup>a</sup> Composite score based on an average of parent and teacher ratings. <sup>b</sup> Child's gender was coded so that 0 = male and 1 = female. <sup>c</sup> Due to a low base rate of minorities other than African-American and to make correlation analyses meaningful, child's ethnicity was recoded into two groups: white and non-white. <sup>d</sup> Parent's age is based on responding parent.

<sup>†</sup> Trend,  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Due to a low base rate of minorities other than African American and to make correlation analyses meaningful, child's ethnicity was recoded into two groups (white and non-white) and treated as a dichotomous variable. Child's gender was significantly related to all outcome variables and the BIA score was significantly related to the ADHD Symptoms Composite, parent-rated ADHD, teacher-rated ADHD, Aggressive Behavior Composite, and parent-rated Aggressive Behavior. Therefore, child's gender and BIA were controlled in all subsequent regression analyses. Child's age was also controlled in all analyses including EF/Attention to control for the effects of age on this variable (i.e., given that age-adjusted standardized scores could not be calculated for the testing subtests).

### Correlations among Variables

#### *Bivariate Correlations*

The variables of interest in the study (i.e., SES, Negative Parenting, Negative Affectivity, Surgency, Effortful Control, EF/Attention, ADHD Symptoms, and Aggressive Behaviors) were examined through a correlation analysis to determine how these constructs relate to each other (Table 7). Negative Parenting, Surgency, and Negative Affectivity were positively correlated to outcome variables, whereas, Effortful Control and EF/Attention were negatively correlated to outcome variables ( $ps < .05$ ). SES was only marginally related to the Aggressive Behavior Composite,  $r = -.15$ ,  $p < .10$ , and parent-rated Aggressive Behavior,  $r = -.16$ ,  $p < .10$ , but was significantly correlated to Effortful Control,  $r = .26$ ,  $p < .01$ . Additionally, the dimensions of temperament were not consistently related to each other: Surgency was marginally related to Effortful Control,  $r$

= -.16,  $p < .10$ , whereas Negative Affectivity was significantly related to Effortful Control,  $r = -.29$ ,  $p < .01$ .

Table 7

*Correlations among Variables of Interest*

	2	3	4	5	6	7	8	9	10	11	12
1. Hollingshead SES	-0.15 <sup>†</sup> (138)	-.13 (136)	-.037 (136)	.26** (136)	-.043 (102)	-.11 (120)	-.06 (134)	-.14 (129)	-.15 <sup>†</sup> (124)	-.16 <sup>†</sup> (134)	-.086 (128)
2. Negative Parenting	-	.17* (136)	.30*** (136)	-.18* (136)	-.13 (102)	.35*** (120)	.30** (134)	.30** (129)	.34*** (124)	.23** (134)	.26** (128)
3. Surgency	-	-	-.028 (136)	-.16 <sup>†</sup> (136)	-.025* (100)	.45*** (120)	.46*** (134)	.35*** (127)	.39*** (124)	.34*** (134)	.28** (126)
4. Negative Affectivity	-	-	-	-.29** (136)	-.13 (100)	.30** (120)	.42*** (134)	.13 (127)	.26** (124)	.36*** (134)	.13 (126)
5. Effortful Control	-	-	-	-	.30** (100)	-.62*** (120)	-.60*** (134)	-.47*** (127)	-.44*** (124)	-.34*** (134)	-.35*** (126)
6. EF/Attention	-	-	-	-	-	-.41*** (90)	-.33** (98)	-.38*** (100)	-.33** (94)	-.07 (98)	-.39*** (99)
7. ADHD Composite <sup>a</sup>	-	-	-	-	-	-	.87*** (120)	.89*** (120)	.78*** (120)	.51*** (120)	.70*** (120)
8. ADHD Symp Parent	-	-	-	-	-	-	-	.54*** (125)	.61*** (124)	.58*** (134)	.42*** (124)
9. ADHD Symp Teacher	-	-	-	-	-	-	-	-	.77*** (124)	.33*** (125)	.80*** (129)
10. Agg Beh Composite <sup>a</sup>	-	-	-	-	-	-	-	-	-	.69*** (124)	.86*** (124)
11. Agg Beh Parent	-	-	-	-	-	-	-	-	-	-	.23** (124)
12. Agg Beh Teacher	-	-	-	-	-	-	-	-	-	-	-

Note. SES = Socioeconomic Status; EF = Executive Functioning; ADHD Symp = ADHD Symptoms; Agg Beh = Aggressive Behavior. *N*s for each cell are noted in parentheses. <sup>a</sup> Composite score based on an average of parent and teacher ratings. <sup>†</sup> Trend,  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

### *Canonical Correlations*

A canonical correlation analysis was conducted to explore how contextual and biologically-based predictors of child externalizing behaviors related to ADHD Symptoms and Aggressive Behavior in a multivariate model. For this analysis, SES, Negative Parenting, the three dimensions of temperament (Surgency, Negative Affectivity, and Effortful Control) and EF/Attention were entered, as a set, predicting parent-rated ADHD Symptoms, teacher-rated ADHD Symptoms, parent-rated Aggressive Behavior, and teacher-rated Aggressive Behavior, as a set.

A canonical correlation coefficient is analogous to the multiple R in a regression analysis and, when squared, it represents the amount of variance in one set of variables accounted for by the other set (Henningsgaard & Arnau, 2008; Thompson, 2000). Results of the canonical correlation analysis (Table 8) indicated that the first two functions were interpretable. In Function I, contextual and biologically-based predictor variables accounted for 59.05% of the variance in child externalizing behaviors. Function coefficients (analogous to beta weights) and structure coefficients (correlations between each variable and the canonical variate score; Henningsgaard & Arnau, 2008) are presented in the table. Based upon salient function coefficients and salient structure coefficients, higher Negative Parenting, higher Surgency, higher Negative Affectivity, lower Effortful Control, and lower EF/Attention were related to higher parent-rated and teacher-rated ADHD Symptoms and Aggressive Behavior. Surgency and Effortful Control were the most useful in defining this function as they emerged with the highest  $r^2_s$ , 43.03% and 58.68%, respectively.

In Function II, contextual and biologically-based predictor variables accounted for 17.76% of the variance in child externalizing behaviors. In this Function, based upon salient function and salient structure coefficients, a pattern of higher scores on Surgency, Negative Affectivity, and EF/Attention was strongly associated with a pattern of higher parent-rated Aggressive Behavior but lower teacher-rated ADHD Symptoms and Aggressive Behavior. In this Function II, it was Negative Affectivity and EF/Attention which emerged as the most useful variables in defining these functions,  $r^2_s = 23.33\%$  and  $47.20\%$ , respectively. Examination of the  $h^2$  statistic—or the communality coefficient—which represents the sum of the squared structured coefficient for a given variable across functions (Thompson, 2000) indicates that that the biologically-based variables, particularly EF/Attention and Effortful Control, were the most useful in defining the entire analysis.

Table 8

*Results of Canonical Correlation Analysis*

Variable	Function I			Function II			$h^2$
	Function	Structure	$r_s^2$	Function	Structure	$r_s^2$	
<i>Contextual and biologically-based predictors</i>							
SES	.121	-.08	.64%	-.127	-.135	1.82%	2.46%
Negative Parenting	.165	<b>.490</b>	24.01%	.058	.084	.71%	24.72%
Surgency	<b>.476</b>	<b>.656</b>	43.03%	<b>.423</b>	.182	3.31%	46.34%
Negative Affectivity	<b>.303</b>	<b>.482</b>	23.23%	<b>.609</b>	<b>.483</b>	23.33%	46.56%
Effortful Control	<b>-.548</b>	<b>-.766</b>	58.68%	.284	.263	6.92%	65.60%
EF/Attention	-.106	<b>-.482</b>	23.23%	<b>.813</b>	<b>.687</b>	47.20%	70.43%
$Rc^2$			59.05%			17.76%	
Parent-rated ADHD Symptoms	<b>.809</b>	<b>.981</b>	96.24%	.168	.102	1.04%	97.28%
Teacher-rated ADHD Symptoms	.139	<b>.671</b>	45.02%	<b>-.747</b>	<b>-.623</b>	33.81%	78.83%
Parent-rated Aggressive Behavior	.106	<b>.667</b>	44.49%	<b>.693</b>	<b>.524</b>	27.46%	71.95%
Teacher-rated Aggressive Behavior	.085	<b>.496</b>	24.60%	-.252	<b>-.609</b>	37.09%	61.69%
<i>Child Externalizing Behaviors</i>							

Note:  $Rc^2$  = squared canonical correlation coefficient; function and structure coefficients with an absolute value of 0.30 or greater are indicated in **bold**.

### Unique Predictors of ADHD Symptoms and Aggressive Behaviors

Six hierarchical multiple regression analyses were conducted to determine the unique contribution of SES, Negative Parenting, the three temperament dimensions and EF/Attention in the prediction of ADHD Symptoms and Aggressive Behaviors. Child's age, child's gender and BIA were entered simultaneously on Step 1, as control variables, and SES, Negative Parenting, the three temperament dimensions and EF/Attention were entered simultaneously on Step 2. The six criterion variables (i.e., the ADHD Symptoms Composite, parent-rated ADHD, teacher-rated ADHD, Aggressive Behavior Composite, parent-rated Aggressive Behavior and teacher-rated Aggressive Behavior) were then regressed separately on to the variables in Step 1 and Step 2. Table 9 displays  $R^2\Delta$  for Step 2 and the standardized regression coefficients ( $\beta$ ) for each variable.

Results revealed that the full model significantly predicted the ADHD Symptoms Composite,  $F(9, 80) = 11.39, p < .001; R^2 = .56$ . Results generally indicated that, when controlling for all other variables (i.e., age, gender, BIA, SES, Negative Parenting, EF/Attention and the other dimensions of temperament), Surgency and Effortful Control uniquely predicted the ADHD Symptoms Composite. Additionally, the full model with control and predictor variables also significantly predicted parent-rated ADHD symptoms,  $F(9, 88) = 14.06, p < .001; R^2 = .59$  and teacher-rated ADHD symptoms,  $F(9, 87) = 5.67, p < .001; R^2 = .37$ . Results indicated that, when controlling for all other variables (i.e., age, gender, BIA, SES, Negative Parenting, EF/Attention and the other dimensions of temperament), SES, Surgency, Negative Affectivity and Effortful Control uniquely predicted parent-rated ADHD Symptoms, but only Effortful Control emerged as a unique predictor of teacher-rated ADHD Symptoms.



Table 9

*Results of Multiple Regression Analyses With Socioeconomic Status, Negative Parenting, Child Temperament and EF/Attention Predicting ADHD Symptoms and Aggressive Behaviors*

	ADHD Symp Composite <sup>a</sup> ( <i>n</i> = 90)	ADHD Symp Parent ( <i>n</i> = 98)	ADHD Symp Teacher ( <i>n</i> = 97)	Agg Beh Composite <sup>a</sup> ( <i>n</i> = 94)	Agg Beh Parent ( <i>n</i> = 98)	Agg Beh Teacher ( <i>n</i> = 96)
<b>Model 1 (Controls)</b>	<b>.21***</b>	<b>.12**</b>	<b>.18***</b>	<b>.07<sup>†</sup></b>	<b>.06<sup>†</sup></b>	<b>.04</b>
Child Gender	-.28**	-.18 <sup>†</sup>	-.33**	-.19 <sup>†</sup>	-.09	-.16
Child Age	-.16	-.03	-.17 <sup>†</sup>	-.07	-.03	-.03
BIA	-.33**	-.27*	-.20 <sup>†</sup>	-.16	-.23*	-.10
<b>Model 2 (Main Effects) <math>R^2\Delta</math></b>	<b>.35***</b>	<b>.47***</b>	<b>.19**</b>	<b>.28**</b>	<b>.26***</b>	<b>.20**</b>
SES	.18 <sup>†</sup>	.19*	.10	.05	.06	.03
Negative Parenting	.10	.07	.11	.19 <sup>†</sup>	.14	.13
EF/Attention	-.12	-.08	-.20 <sup>†</sup>	-.13	.20 <sup>†</sup>	-.38**
Surgency	.28**	.39***	.12	.24*	.32**	.08
Negative Affectivity	.11	.30***	-.06	.11	.26**	-.03
Effortful Control	-.42***	-.37***	-.33**	-.27*	-.24*	-.18

*Note.* ADHD Symp = ADHD Symptoms; Agg Beh = Aggressive Behavior; BIA = Brief Intellectual Ability score; SES = Socioeconomic Status; EF = Executive Functioning. <sup>a</sup> Composite score based on an average of parent and teacher ratings. Beta-weights reported for each predictor. **R<sup>2</sup> or R<sup>2</sup>Δ** for models are shown in **bold**. <sup>†</sup> Trend,  $p < .10$ ; \*  $p < .05$ ; \*\*\*  $p < .001$

As a group, child's age, gender, BIA, SES, Negative Parenting, EF/Attention and the dimensions of temperament significantly predicted the Aggressive Behavior Composite,  $F(9, 84) = 4.95, p < .001; R^2 = .35$ , parent-rated Aggressive Behavior,  $F(9, 88) = 4.75, p < .001; R^2 = .33$ , and teacher-rated Aggressive Behavior,  $F(9, 86) = 2.98, p < .001; R^2 = .24$ . Nevertheless, results revealed that, when controlling for all other variables (i.e., age, gender, BIA, SES, Negative Parenting, EF/Attention and the other dimensions of temperament), only Surgency and Effortful Control uniquely predicted the Aggressive Behavior Composite, whereas all three dimensions of temperament uniquely predicted parent-rated Aggressive Behavior. However, only EF/Attention emerged as a unique predictor of teacher-rated Aggressive Behavior.

#### Interactions in the Prediction of ADHD Symptoms and Aggressive Behaviors

A total of 24 moderated multiple regression analyses were conducted with the 2 predictors (SES and Negative Parenting), 2 moderators (EF/Attention and temperament) and six criterion variables (ADHD Symptoms Composite, parent-rated ADHD Symptoms, teacher-rated ADHD Symptoms, Aggressive Behavior Composite, parent-rated Aggressive Behavior, and teacher-rated Aggressive Behavior) to determine if temperament and EF/Attention moderated the relation between SES and externalizing behaviors and between negative parenting practices and externalizing behaviors. Following the procedures outlined by Baron and Kenny (1986) and Holmbeck (2002), scores for non-standardized predictors (i.e., SES, Negative Parenting, Surgency, Negative Affectivity, Effortful Control, and EF/Attention) were centered (by subtracting the sample mean from each individual score) prior to calculating the interaction term. For each analysis, control variables were entered on the first step, the centered predictor

scores were entered on the second step, and the product(s) of the predictors (2-way interactions only) were entered on the third step. Control variables were child's gender and BIA (both of which related to outcomes) for analyses examining temperament as a moderator and child's gender, BIA, and age for analyses examining EF/Attention as a moderator.<sup>1</sup> Six criterion variables were examined for each model. The criterion variables included the ADHD Symptoms Composite, parent-rated ADHD Symptoms, teacher-rated ADHD Symptoms, Aggressive Behavior Composite, parent-rated Aggressive Behavior, and teacher-rated Aggressive Behavior. Interactions were examined even in the absence of a main effect for SES or negative parenting given that a main effect is not necessary for the presence of an interaction.

*Does Child Temperament Moderate the Relation between SES and Externalizing Behaviors?*

A series of moderated multiple regression analyses were conducted to determine if temperament moderated the relation between SES and child externalizing behaviors. In the first of these analyses, child's gender, and BIA were entered simultaneously on Step 1 as control variables, SES and the three temperament dimensions were entered simultaneously on Step 2, and the three two-way interactions of interest (each of three temperament dimensions X SES) were entered on Step 3 with the ADHD Symptoms Composite as the criterion variable. This same model was used as a predictor of the remaining five criterion variables. Thus, a total of six regression analyses were conducted to determine if temperament moderated the relation between SES and child externalizing behaviors. Table 10 displays  $R^2\Delta$  for each step and the standardized regression coefficients ( $\beta$ ) for each variable.

Table 10

*Results of Moderated Multiple Regression Analyses With Socioeconomic Status and Child Temperament Predicting ADHD Symptoms and Aggressive Behaviors*

		ADHD Symp Composite <sup>a</sup> ( <i>n</i> = 90)	ADHD Symp Parent ( <i>n</i> = 98)	ADHD Symp Teacher ( <i>n</i> = 97)	Agg Beh Composite <sup>a</sup> ( <i>n</i> = 94)	Agg Beh Parent ( <i>n</i> = 98)	Agg Beh Teacher ( <i>n</i> = 96)
<b>Model 1 (Controls)</b>	<b><i>R</i><sup>2</sup></b>	<b>.19***</b>	<b>.12**</b>	<b>.16***</b>	<b>.06*</b>	<b>.06*</b>	<b>.03</b>
Child Gender		-.28**	-.18 <sup>†</sup>	-.34**	-.19 <sup>†</sup>	-.09	-.17
BIA		-.27**	-.26 <sup>†</sup>	-.14	-.13	-.22*	.01
<b>Model 2 (Main Effects)</b>	<b><i>R</i><sup>2</sup>Δ</b>	<b>.35***</b>	<b>.46***</b>	<b>.16**</b>	<b>.24***</b>	<b>.23***</b>	<b>.10*</b>
SES		.21*	.20*	.14	.08	.03	.08
Surgency		.31***	.42***	.17 <sup>†</sup>	.29**	.31**	.15
Negative Affectivity		.15 <sup>†</sup>	.39***	-.01	.19*	.29**	.05
Effortful Control		-.47***	-.39***	-.39***	-.32**	-.21*	-.29*
<b>Model 3 (Interactions)</b>	<b><i>R</i><sup>2</sup>Δ</b>	<b>.03<sup>†</sup></b>	<b>.01</b>	<b>.07*</b>	<b>.05<sup>†</sup></b>	<b>.08*</b>	<b>.11<sup>†</sup></b>
SES X Surgency		-.09	-.11	-.03	-.20*	-.24*	-.10
SES X Negative Affectivity		.04 <sup>^</sup>	-.01	.01	-.01	-.16 <sup>†</sup>	.14
SES X Effortful Control		-.19*	-.04	-.29**	-.21*	.03	-.32**

*Note.* ADHD Symp = ADHD Symptoms; Agg Beh = Aggressive Behavior; BIA = Brief Intellectual Ability score; SES = Socioeconomic Status. <sup>a</sup> Composite score based on an average of parent and teacher ratings. Beta-weights reported for each predictor. ***R*<sup>2</sup>** or ***R*<sup>2</sup>Δ** for models are shown in **bold**. <sup>†</sup> Trend, *p* < .10; \* *p* < .05; \*\*\* *p* < .001

Results revealed that the full model significantly predicted the ADHD Symptoms Composite,  $F(9, 80) = 11.90, p < .001; R^2 = .57$ . Results generally indicated that SES, Surgency and Effortful Control uniquely predicted the ADHD Symptoms Composite. Thus, higher levels of both SES and Surgency, but lower levels of Effortful Control are related to higher levels of the ADHD Symptoms Composite. Furthermore, a significant interaction between SES and Effortful Control emerged,  $\beta = -.193, p < .05$ . This interaction remained significant in a reduced model that included only the main effects and the interaction term,  $F(3, 116) = 30.06, p < .001; R^2\Delta = .05$ . The interaction was plotted using the procedures recommended by Holmbeck (2002) and revealed that when Effortful Control was low, children from higher SES backgrounds had higher ratings on the ADHD Symptoms Composite than children with lower SES,  $\beta = .14, p < .001$  (Figure 1). However, when Effortful Control was high, children with higher SES tended to have lower ratings on the ADHD Symptoms Composite than children with lower SES,  $\beta = -.09, p < .10$ .

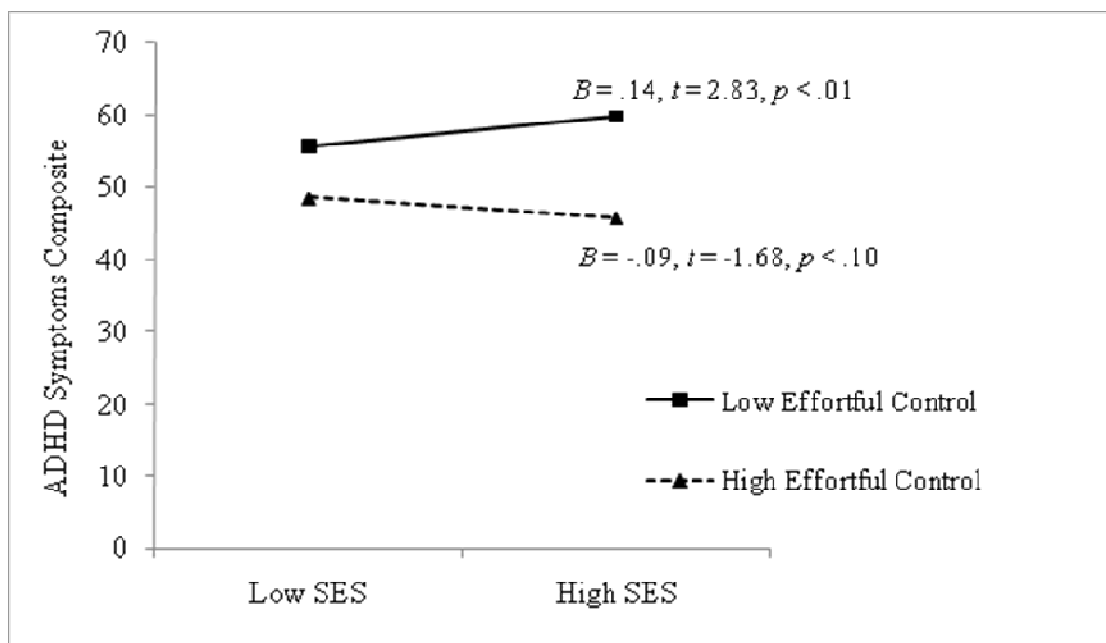


Figure 1. Interaction between SES and Effortful Control predicting the ADHD Symptoms Composite.

As a group, the variables of interest (i.e., age, gender, BIA, SES, the dimensions of temperament, and the interactions) also significantly predicted parent-rated ADHD Symptoms  $F(9, 88) = 14.17, p < .001; R^2 = .59$ , and teacher-rated ADHD Symptoms,  $F(9, 87) = 6.15, p < .001; R^2 = .39$ . SES, Surgency, Negative Affectivity, and Effortful Control all emerged as unique predictors of parent-rated ADHD Symptoms; however, only Effort Control emerged as a unique predictor of teacher-rated ADHD Symptoms. A significant interaction between SES and Effortful Control predicting teacher-rated ADHD Symptoms surfaced,  $\beta = -.29, p < .01$ . This interaction remained significant in a reduced model that included only the main effects and the interaction term,  $F(3, 123) = 16.59, p < .001; R^2\Delta = .07$ . A plot of the interaction revealed that, when Effortful Control was low, children with higher SES scored higher on teacher-rated ADHD symptoms,  $\beta = .15, p < .05$ ; however, when Effortful Control was high, children with higher SES had lower scores on teacher-rated ADHD Symptoms than children with lower SES,  $\beta = -.15, p < .05$ .

(Figure 2).

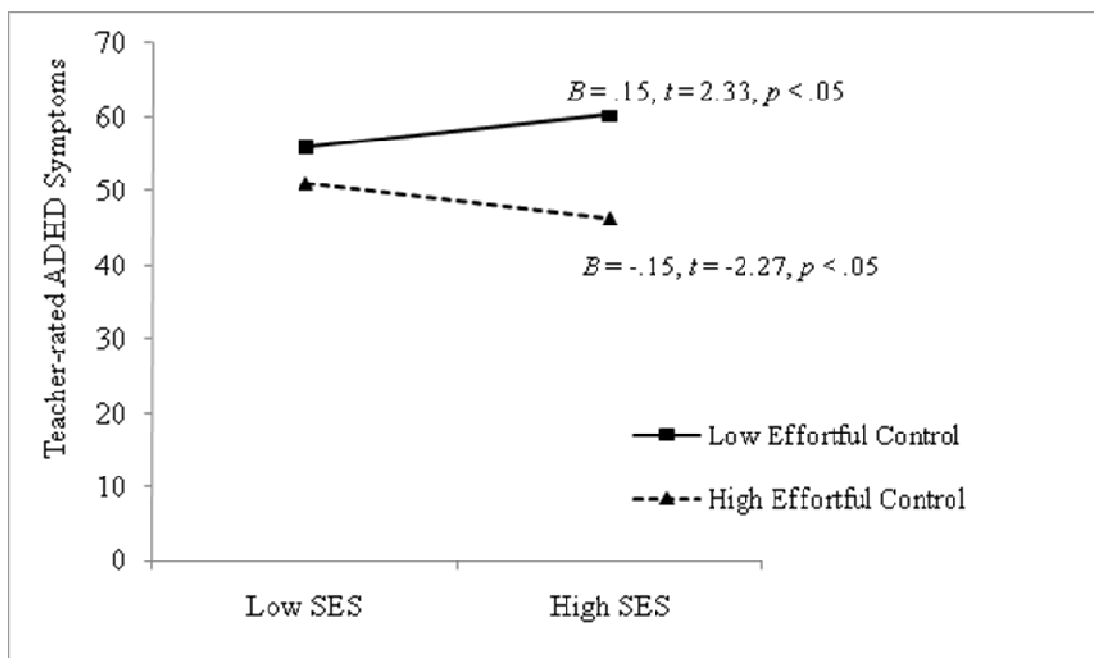


Figure 2. Interaction between SES and Effortful Control predicting teacher-rated ADHD Symptoms.

When the Aggression Behavior Composite was regressed on the full model, it significantly predicted the criterion,  $F(9, 84) = 5.02, p < .001; R^2 = .35$ . Similarly, this full model significantly predicted parent-rated Aggressive Behavior,  $F(9, 88) = 5.71, p < .001; R^2 = .37$ , and teacher-rated Aggressive Behavior,  $F(9, 86) = 2.92, p < .010; R^2 = .23$ . Moreover, all three dimensions of temperament emerged as significant unique predictors of the Aggressive Behavior Composite and parent-rated Aggressive Behavior. However, only Effortful Control uniquely predicted teacher-rated Aggressive Behavior. The interaction between SES and Surgency,  $\beta = -.20, p < .05$ , and the interaction between SES and Effortful Control,  $\beta = -.21, p < .01$ , in the prediction of the Aggressive Behavior Composite emerged as significant. In a reduced model, the interaction of SES and Surgency predicting the Aggressive Behavior Composite was not significant,  $F(3, 120) = 7.85, p < .001; R^2\Delta = .00, p = ns$ , but the interaction of SES and Effortful Control in the

prediction the Aggressive Behavior Composite remained significant,  $F(3, 120) = 11.83, p < .001; R^2\Delta = .03$ . This latter interaction was plotted and the results revealed that, when Effortful Control was high, children with higher SES tended have lower scores on the Aggressive Behavior Composite,  $\beta = -.13, p < .10$  (Figure 3).

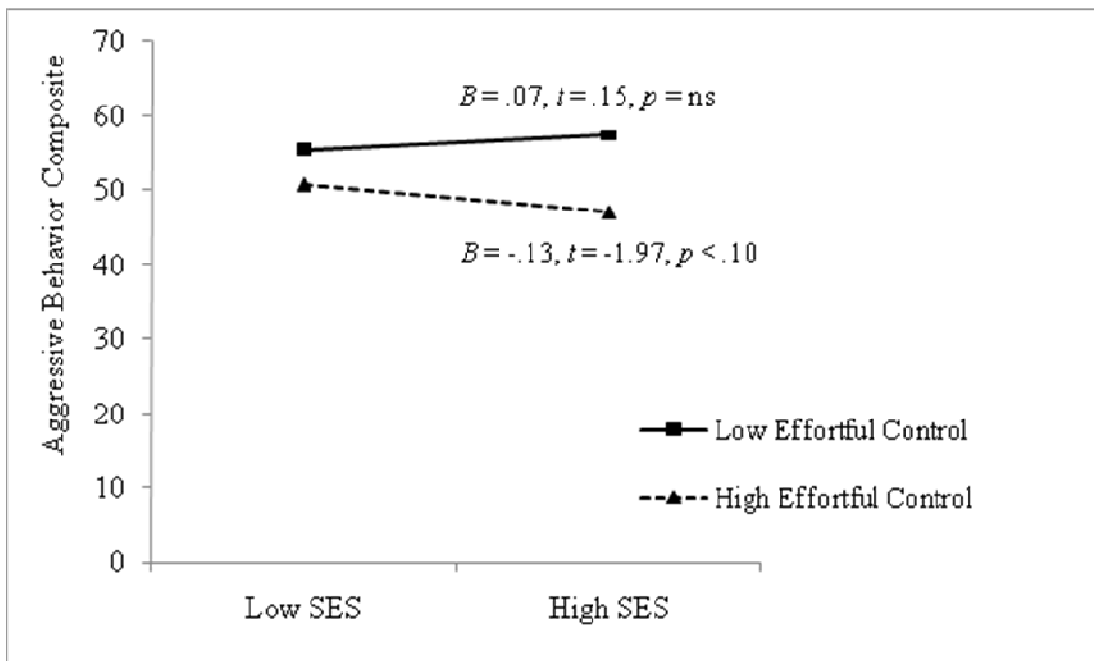


Figure 3. Interaction between SES and Effortful Control predicting the Aggressive Behavior Composite.

Additionally, a significant SES by Surgency interaction,  $\beta = -.24, p < .05$ , and a marginally significant SES by Negative Affectivity interaction,  $\beta = -.16, p < .10$ , resulted when predicting parent-rated Aggressive Behavior. The SES and Surgency interaction predicting parent-rated Aggressive Behavior remained significant in a reduced model,  $F(3, 130) = 7.72, p < .001; R^2\Delta = .02$ , but the SES by Negative Affectivity was no longer marginally significant,  $F(3, 130) = 8.55, p < .000; R^2\Delta = .01, p = ns$ . The significant interaction was plotted and the results revealed that, when Surgency was high, children



with lower SES scored higher on parent-rated Aggressive Behavior than did children with higher SES,  $\beta = -.16, p < .05$  (Figure 4).

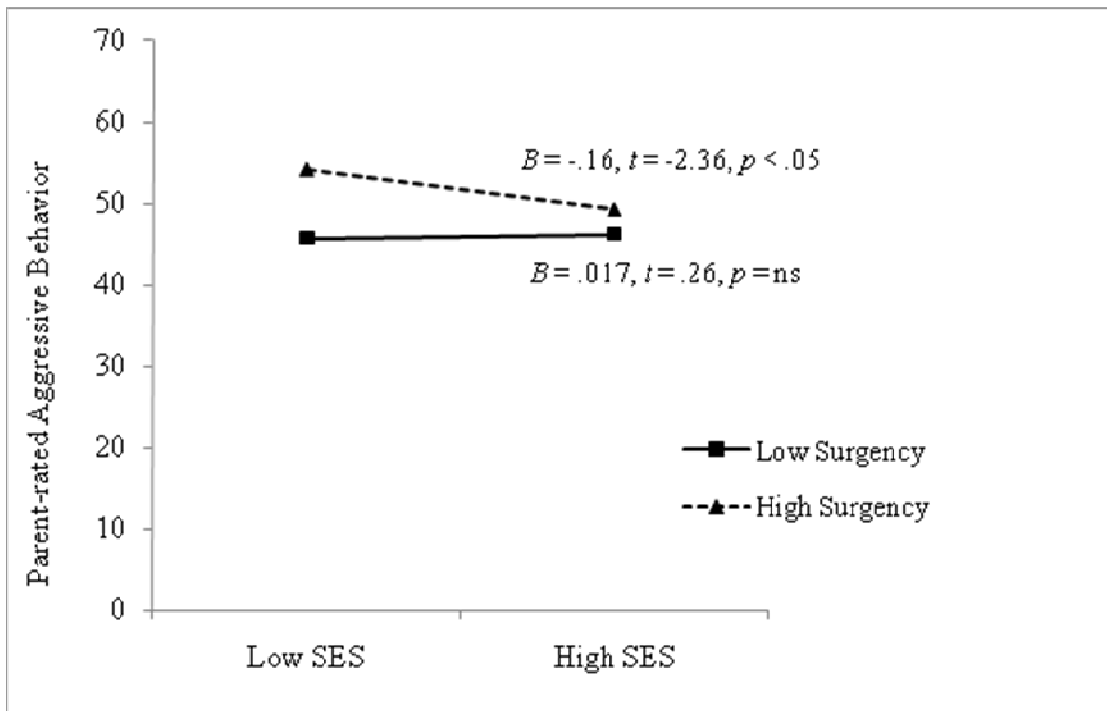


Figure 4. Interaction between SES and Surgency predicting parent-rated Aggressive Behavior.

SES and Effortful Control also interacted to predict teacher-rated Aggressive Behavior,  $\beta = -.324, p < .01$ . This interaction remained significant in a reduced model,  $F(3, 122) = 9.92, p < .001; R^2\Delta = .07$ , and, therefore, was plotted. Results revealed that lower Effortful Control was related to higher teacher-rated Aggressive Behavior,  $\beta = .27, p < .05$ , and higher Effortful Control was related to lower teacher-rated Aggressive Behavior,  $\beta = -.25, p < .05$ , but only for children from a higher SES (Figure 5).

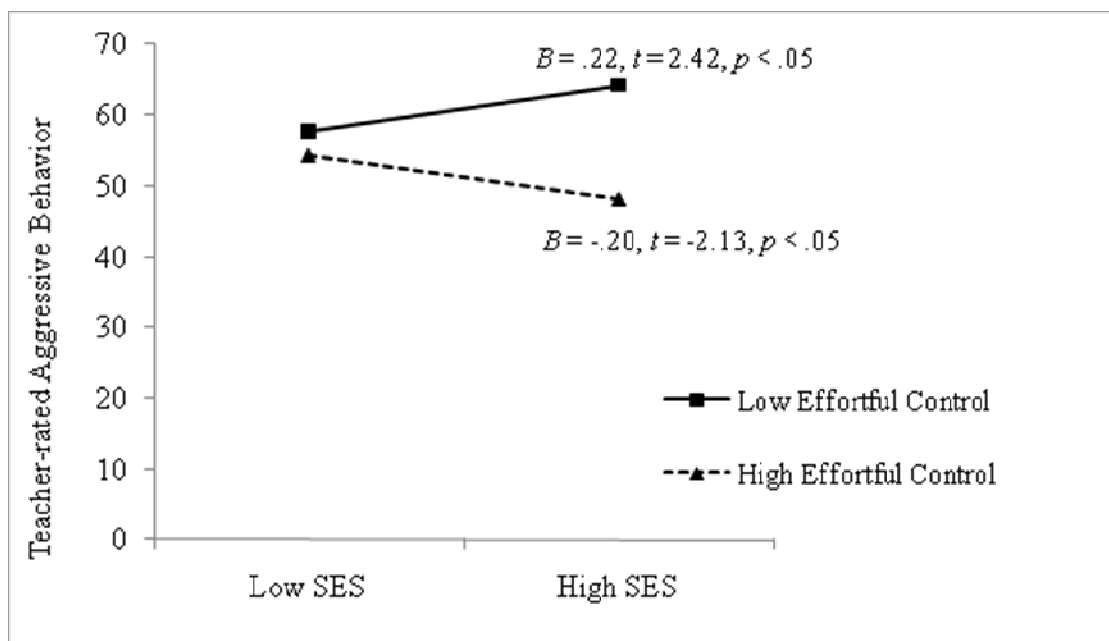


Figure 5. Interaction between SES and Effortful Control predicting teacher-rated Aggressive Behavior.

*Does Child Temperament Moderate the Relation between Negative Parenting and Externalizing Behaviors?*

A series of moderated multiple regression analyses were conducted to determine if temperament moderated the relation between negative parenting and child externalizing behaviors. In the first of these analyses, child's gender, and BIA were entered simultaneously on Step 1 as control variables, SES and the three temperament dimensions were entered simultaneously on Step 2, and the three two-way interactions of interest (each of three temperament dimensions X negative parenting) were entered on Step 3 with the ADHD Symptoms Composite as the criterion variable. This same model was used as a predictor of the remaining five criterion variables. Thus, a total of six regression analyses were conducted to determine if temperament moderated the relation between SES and child externalizing behaviors. Table 11 displays  $R^2\Delta$  for each step and the standardized regression coefficients ( $\beta$ ) for each variable.

Table 11

*Results of Moderated Multiple Regression Analyses With Negative Parenting and Child Temperament Predicting ADHD Symptoms and Aggressive Behaviors*

		ADHD Symp Composite <sup>a</sup> ( <i>n</i> = 90)	ADHD Symp Parent ( <i>n</i> = 98)	ADHD Symp Teacher ( <i>n</i> = 97)	Agg Beh Composite <sup>a</sup> ( <i>n</i> = 94)	Agg Beh Parent ( <i>n</i> = 98)	Agg Beh Teacher ( <i>n</i> = 96)
<b>Model 1 (Controls)</b>	<b><i>R</i><sup>2</sup></b>	<b>.19***</b>	<b>.12**</b>	<b>.16***</b>	<b>.06*</b>	<b>.06*</b>	<b>.03</b>
Child Gender		-.28**	-.18 <sup>†</sup>	-.34*	-.19 <sup>†</sup>	-.09	-.17
BIA		-.27**	-.26 <sup>†</sup>	-.14	-.13	-.22*	.01
<b>Model 2 (Main Effects)</b>	<b><i>R</i><sup>2</sup>Δ</b>	<b>.33***</b>	<b>.43***</b>	<b>.16**</b>	<b>.27***</b>	<b>.24***</b>	<b>.12*</b>
Negative Parenting		.13	.08	.13	.21*	.12	.16
Surgency		.29**	.40***	.16 <sup>†</sup>	.26**	.29**	.13
Negative Affectivity		.12	.31***	-.04	.12	.26**	.01
Effortful Control		-.41***	-.35***	-.35**	-.29**	-.19 <sup>†</sup>	-.25*
<b>Model 3 (Interactions)</b>	<b><i>R</i><sup>2</sup>Δ</b>	<b>.05*</b>	<b>.03</b>	<b>.05<sup>†</sup></b>	<b>.01</b>	<b>.04</b>	<b>.01</b>
Negative Parenting X Surgency		.22**	.16*	.24*	-.01	-.12	.08
Negative Parenting X Negative Affectivity		.03	.01	.11	-.12	-.18 <sup>†</sup>	.00
Negative Parenting X Effortful Control		-.02	-.06	.07	-.09	-.19 <sup>†</sup>	.04

*Note.* ADHD Symp = ADHD Symptoms; Agg Beh = Aggressive Behavior; BIA = Brief Intellectual Ability score. <sup>a</sup> Composite score based on an average of parent and teacher ratings. Beta-weights reported for each predictor. ***R*<sup>2</sup>** or ***R*<sup>2</sup>Δ** for models are shown in **bold**. <sup>†</sup> Trend, *p* < .10; \* *p* < .05; \*\*\* *p* < .001

Results revealed that the full model significantly predicted the ADHD Symptoms Composite,  $F(9, 80) = 11.66, p < .001; R^2 = .57$ ; parent-rated ADHD Symptoms,  $F(9, 88) = 13.78, p < .001; R^2 = .59$ ; and teacher-rated ADHD Symptoms,  $F(9, 87) = 5.60, p < .001; R^2 = .37$ . Surgency and Effortful Control uniquely predicted the ADHD Symptoms Composite, whereas all three dimensions of temperament predicted parent-rated ADHD Symptoms. However, only Effortful Control uniquely predicted teacher-rated ADHD Symptoms. Results revealed that the interaction of Negative Parenting and Surgency significantly predicted the ADHD Symptoms Composite,  $\beta = .22, p < .01$ , parent-rated ADHD Symptoms,  $\beta = .16, p < .05$ , and teacher-rated ADHD symptoms,  $\beta = .24, p < .05$ . When entered in a reduced model, two of these interactions remained significant—predicting the ADHD Symptoms Composite,  $F(3, 116) = 16.36, p < .001; R^2\Delta = .02$ , and predicting parent-rated ADHD Symptoms,  $F(3, 130) = 16.74, p < .001; R^2\Delta = .03$ . The interaction of Negative Parenting and Surgency predicting teacher-rated ADHD Symptoms was no longer significant in the reduced model,  $F(3, 123) = 8.43, p < .001; R^2\Delta = .01, p = ns$ . The interactions that remained significant in the reduced model were plotted. Results revealed that, when Surgency was high, children whose parents used higher levels of negative parenting practices were rated higher on both the ADHD Symptoms Composite,  $\beta = .38, p < .001$  (Figure 6), and parent-rated ADHD Symptoms,  $\beta = .35, p < .001$  (Figure 7).

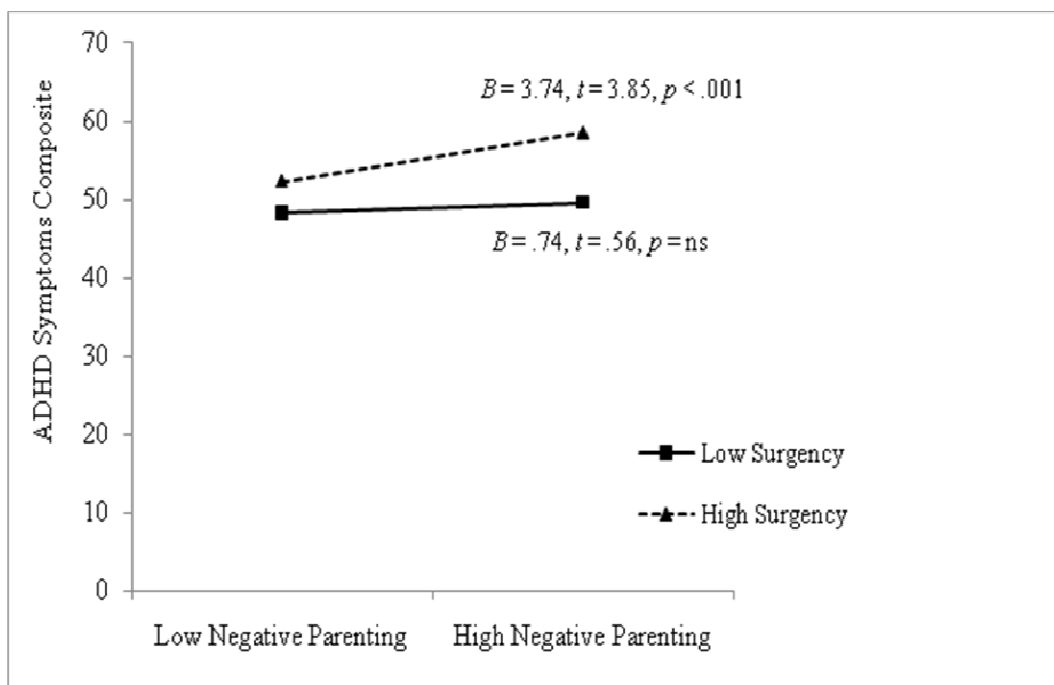


Figure 6. Interaction between Negative Parenting and Surgency predicting the ADHD Symptoms Composite.

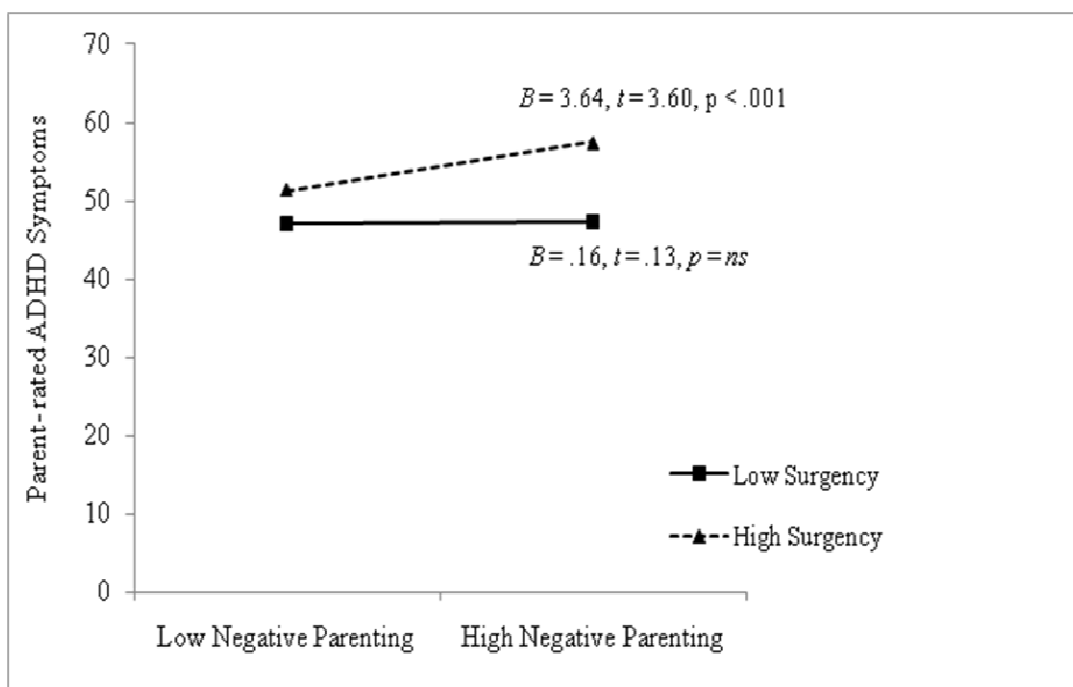


Figure 7. Interaction between Negative Parenting and Surgency predicting parent-rated ADHD Symptoms.

Additionally, the full model significantly predicted the Aggressive Behavior Composite,  $F(9, 93) = 7.18, p < .001; R^2 = .34$ . Results revealed that, when controlling for all other factors (i.e., gender, BIA, SES, and the other dimensions of temperament), Negative Parenting, Surgency and Effortful Control each uniquely predicted the Aggressive Behavior Composite. No significant interactions emerged. As a group, the variables of interest (i.e., age, gender, BIA, SES, the dimensions of temperament, and the interactions) also significantly predicted parent-rated Aggressive Behavior,  $F(9, 88) = 5.05, p < .001; R^2 = .34$ , but marginally predicted teacher-rated Aggressive Behavior,  $F(9, 86) = 1.68, p = .10; R^2 = .15$ . Surgency and Negative Affectivity uniquely predicted parent-rated Aggressive Behavior; however, only Effort Control emerged as a unique predictor of teacher-rated Aggressive Behavior. Two marginally significant interactions—between Negative Parenting and Negative Affectivity,  $\beta = -.18, p < .10$ , and between Negative Parenting and Effortful Control,  $\beta = -.19, p < .10$ —each predicting parent-rated Aggressive Behavior emerged. When entered in a reduced model, the interaction of Negative Parenting and Negative Affectivity predicting parent-rated Aggressive Behavior was no longer significant,  $F(3, 130) = 7.40, p < .001; R^2\Delta = .00, p = ns$ . However, the interaction of Negative Parenting and Effortful Control predicting parent-rated Aggressive Behavior became marginally significant  $F(3, 130) = 8.33, p < .001; R^2\Delta = .02$ . This interaction was plotted and the results revealed that, when Effortful Control was low, children whose parents used higher levels of negative parenting practices were rated higher on parent-rated Aggressive Behavior,  $\beta = .35, p < .05$  (Figure 8).

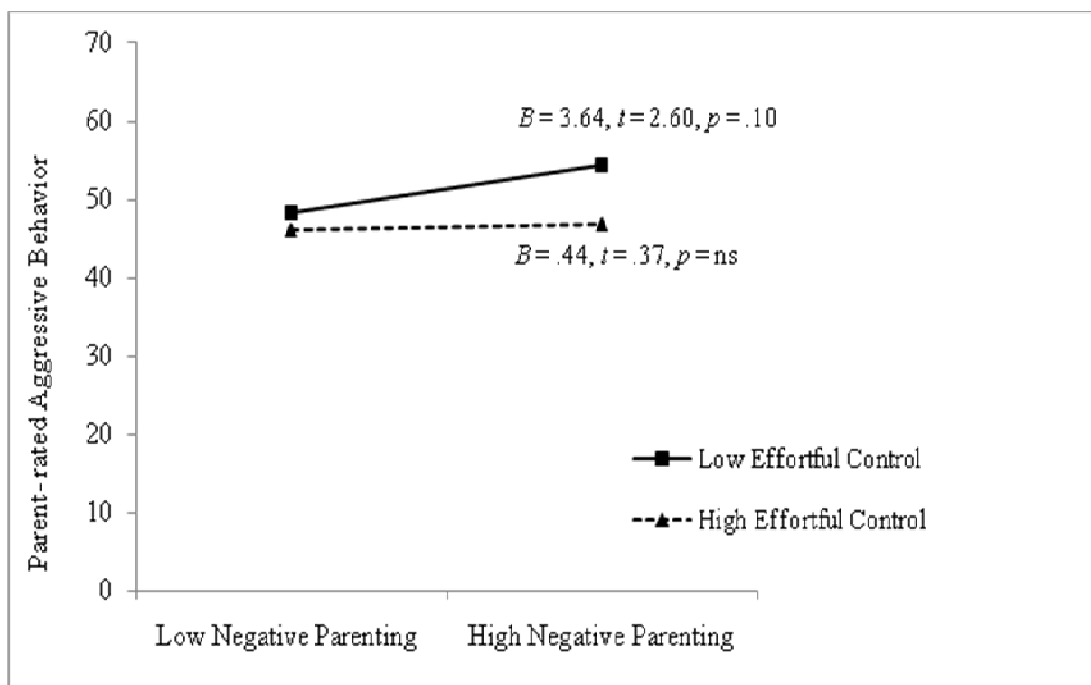


Figure 8. Interaction between Negative Parenting and Effortful Control predicting parent-rated Aggressive Behavior.

*Does EF/Attention Moderate the Relation between SES and Externalizing Behaviors?*

A series of moderated multiple regression analyses were conducted to determine if EF/Attention moderated the relation between SES and child externalizing behaviors. In the first of these analyses, child's gender, child's age, and BIA were entered simultaneously on Step 1 as control variables, SES and EF/Attention were entered simultaneously on Step 2, and the two-way interaction (SES X EF/Attention) was entered on Step 3 with the ADHD Symptoms Composite as the criterion variable. This same model was used as a predictor of the remaining five criterion variables. Thus, a total of six regression analyses were conducted to determine if EF/Attention moderated the relation between SES and child externalizing behaviors. Table 12 displays  $R^2\Delta$  for each step and the standardized regression coefficients ( $\beta$ ) for each variable.

Table 12

*Results of Moderated Multiple Regression Analyses With Socioeconomic Status and EF/Attention Predicting ADHD Symptoms and Aggressive Behaviors*

		ADHD Symp Composite <sup>a</sup> ( <i>n</i> = 90)	ADHD Symp Parent ( <i>n</i> = 98)	ADHD Symp Teacher ( <i>n</i> = 99)	Agg Beh Composite <sup>a</sup> ( <i>n</i> = 94)	Agg Beh Parent ( <i>n</i> = 98)	Agg Beh Teacher ( <i>n</i> = 98)
<b>Model 1 (Controls)</b>	<b><i>R</i><sup>2</sup></b>	<b>.21***</b>	<b>.12**</b>	<b>.16**</b>	<b>.07<sup>†</sup></b>	<b>.06<sup>†</sup></b>	<b>.03</b>
Child Gender		-.28**	-.18 <sup>†</sup>	-.31**	-.19 <sup>†</sup>	-.09	-.14
Child Age		-.16	-.03	-.15	-.07	-.03	-.08
BIA		-.33**	-.27*	-.22*	-.16	-.23*	-.05
<b>Model 2 (Main Effects)</b>	<b><i>R</i><sup>2</sup>Δ</b>	<b>.09**</b>	<b>.09**</b>	<b>.08*</b>	<b>.08*</b>	<b>.01</b>	<b>.15***</b>
SES		.07	.08	-.01	-.02	-.02	-.04
EF/Attention		-.34**	-.34**	-.33**	-.34**	-.02	-.47***
<b>Model 3 (Interactions)</b>	<b><i>R</i><sup>2</sup>Δ</b>	<b>.03<sup>†</sup></b>	<b>.01</b>	<b>.04*</b>	<b>.03<sup>†</sup></b>	<b>.01</b>	<b>.02</b>
SES X EF/Attention		-.17 <sup>†</sup>	-.07	-.20*	-.18 <sup>†</sup>	-.11	-.14

*Note.* ADHD Symp = ADHD Symptoms; Agg Beh = Aggressive Behavior; BIA = Brief Intellectual Ability score; SES = Socioeconomic Status; EF = Executive Functioning. <sup>a</sup> Composite score based on an average of parent and teacher ratings. Beta-weights reported for each predictor. ***R*<sup>2</sup> or *R*<sup>2</sup>Δ** for models are shown in **bold**. <sup>†</sup> Trend, *p* < .10; \* *p* < .05; \*\*\* *p* < .001



Results revealed that the full model significantly predicted the ADHD Symptoms Composite,  $F(6, 83) = 6.72, p < .001; R^2 = .33$ ; parent-rated ADHD Symptoms,  $F(6, 91) = 4.26, p < .01; R^2 = .22$ ; and teacher-rated ADHD Symptoms,  $F(6, 92) = 5.87, p < .001; R^2 = .28$ . Overall, EF/Attention uniquely predicted the ADHD Symptoms Composite, parent-rated ADHD Symptoms and teacher-rated ADHD Symptoms when all other variables in the full model were held constant. A marginally significant interaction emerged between SES and EF/Attention predicting the ADHD Symptoms Composite,  $\beta = -.17, p < .10$ , and a significant interaction emerged between SES and EF/Attention predicting teacher-rated ADHD Symptoms,  $\beta = -.20, p < .05$ . The interaction of SES and EF/Attention predicting the ADHD Symptoms Composite,  $F(3, 86) = 7.90, p < .001; R^2\Delta = .04$ , became significant in a reduced model, and the interaction of SES and EF/Attention predicting teacher-rated ADHD Symptoms,  $F(3, 95) = 8.29, p < .001; R^2\Delta = .04$ , remained significant in a reduced model. Therefore, both interactions were plotted. Results revealed that, when EF/Attention was high, children with higher SES scored lower on the ADHD Symptoms Composite,  $\beta = -.30, p < .05$  (Figure 9), and teacher-rated ADHD Symptoms,  $\beta = -.33, p < .05$  (Figure 10), compared to children with lower SES.

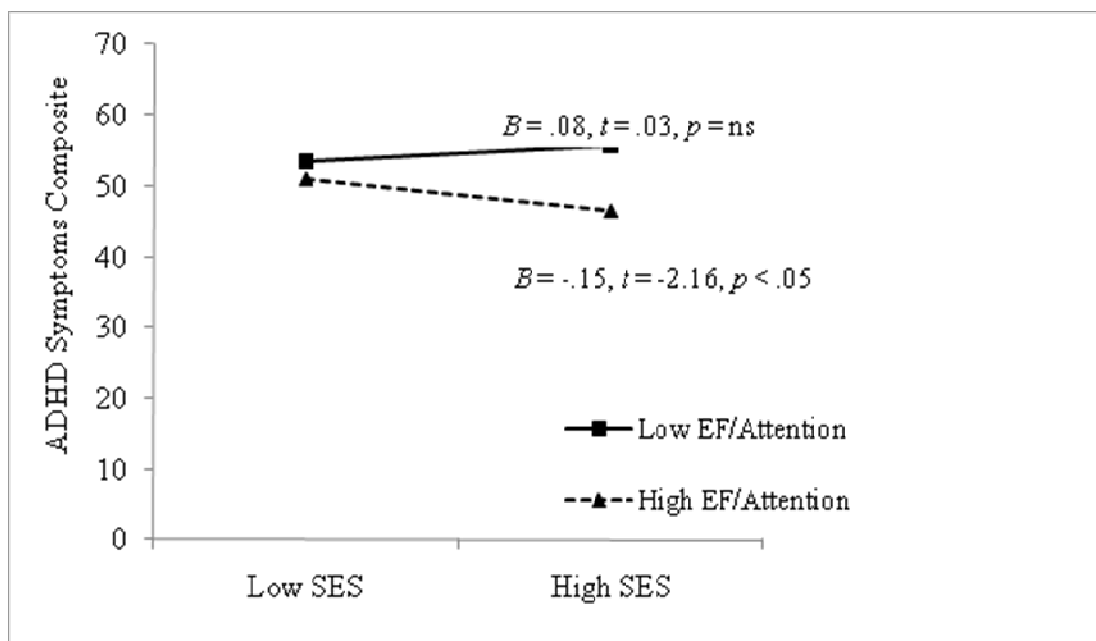


Figure 9. Interaction between SES and EF/Attention predicting the ADHD Symptoms Composite.

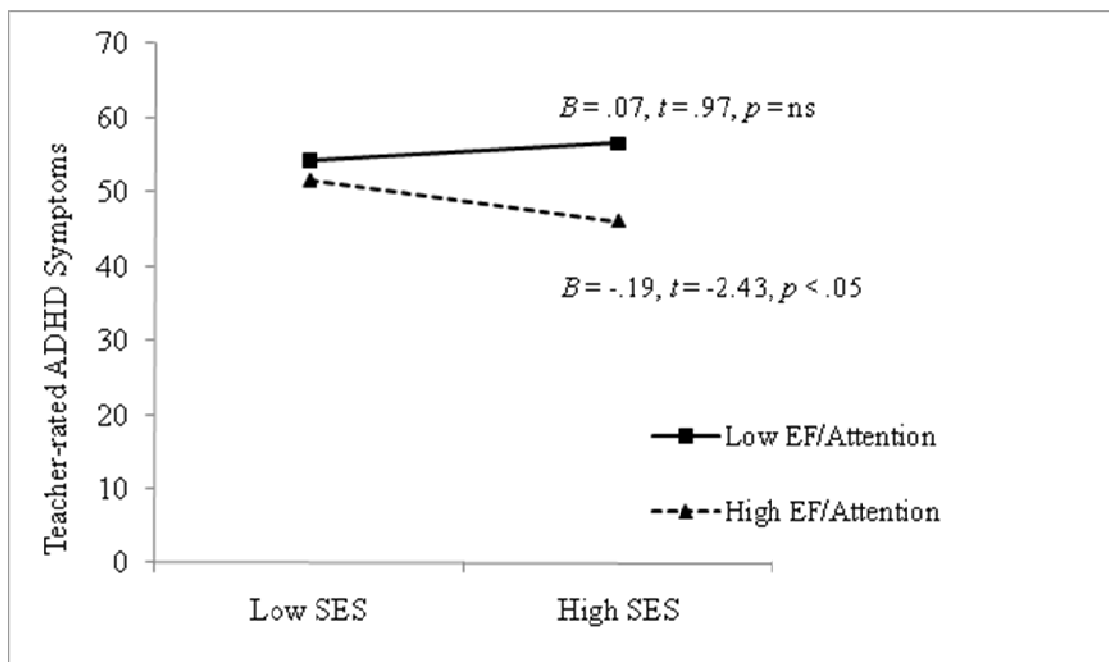


Figure 10. Interaction between SES and EF/Attention predicting teacher-rated ADHD Symptoms.

When the full model was used to predict Aggressive Behaviors, similar results emerged. Specifically, the full model significantly predicted the Aggressive Behavior Composite,  $F(6, 87) = 3.16, p < .01; R^2 = .18$ , and teacher-rated Aggressive Behavior,  $F(6, 91) = 3.66, p < .01; R^2 = .19$ , but not parent-rated Aggressive Behavior,  $F(6, 91) = 1.24, p = ns; R^2 = .08$ . Moreover, EF/Attention was a unique predictor of the Aggressive Behavior Composite and teacher-rated Aggressive Behavior. A marginally significant interaction of SES and EF/Attention predicting the Aggressive Behavior Composite emerged,  $\beta = -.18, p < .10$ . This interaction became significant in a reduced model,  $F(3, 90) = 5.16, p < .01; R^2\Delta = .03$ , and it was plotted. Results revealed that, when EF/Attention was high, children with higher SES tended to score lower on the Aggressive Behavior Composite,  $\beta = -.28, p < .10$ , compared to children with lower SES (Figure 11).

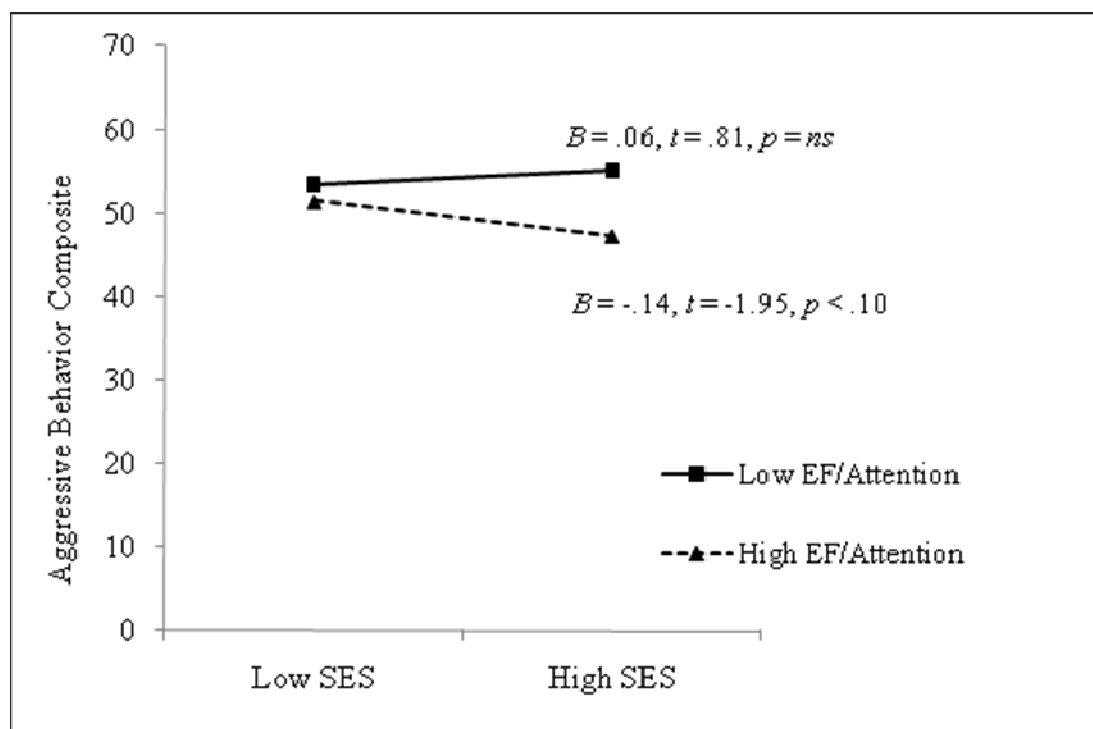


Figure 11. Interaction between SES and EF/Attention predicting the Aggressive Behavior Composite.

*Does EF/Attention Moderate the Relation between Negative Parenting and Externalizing Behaviors?*

A series of moderated multiple regression analyses were conducted to determine if EF/Attention moderated the relation between negative parenting and child externalizing behaviors. In the first of these analyses, child's gender, child's age, and BIA were entered simultaneously on Step 1 as control variables, negative parenting and EF/Attention were entered simultaneously on Step 2, and the two-way interaction (negative parenting X EF/Attention) was entered on Step 3 with the ADHD Symptoms Composite as the criterion variable. This same model was used as a predictor of the remaining five criterion variables. Thus, a total of six regression analyses were conducted to determine if EF/Attention moderated the relation between negative parenting and child externalizing behaviors. Table 13 displays  $R^2\Delta$  for each step and the standardized regression coefficients ( $\beta$ ) for each variable.

Table 13

*Results of Moderated Multiple Regression Analyses With Negative Parenting and EF/Attention Predicting ADHD Symptoms and Aggressive Behaviors*

		ADHD Symp Composite <sup>a</sup> ( <i>n</i> = 90)	ADHD Symp Parent ( <i>n</i> = 98)	ADHD Symp Teacher ( <i>n</i> = 99)	Agg Beh Composite <sup>a</sup> ( <i>n</i> = 94)	Agg Beh Parent ( <i>n</i> = 98)	Agg Beh Teacher ( <i>n</i> = 98)
<b>Model 1 (Controls)</b>	<b><i>R</i><sup>2</sup></b>	<b>.21***</b>	<b>.12**</b>	<b>.16**</b>	<b>.07<sup>†</sup></b>	<b>.06<sup>†</sup></b>	<b>.03</b>
Child Gender		-.28**	-.18 <sup>†</sup>	-.31**	-.19 <sup>†</sup>	-.09	-.14
Child Age		-.16	-.03	-.15	-.07	-.03	-.08
BIA		-.33**	-.27*	-.22*	-.06	-.23*	-.05
<b>Model 2 (Main Effects)</b>	<b><i>R</i><sup>2</sup>Δ</b>	<b>.14***</b>	<b>.14***</b>	<b>.11**</b>	<b>.15***</b>	<b>.07*</b>	<b>.19***</b>
Negative Parenting		.23*	.23*	.21*	.28**	.27**	.21*
EF/Attention		-.30**	-.30**	-.29**	-.27*	.04	-.42***
<b>Model 3 (Interactions)</b>	<b><i>R</i><sup>2</sup>Δ</b>	<b>.02</b>	<b>.01</b>	<b>.01</b>	<b>.01</b>	<b>.01</b>	<b>.01</b>
Negative Parenting X EF/Attention		-.15	-.06	-.10	-.10	-.08	-.08

*Note.* ADHD Symp = ADHD Symptoms; Agg Beh = Aggressive Behavior; EF = Executive Functioning. <sup>a</sup> Composite score based on an average of parent and teacher ratings. Beta-weights reported for each predictor. ***R*<sup>2</sup> or *R*<sup>2</sup>Δ** for models are shown in **bold**. <sup>†</sup> Trend, *p* < .10; \* *p* < .05; \*\*\* *p* < .001

Results revealed that the full model significantly predicted the criterion,  $F(6, 83) = 7.92$ ,  $p < .001$ ;  $R^2 = .36$ . Similarly, this full model significantly predicted parent-rated ADHD Symptoms,  $F(6, 91) = 5.41$ ,  $p < .001$ ;  $R^2 = .26$ ; and teacher-rated ADHD Symptoms,  $F(6, 92) = 6.16$ ,  $p < .001$ ;  $R^2 = .29$ . Both Negative Parenting and EF/Attention uniquely predicted the ADHD Symptoms Composite, parent-rated ADHD Symptoms and teacher-rated ADHD Symptoms; however, none of the interactions between Negative Parenting and EF/Attention significantly predicted these criterion variables.

Similarly, the full model with the controls (i.e., child's age, gender and BIA), the variables of interest (i.e., Negative Parenting and EF/Attention) and the interactions (i.e., Negative Parenting X EF/Attention) significantly predicted the Aggressive Behavior Composite,  $F(6, 87) = 4.27$ ,  $p < .01$ ;  $R^2 = .23$ ; parent-rated Aggressive Behavior  $F(6, 91) = 2.41$ ,  $p < .05$ ;  $R^2 = .14$ ; and teacher-rated Aggressive Behavior,  $F(6, 91) = 4.30$ ,  $p < .01$ ;  $R^2 = .22$ . Overall, Negative Parenting and EF/Attention uniquely predicted both the Aggressive Behavior Composite and teacher-rated Aggressive Behavior; however, only Negative Parenting uniquely predicted parent-rated Aggressive Behavior. No significant interactions emerged.

## CHAPTER VI

## DISCUSSION

The current study investigated whether child temperament and EF/Attention would moderate the SES–externalizing behavior link and the negative parenting–externalizing behavior link in a sample of preschoolers from diverse racial, socioeconomic and family backgrounds. Two main hypotheses were proposed. First, lower SES, more negative parenting practices, as well as higher levels of problematic child temperament dimensions and lower levels of executive functioning/attention, would be related to higher levels of child externalizing behaviors (ADHD symptoms and aggressive behaviors). Second, biologically-based child characteristics would moderate the relation between SES and negative parenting practices and child externalizing behaviors. Thus, it was expected that SES and negative parenting practices would be more strongly associated with child externalizing behaviors for children with more difficult temperaments and/or lower levels of executive functioning/attention.

Before considering the relation of other variables to child externalizing behaviors, it is essential to keep in mind that behavior problems were overall normative within this sample. Mean T-scores for ADHD symptoms and aggressive behavior on the BASC-2—based on both parent and teacher report (Reynolds & Kamphaus, 2004)—were all within the normative range (ranging from 49.04 to 55.74) with normative standard deviations (ranging from 7.87 to 12.15). Still, some of the children exhibited clinically significant behavior problems, and the full range of scores was present, as would be expected with a non-clinical, community sample. Furthermore, the interest for the current study was in how specific predictors *related to* variance in child behavior problems, whether those behavior problems were clinically significant or not.

## Relations among Contextual and Biologically-Based Predictors and Child Externalizing Behaviors

Bivariate correlational analyses revealed that negative parenting, the three dimensions of temperament and EF/Attention were significantly correlated with ADHD symptoms and aggressive behavior. All correlations were in the expected direction. Higher levels of negative parenting, surgency and negative affectivity, but lower levels of effortful control and EF/Attention were related to higher levels of ADHD symptoms and aggressive behaviors. However, contrary to prediction and previous research (e.g., Amone-P'Olak et al., 2009; Barry et al., 2005; Kim-Cohen et al., 2004), SES was not significantly related to ADHD symptoms or aggressive behavior. A number of reasons can be proposed to explain this unexpected finding. First, as mentioned earlier, this sample was not a high risk group. Apart from low SES, which was based on an individual's education, occupation, gender and marital status, this sample was not at risk for other factors commonly associated with SES such as prenatal exposure to drugs/alcohol and single parenting. In fact, the majority of participants were raising their child with the help of their spouse, partner, or family members. In addition, the sample was fairly well educated. More than 95% of parents graduated high school and greater than 65% completed at least some college. Thus, it may be that SES is more strongly related to externalizing behavior problems in higher risk samples (i.e., prenatal exposure to drugs/alcohol, single parenting and low educational attainment). Second, the child's age may have also affected this relation. Perhaps, the influence of SES is not paramount at this young age. The influence of SES may increase in importance as the child gets older. Third, there is always potential for underreporting of symptoms. It is likely that



Head Start parents and teachers are a bit more guarded and tended to underreport the prevalence of behavior problems in this sample, possibly due to concern about the impact of results on the Head Start program and a desire to highlight its effectiveness. In addition, the ethnic background of this group may have also been a factor. There was an ethnicity disparity between the Head Start and Non Head Start Group. The majority of Head Start parents and preschoolers were African American, whereas the majority of non Head Start parents and preschoolers were Caucasian. Generally, minority participants are skeptical of research studies and may likely underreport symptoms to present a favorable view of themselves and their children. Nevertheless, underreporting does not fully account for the non significant relation between SES and externalizing behaviors. If Head Start parents were underreporting, this would be evident across variables. However, this was not so. Parents from Head Start, low SES backgrounds, openly endorsed using more negative parenting practices than those whose children attended non Head Start preschools. Fourth, is the possibility that Head Start intervention is effective; therefore, this low SES group had no significant behavior problem differences from the higher SES group. Thus, Head Start intervention may be a protective factor in the SES – child behavior link.

The pattern of non significant relation between SES and behavior problems was also demonstrated in the multivariate canonical correlation analysis. Again, SES did not emerge as a significant correlate in none of the two interpretable functions. In the first function, negative parenting and all four biologically-based predictors were notably related to child externalizing behaviors (i.e., when considering multiple narrowband domains from multiple raters simultaneously). Whereas Effortful Control was the most

useful variable in defining Function I, EF/Attention was the most useful function in defining Function II. In fact, EF/Attention appeared to be the most useful in defining the entire analysis. Taken together, these results provide support for the current study's first hypothesis for all predictors with the exception of SES.

As expected, more negative parenting practices, more difficult temperament (i.e., higher levels of Surgency and Negative Affectivity, but lower levels of Effortful Control) and lower EF/Attention was related to higher parent-rated and teacher-rated ADHD Symptoms and Aggressive Behavior. Although all these variables were useful in defining Function I, Surgency and Effortful Control were the most influential variables. This highlights the importance of these dimensions of temperament in explaining higher levels of externalizing behaviors.

In Function II, a different and somewhat unexpected pattern emerged. Higher scores on Surgency, Negative Affectivity, and EF/Attention were strongly associated with a pattern of higher parent-rated Aggressive Behavior. Effortful Control was not useful in defining this function. The relation between higher levels of Surgency and Negative Affectivity and parent-rated Aggressive Behavior is expected. However, that higher EF/Attention was strongly associated with higher parent-rated Aggressive Behavior is unexpected and contrary to the literature reviewed previously. Perhaps, children with higher EF/Attention, thus higher working memory and sustained auditory abilities, attend to their parent's inconsistent parenting practices and question parent's rules. Given their attentional abilities, these children may persist in their arguments and may not give up easily. Thus, this "strength" is not view as such; rather, it is view by parents as defiance, oppositionality, and argumentativeness. On the other hand, higher

levels of Surgency, Negative Affectivity, and EF/Attention were strongly associated with lower teacher-rated ADHD Symptoms and Aggressive Behavior. The relation between EF/Attention and teacher-rated ADHD Symptoms and Aggressive Behavior is expected. However, the results indicating that higher levels of Surgency and Negative Affectivity were strongly associated with lower teacher-rated ADHD Symptoms and Aggressive Behavior is inconsistent with the literature reviewed. It is likely that teachers view these temperamental variables more positively than parents. Therefore, they are more accepting of the children's individual differences than parents. Consequently, classroom management strategies may be designed to match, rather than change the child's temperament. Perhaps parents attempt to change or alter their children's temperament lead to increased behavior problems. Acceptance of children's differences may be easier for teachers, who may have more experience with children and a better idea of normative behavior, than parents who may not have access to a normative comparison group.

#### Unique Predictors of ADHD Symptoms and Aggressive Behaviors

The first hypothesis was further examined through a series of multiple regression analyses. As a group, the control variables (child's age, gender and estimate of intelligence) and the variables of interest (SES, negative parenting, the three dimensions of temperament and EF/Attention) significantly predicted ADHD symptoms and aggressive behavior. More importantly, the contextually-based variables of interest (SES and negative parenting) and the biologically-based variables of interest (three dimensions of temperament and EF/Attention) explained a significant amount of variance in ADHD symptoms and aggressive behavior above and beyond the control variables. The amount of additional variance explained in these constructs for the parent-rated and teacher-rated

outcomes ranged from 19% to 47%. The amount of additional variance explained in ADHD symptoms and aggressive behavior was 35% and 28%, respectively, for the composite-level variables. Thus, these results provided further solid support for the first hypothesis.

As planned, the unique contribution of these predictors, controlling for the other predictors, was also explored. Results revealed that only the dimensions of temperament consistently emerged as unique predictors of ADHD symptoms and aggressive behaviors. Thus, higher levels of surgency and negative affectivity, but lower levels of effortful control were related to higher levels of ADHD symptoms and aggressive behavior, in general. For each of these dimensions of temperament, only certain outcome variables were significant at the beta-level. Overall, these findings are consistent with the previous findings that effortful control (e.g., Eiden et al., 2007; Zhou et al., 2007), as well the affective components of temperament (e.g., Eisenberg et al., 2005; Nigg et al., 2004; Pinard, 2007), are related to externalizing behaviors. Some support for this was found in the current study; negative affectivity was related to both aggressive behaviors and ADHD symptoms and was also significantly negatively related to effortful control. According to Nigg et al., negative affectivity a risk factor in the development of externalizing behaviors, may be more important for children with comorbid ADHD and aggressive or oppositional behaviors. Nigg et al. proposed that these children, typically characterized by low levels of effortful control, are vulnerable to a reactive temperament and, hence, are at greater risk for comorbid disorders. Therefore, the regulatory and reactive domains of temperament may both be important contributing factors, especially when considering ADHD with comorbid conditions. It is also likely that low effortful

control, in the absence of high levels of negative affectivity and surgency could be related to higher levels of both ADHD symptoms and aggressive behaviors.

Of the dimensions of temperament, effortful control emerged as the most consistent unique predictor of both ADHD symptoms and aggressive behaviors. The inverse relation between effortful control (the ability to manage and regulate attention and inhibit impulses) and symptoms of ADHD has been established in the literature. Low levels of effortful control imply difficulty managing and regulating attention.

Behaviorally this is manifested as difficulty focusing and inattentiveness, hallmark symptoms of ADHD. Moreover, the inhibitory component (i.e., the ability to inhibit impulses) of effortful control may also explain its relation to aggressive behaviors in preschoolers. Consistent with the results of the bivariate and canonical correlation analyses, which revealed that SES was not significantly related to externalizing behavior in this sample, SES only emerged as a unique predictor of parent-rated ADHD symptoms. Unexpectedly, this relation was in the opposite direction than predicted. In this sample, higher SES was related to higher parent ratings of ADHD symptoms. However, given that this relation only emerged for one outcome variable and did not surface in the bivariate correlations, it should be interpreted with caution.

Results indicated that EF/Attention only surfaced as a unique predictor of teacher-rated aggressive behavior. Trends were found for the unique relation between EF/Attention and teacher-rated ADHD symptoms and parent-rated aggressive behavior. That EF/Attention did not surface consistently as a unique predictor of ADHD symptoms and aggressive behavior is not surprising given its significant correlation with other predictors (i.e., surgency and effortful control) in the model. Once accounting for shared

variance between EF/Attention and these temperament dimensions—the latter of which are more behaviorally based child variables and which were more strongly correlated to child externalizing behaviors—there was not enough unique variance in EF/Attention to explain the outcome variables of interest. Indeed, when EF/Attention and SES were entered in regression analyses with demographic variables as controls, EF/Attention surfaced as the only unique predictor of all criterion variables, except teacher-reported aggressive behavior. Method of measurement also may have impacted these findings. That is, EF/Attention was a composite based on neuropsychological tasks, whereas both child temperament and child externalizing behaviors were based on parent and teacher ratings on a questionnaire. Nevertheless, these results should not undermine the contribution of EF/Attention as a predictor of child behavior problems as the findings in the canonical correlation analyses also underscore the importance of EF/Attention as a predictor of child behavior problems. In the canonical correlation analyses, EF/Attention was useful in defining both functions. In fact, EF/Attention appeared to be the most useful in defining the entire analysis.

Negative parenting practices were moderately correlated with both child temperament and child externalizing behaviors in the bivariate correlations. However, given its shared variance with temperament, negative parenting practices did not emerge as a unique predictor in the overall regression model. Here, method of measurement was the same (parent report on questionnaires); however, parent ratings of their own parenting behaviors were not as robustly related to child outcomes as was the child's own temperament. These results support previous research (Belsky, 1984; Copeland et al., 2003; Lengua & Kovacs, 2005) that the child's temperament is an important predictor of

child behavior problems. Thus, child temperament may be a stronger predictor of child behavior than parenting practices in the preschool period. It is possible that the importance of parenting may increase as a child gets older and the parent has had a longer temporal influence. This view is consistent with the interactionist view of temperament, which posits that, although biologically based, the expression of temperament is influenced by the environment (Rothbart & Derryberry, 1984)

#### Does Child Temperament Moderate the Relation between SES and Externalizing Behaviors?

A series of moderated multiple regression analyses were conducted to determine if temperament moderated the relation between SES and child externalizing behaviors. Two of the three dimensions of temperament (surgency and effortful control) moderated the relation between SES and externalizing behaviors. Specifically, when effortful control was low, children from higher SES backgrounds demonstrated more ADHD symptoms than children from lower SES backgrounds. However, when effortful control was high, children with higher SES tended to have lower ratings on the ADHD symptoms. These results imply that low effortful control was a risk factor for ADHD symptoms, whereas high effortful control was a protective factor for ADHD symptoms, but only for children from higher SES backgrounds. It is possible that the influence of temperament become more salient when environmental risk factors are minimized.

These patterns of results were replicated when examining predictors of aggressive behavior. When effortful control was high, children with higher SES tended to exhibit fewer aggressive behaviors. Conversely, lower effortful control was related to higher levels of aggressive behavior, but also only for children from a higher SES. The findings

that low effortful control may predispose children from high SES to ADHD symptoms and aggressive behavior and that high effortful control appears to buffer children from high SES from these externalizing behaviors is interesting. These results are not consistent with the cumulative risk model proposed by Appleyard et al. (2005) which posits that early cumulative risk increases the likelihood of externalizing behaviors. According to this model, more difficult temperament would place children from low SES backgrounds at additional risk for behavior problems. Notably, there have been few studies explicitly examining the interaction between SES and child temperament in predicting these types of child outcomes, and it may be that the impact of temperament is most notable for children from higher SES backgrounds (i.e., despite the overall risk for low SES). It is also likely that other factors, such as Head Start status may limit the influence of temperament as a risk or protective factor in low SES groups. Moreover, Head Start may be a more robust moderator. Thus, it would be interesting to examine whether Head Start intervention is serving as a protective factor for this low SES group and may be a more robust moderator in the relation between SES and externalizing behaviors. However, the particular way in which SES and child externalizing behaviors related in the current study's sample should be considered—that is, the lack of a main effect for SES may have impacted subsequent tests of interaction with this variable, and these moderation findings may be somewhat idiosyncratic. Nevertheless, more consistent with initial predictions, surgency emerged as a risk factor in the *low* SES–aggressive behavior link. When surgency was high, children with lower SES demonstrated more aggressive behavior based on parent report than did children with higher SES.



## Does Child Temperament Moderate the Relation between Negative Parenting and Externalizing Behaviors?

In line with the results reported previously for SES and externalizing behaviors, only surgency and effortful control moderated the relation between negative parenting and externalizing behaviors. Specifically, when surgency was high, children whose parents used higher levels of negative parenting practices exhibited more ADHD symptoms. Thus, high levels of surgency emerged as a risk factor for children whose parents employed more negative parenting practices. In line with this, children who demonstrated lower levels of effortful control, but whose parents used higher levels of negative parenting practices, were more prone to aggressive behavior based on parent report. Conceivably, children with lower levels of effortful control and higher levels of surgency are likely more difficult to parent and may elicit more negative parenting from their parents, which in turn exacerbate externalizing behaviors. This is consistent with Belsky (1984) who argued that characteristics of children that make them more difficult to care for (e.g., more negative parenting) may adversely affect the amount and type of care they receive. These results highlight the importance of goodness-of-fit model proposed by Thomas and Chess (1977). According to Thomas and Chess, many behavior problems could be prevented if the demands, expectations, and opportunities are in sync with the child's temperament (i.e., goodness-of-fit).

These results which indicated that surgency and effortful control moderated the relation between negative parenting and externalizing behaviors are consistent with previous studies that provided evidence of temperament moderating the relation between maternal sensitivity (Mesman et al., 2009), maternal responsiveness (Lahey et al., 2008),

negative parenting (Pinard, 2007) and child externalizing behaviors. Temperament has also been found to moderate the relation between family conflict and child behaviors problems (Ramos et al., 2005; Whiteside-Mansell et al., 2009). Except for Pinard (2007), all the studies cited examined broadband measures of child externalizing behaviors, thus limiting the ability to determine the possible etiologies of various narrowband child behavioral outcomes (Paterson & Sanson, 1999). The current study is different as it examined two narrowband measures of child externalizing behaviors, specifically ADHD symptoms and aggressive behavior. Such studies are valuable as research has shown that narrowband dimensions of child disruptive behaviors may have different etiologies. Therefore, the current study adds to existing literature.

#### Does EF/Attention Moderate the Relation between SES and Externalizing Behaviors?

First, it is important to revisit the main effect findings for EF/Attention in this particular model because they differ from those found in the overall model used to test the first hypothesis of the current study. Specifically, in a regression model examining the role of EF/Attention in the relation between SES and externalizing behaviors, EF/Attention surfaced as a unique predictor of ADHD symptoms and aggressive behaviors, even when child's age, gender, BIA and SES were held constant. These results are consistent with the predictions of the current study and with previous literature. In particular, impaired EF/Attention has also been associated with CD (Giancola, Messich, & Tarter, 1998), ODD (Speltz et al., 1999), ADHD symptoms (Berwid et al., 2005; Brocki et al. 2010; Thorell & Wåhlstedt, 2006) and aggression (Ellis et al., 2009; Hughes et al. 2000; LeMarquand et al., 1998) in children. Nevertheless, research examining the relation of EF to aggressive behaviors and ODD in children has yielded inconsistent

findings. Thus, these results add to existing literature by providing additional evidence that impaired EF/Attention is related to higher levels of aggressive behavior. Yet, future research should further examine this relation while controlling for ADHD symptoms.

In addition to being a unique predictor of externalizing behaviors, EF/Attention also moderated the relation between SES and externalizing behaviors. Specifically, when EF/Attention was high, children from high SES backgrounds demonstrated less ADHD symptoms and aggressive behavior. Based on these findings, high EF/Attention was a protective factor but only for children from high SES backgrounds. These findings are different from prediction. It was expected that high EF/Attention would be a protective factor particularly for children from *low* SES backgrounds. These results are similar to the findings for the temperament and SES interactions and, again, may be idiosyncratic to this sample and the way in which SES related to the outcomes of interest. Alternatively, these results may indicate that particular biologically-based predispositions (i.e., low levels of difficult temperament; high EF/Attention) may be most beneficial under certain environmental conditions.

#### Does EF/Attention Moderate the Relation between Negative Parenting and Externalizing Behaviors?

EF/Attention did not emerge as a moderator in the relation between negative parenting and externalizing behaviors. Thus, EF/Attention was not a risk or protective factor for externalizing behaviors in the presence of negative parenting practices. However, in this model with child's age, gender and BIA as control variables, and EF/Attention and negative parenting as predictor variables, both EF/Attention and negative parenting surfaced as unique predictors of ADHD symptoms and aggressive

behavior. More negative parenting practices and impaired EF/Attention predicted higher levels of ADHD symptoms and aggressive behavior. Again, these main effect findings are notable because they differ from those found in the overall model used to test the first hypothesis of the current study.

### Clinical Implications

Consistent with previous research, the results of current study indicate that both biologically-based and contextual correlates contribute to the development of externalizing behaviors in preschoolers. Specifically, higher levels of negative parenting, surgency and negative affectivity, low effortful control and impaired EF predicted increased levels of ADHD symptoms and aggressive behaviors. These results have important clinical implications.

Knowledge of biologically-based precursors is imperative in the early screening, assessment, and identification of children who are at greatest risk for the development of behavior problems. This enhances the possibility of early intervention that could potentially alter these impending pathological trajectories. Evidence suggests that early intervention may successfully prevent behavior disorders and temperament-based selection may help identify individuals at higher risk (Rettew & McKee, 2005). In addition, analysis of the processes through which temperament and EF places a child at risk for behavior problems could provide invaluable information which can be utilized to structure interventions. The identification of risk and protective factors can be important in structuring interventions which can modify these factors.

Additionally, interventions can be geared at modifying these biologically-based risk factors. Although this may be a more formidable task than parent training or matching treatment to temperament, emerging research has provided some evidence for the usefulness of such interventions. Thorell, Lindqvist, Nutley, Bohlin, and Klingberg (2009) attempted to improve the EF of preschoolers by providing them with computerized training of either visuo-spatial working memory or inhibition for 5 weeks. According to Thorell et al., the children trained on working memory improved significantly on trained tasks and showed training effects on non-trained tasks of spatial memory, verbal working memory, and attention. Although children trained on inhibition showed a significant improvement over time on the trained task paradigms, their performance was not significantly different from the control group and training effects did not generalize to non-trained inhibitory tasks. Thorell et. al explained that the lack of improvement in inhibition after training may be explained by the training program used, but it is also possible that various executive functions differ in how easily they can be improved by training.

Moreover, the environment of the child should be a target of intervention. Research has supported the view the environment interacts with temperament to produce a particular outcome. Derryberry and Rothbart (1984) explained that although temperament exists within the person, its manifestation depends on the environment, specifically the degree of stimulation and regulation provided by that environment. In fact, Thomas and Chess (1977) explained that many behavior problems could be prevented if the demands, expectations, and opportunities are in sync with the child's temperament (i.e., goodness-of-fit).

Moreover, the results of this and other studies have revealed that parenting is independently related to child behavior problems (e.g., Barry et al., 2005; Belsky et al., 1998) and may also be a risk/protective factor (e.g., Belsky et al., 1998; Van Aken et al., 2007). Thus, interventions geared at parents are imperative. Interventions geared at parents should comprise of a psychoeducational and practical component. Through psychoeducation parents can be informed about the effects of temperament and EF on parenting and behavior problems. This may further enhance parenting by facilitating parent understanding of differences in the child biological predisposition. Such information can reduce self blame and feelings of incompetence in parents. With this information, parents can focus on altering aspects of the environment to better suit the children.

In addition, parent training programs can be geared at teaching parents new and better ways of interacting with their children, since various management strategies may not be optimal for all children. For example, time out may not be an effective strategy for the child who is low in task persistence, for it may actually reinforce the child's attempt to abandon activities midstream when they become difficult. Parental interventions which educate parents about the biologically-based characteristics influencing child behavior may lead to greater parental acceptance of the child and healthier parent and child relationships, which should ultimately positively impact children's behavior.

Finally, temperamental research can inform clinicians, who can incorporate this knowledge when guiding parents and caregivers as well as into their treatment modalities. Thus, during the intake and case conceptualization, the clinician should obtain a good understanding of the child's temperament. This should guide treatment as there

should also be goodness-of-fit between the child's temperament and behavior management strategies.

#### Limitations and Future Directions

The results of the current study must be considered in light of four major limitations. First, the current study relied exclusively on correlational analyses and single-time-point measures of SES, parenting, child temperament, EF and child externalizing behaviors. Consequently, causation cannot be inferred from the current study's results. Longitudinal examination of these factors is essential, as these would allow for a better understanding of causal pathways between these constructs.

Second, is the issue of criterion contamination or "overlap in content" between the measures of child temperament and externalizing behavior problems used in this study. Although researchers (e.g., Lemery, Essex, & Smider, 2002; Lengua, West, & Sandler, 1998) have reported a significant degree of conceptual and empirical independence between parent reports of child temperament and behavior problems even controlling for potential overlap of measures, the issue of criterion contamination was not addressed in the current study. Future studies should employ more objective methods, such as direct observations and performance on laboratory tasks, to assess child temperament and externalizing behaviors. When this is not possible, statistical procedures should be used to control for or minimize overlap of measures. Moreover, multi-method assessments across different raters should also be employed in future studies as this will also reduce the probability of biased reporting which confounds questionnaire measures. In the current study, the issue of biased reporting was addressed partly by combining

parent and teacher report of outcome variables into composites as well as considering them separately.

Third, the current study, like many others, examined the relation of temperament dimensions and EF to dimensional ratings of symptoms of psychopathology. Although informative, such studies provide limited information on the relation between temperament, EF and psychological disorders. Thus, studies in clinical settings are important, for they will allow comparisons among clinical and control groups.

Fourth, there was also limited power for some analyses, particularly those examining interaction effects, which may mean that true interactions existed that went undetected. An *a priori* sample size of 100 was determined based on a power analysis for multiple regression analyses, assuming a moderate effect size ( $R^2\Delta = .10$ ), alpha less than .05, power equal to .80, 9 total predictors, and 3 tested predictors (i.e., for the most complex interaction model being tested). In fact, 138 participants were recruited for the study; however, missing data reduced the sample size for most analyses and, thus, power. Furthermore, the effect sizes for the interactions were smaller than anticipated ( $R^2\Delta$  ranging from .01 to .11), and would require a larger sample size to adequately test their effects.

The current study examined child temperament and EF/Attention as risk/protective factors in the relation between SES, negative parenting and child externalizing behaviors. Future research could investigate the mechanism through which SES and negative parenting relate to child externalizing behaviors (i.e., assuming that SES continues to show the strong relation to child externalizing behaviors that was not supported in the current study but that has been well supported in previous literature). In



addition to examining moderational and mediational models, more complex models should be considered given that complex relations exist among these variables. An example would be a moderated-mediation model examining whether child temperament would moderate the indirect effects of SES on externalizing behaviors through negative parenting practices. According to Flouri (2008), studies examining SES as a moderator in the temperament-parenting link is sparse. Although the current study adds to existing literature by examining SES as a main variable, future research efforts should explore the role of SES in the relation between temperament and parenting.

### Conclusion

The findings of the current study illustrate that complex interrelations exist between contextual (i.e., SES and negative parenting) and biologically-based (i.e., temperament and EF/Attention) correlates to predict ADHD symptoms and aggressive behaviors in preschoolers. All three dimensions of temperament, particularly surgency and effortful control, emerged as robust unique predictors of ADHD symptoms and aggressive behavior. Moreover, high surgency, low effortful control and low EF/Attention emerged as risk factors; coupled with certain variation in SES and more negative parenting practices, they exacerbate aggressive behaviors and ADHD symptoms. Evidence also supported the role of temperament as a protective factor. High effortful control served as a protective factor in the development of ADHD symptoms and aggressive behavior for children from high SES backgrounds. The current study, unlike many others, provides evidence that the dimensions of temperament and EF/Attention related differentially to ADHD symptoms and aggressive behaviors. Indeed, this is the first known study to examine this set of both contextually- and biologically-

based factors as they relate to behavioral outcomes in an ethnically diverse community sample. Early child behavioral problems are frequently precursors to more serious forms of psychopathology during adolescence and adulthood. Therefore, identifying the correlates of externalizing behaviors in preschoolers is an important first step in recognizing children who might be at-risk for these maladaptive behaviors and can also aid in the development and implementation of preventative care. The importance of such interventions cannot be overstated, for early intervention alleviates much of the costs and associated burdens to individuals, their families, and society.

## Footnote

1. In addition to the findings presented in the paper, all analyses examining child temperament as a moderator were conducted without BIA as a control to maximize the *N* and the subsequent power to detect moderation effects. For these analyses, which included no child testing data, virtually all of the 138 participants were included (i.e., since the 36 participants that were excluded from the regression analyses were excluded due to missing child testing data). Overall, the pattern of results was identical. All main effect findings remained the same. Six of the eight interactions with temperament followed the same pattern. Although two of the eight were no longer significant, two additional interactions with other outcome variables emerged. Thus, it was decided to present the more rigorous analyses with BIA as a control variable.

## APPENDIX A

## DEMOGRAPHICS AND BACKGROUND INFORMATION FORM

General Information:

**Child's Name:** \_\_\_\_\_  
(First) (Middle) (Last)

**Child's Date of Birth:** \_\_\_\_\_ **Child's Age:** \_\_\_\_\_

**Child's Gender (Circle one):** Male Female

**Child's Race (Circle one):** Caucasian African American Asian Hispanic  
Bi-racial Other (please explain): \_\_\_\_\_

**Child's School:** \_\_\_\_\_

**Are you the child's legal guardian/parent?** YES \_\_\_\_\_ NO \_\_\_\_\_

**Your relation to the child (mark one):**  
\_\_\_\_\_ Biological parent  
\_\_\_\_\_ Step parent  
\_\_\_\_\_ Adoptive parent  
\_\_\_\_\_ Grand Parent  
\_\_\_\_\_ Legal guardian e.g., foster parent  
\_\_\_\_\_ Other (please explain): \_\_\_\_\_

**Your Age:** \_\_\_\_\_

**Your Gender:** Male Female

**Your Name:** \_\_\_\_\_

**Home Address:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Home Phone:** \_\_\_\_\_

*\*Note: Names, addresses, and phone numbers are for contact information only and will not be used in research. This information will be stored separately from your responses.*

**INFORMATION ON FEMALE CARETAKER OF CHILD**

If **NO** female caretaker in the home, please circle here: N/A (then go to “male caretaker” section)

Age: \_\_\_\_\_

**Relation to child:**                   \_\_\_ Biological parent  
    \_\_\_ Step parent  
    \_\_\_ Adoptive parent  
    \_\_\_ Legal guardian  
    \_\_\_ Other (please explain): \_\_\_\_\_

**Current employment:**           \_\_\_ None, unemployed  
    \_\_\_ None, disabled  
    \_\_\_ Yes, part-time  
    \_\_\_ Yes, full-time

**Place of employment:** \_\_\_\_\_

**Occupation/ job position (please be very specific e.g., cashier at a supermarket, high school teacher):**  
 \_\_\_\_\_

**Highest grade completed in school (mark one):**

_____ Less than High School (less than 12 years)	_____ Bachelor’s Degree
_____ High School Diploma/GED	_____ Master’s Degree
_____ Some College, but no degree	_____ PhD. or higher
_____ Associate Degree	_____ Other
	(please explain): _____

**INFORMATION ON MALE CARETAKER OF CHILD**

If **no** male caretaker in the home, please circle here: N/A (then go to “parental and family status” section)

Age: \_\_\_\_\_

**Relation to child:**                   \_\_\_ Biological parent  
    \_\_\_ Step parent  
    \_\_\_ Adoptive parent  
    \_\_\_ Legal guardian  
    \_\_\_ Other please explain): \_\_\_\_\_

**Current employment:**           \_\_\_ None, unemployed  
    \_\_\_ None, disabled  
    \_\_\_ Yes, part-time  
    \_\_\_ Yes, full-time

**Place of employment:** \_\_\_\_\_

**Occupation/ job position (please be very specific e.g., cashier at a supermarket, high school teacher):**  
 \_\_\_\_\_

**Highest grade completed in school (mark one):**

_____ Less than High School (less than 12 years)	_____ Bachelor’s Degree
_____ High School Diploma/GED	_____ Master’s Degree
_____ Some College, but no degree	_____ PhD. or higher
_____ Associate Degree	_____ Other
	(please explain): _____

**PARENTAL AND FAMILY STATUS**

**Marital status of child's biological parents:**

- Single (never married)
- Currently married
- Currently living together (not married)
- Separated
- Divorced
- Widowed

**Are you currently:**  raising your child alone?  
 raising your child with a husband/wife, or partner/significant other?  
 raising your child with the help of family members?

**List all people currently living in the household:**

<u>Name</u>	<u>Relationship to Child</u>	<u>Age</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Taking into account all sources of income (wages, interest, government assistance, child support, etc.), please estimate the total family income on a yearly basis BEFORE taxes.  
*(This is for research purposes **ONLY**. No identifying information will be listed with these data)*

**(Enter corresponding Number from column at right)** \_\_\_\_\_

- 0= Earns no income/dependent on welfare
- 1= Earns less than \$10,000
- 2= \$10,000- \$14,999
- 3= \$15,000- \$ 19,999
- 4= \$20,000- \$ 24,999
- 5= \$25,000- \$29,999
- 6= \$30,000- \$ 34,999
- 7= \$35,000- \$39,999
- 8= \$40,000- 49,999
- 9= \$50,000- \$59,999
- 10= \$60,000- \$ 74,999
- 11= \$ 75,000- \$99,999
- 12= Earns \$100,000 or more

Are you receiving any form of government assistance (e.g. AFCD, SSI)?  
 YES            NO  
*(This is for research purposes **ONLY**. No identifying information will be paired with these data)*

Who is the primary wage earner in the family?  Mother  
 Father  
 Both equally  
 Other (please explain): \_\_\_\_\_

Primary language spoken in the home: \_\_\_\_\_

Other languages spoken in the home: \_\_\_\_\_

**Place a check** next to any illness or condition that **YOUR CHILD** and any member of the **IMMEDIATE FAMILY** (e.g., mom/dad/brothers/sisters/aunt/uncles/grandparents) has had. **When you check an item, please note the member's relationship to the child.**

<u>Check</u>	<u>Condition</u>	<u>Relationship to child</u>	<u>Check</u>	<u>Condition</u>	<u>Relationship to child</u>
<input type="checkbox"/>	Alcoholism	_____	<input type="checkbox"/>	Schizophrenia	_____
<input type="checkbox"/>	Cancer	_____	<input type="checkbox"/>	Bipolar Disorder	_____
<input type="checkbox"/>	Drug Abuse	_____	<input type="checkbox"/>	Depression	_____
<input type="checkbox"/>	Conduct Disorder	_____	<input type="checkbox"/>	Suicide attempts	_____
<input type="checkbox"/>	Oppositional	_____	<input type="checkbox"/>	ADHD	_____
<input type="checkbox"/>	Defiant Disorder	_____	<input type="checkbox"/>	Learning Disability	_____
<input type="checkbox"/>	Autism	_____	<input type="checkbox"/>	Mental Retardation	_____
<input type="checkbox"/>	Anxiety	_____	<input type="checkbox"/>	Other	_____

### INFORMATION ABOUT YOUR CHILD

#### Developmental History

During pregnancy, was mother on medication? Yes No  
 If yes, what kind? \_\_\_\_\_

During pregnancy, did mother smoke? Yes No  
 If yes, how many cigarettes each day? \_\_\_\_\_

During pregnancy did mother drink alcoholic beverages? Yes No  
 If yes, what did she drink? \_\_\_\_\_

Approximately how much alcohol was consumed each day? \_\_\_\_\_

During pregnancy, did mother use drugs? Yes No  
 If yes, what kind? \_\_\_\_\_

Was the child premature? Yes No  
 If yes, by how many months? \_\_\_\_\_

What was the child's birth weigh? \_\_\_\_\_

Were there any birth defects? Yes No  
 If yes, please describe:  
 \_\_\_\_\_  
 \_\_\_\_\_

Has your child been diagnosed with any medical problems? Yes No  
 If yes, please list them:  
 \_\_\_\_\_  
 \_\_\_\_\_

Has your child been diagnosed with any mental problem (e.g., ADHD)

Yes No

If yes, please describe:

---

---

Has your child received speech therapy? Yes No

If yes, please describe:

---

---

Has your child received services at school or from a therapist? Yes No

If yes, please describe:

---

---

Is your child currently taking any medications? Yes No

If yes, please list them:

---

---

Has your child had any major illnesses? Yes No

If yes, please list them:

---

---

Has your child been in any major accidents? Yes No

Were there any injuries as a result of the accident? Yes No

If yes, please explain:

---

---



## APPENDIX B

## APQ (PARENT FORM)

Parent Completing Form (please circle one): Mother      Father      Other \_\_\_\_\_

**Instructions:** The following are a number of statements about your family. Please rate each item as to how often it *TYPICALLY* occurs in your home. The possible answers are Never (1), Almost Never (2), Sometimes (3), Often (4), and Always (5). **PLEASE ANSWER ALL ITEMS.**

	Always				
	Often				
	Sometimes				
	Almost Never				
	Never				
1. You have a friendly talk with your child.	1	2	3	4	5
2. You let your child know when he/she is doing a good job with something.	1	2	3	4	5
3. You threaten to punish your child and then do not actually punish him/her.	1	2	3	4	5
4. You volunteer to help with special activities that your child is involved in (such as sports, scouts, church youth groups).	1	2	3	4	5
5. You reward or give something extra to your child for obeying you and behaving well.	1	2	3	4	5
6. Your child fails to leave a note or to let you know where he is going.	1	2	3	4	5
7. You play games or do other fun things with your child.	1	2	3	4	5
8. Your child talks you out of being punished after he/she has done something wrong.	1	2	3	4	5
9. You ask your child about his day in school.	1	2	3	4	5
10. Your child stays out in the evening past the time he/she is supposed to be home.	1	2	3	4	5
11. You help your child with his/her homework.	1	2	3	4	5
12. You feel that getting your child to obey you is more trouble than it is worth.	1	2	3	4	5
13. You compliment your child when he/she does something well.	1	2	3	4	5
14. You ask your child what his plans are for the coming day.	1	2	3	4	5
15. You drive your child to a special activity.	1	2	3	4	5
16. You praise your child if he/she behaves well.	1	2	3	4	5

	Always				
	Often				
	Sometimes				
	Almost Never				
	Never				
17. Your child is out with friends you do not know.	1	2	3	4	5
18. You hug or kiss your child when he has done something well.	1	2	3	4	5
19. Your child goes out without a set time to be home.	1	2	3	4	5
20. You talk to your child about his/her friends.	1	2	3	4	5
21. Your child is out after dark with an adult with him/her.	1	2	3	4	5
22. You let your child out of a punishment early (like lift restrictions earlier than you originally said).	1	2	3	4	5
23. Your child helps plan family activities.	1	2	3	4	5
24. You get so busy that you forget where your child is and what he/she is doing.	1	2	3	4	5
25. Your child is not punished when he/she has done something wrong.	1	2	3	4	5
26. You attend PTA meetings, parent/teacher conferences, or other meetings at your child's school.	1	2	3	4	5
27. You tell your child that you like it when he/she helps out around the house.	1	2	3	4	5
28. You don't check that your child comes home at the time he/she was supposed to.	1	2	3	4	5
29. You don't tell your child where you are going.	1	2	3	4	5
30. Your child comes home from school more than an hour past the time you expect him/her.	1	2	3	4	5
31. The punishment you give your child depends on your mood.	1	2	3	4	5
32. Your child is at home without adult supervision.	1	2	3	4	5
33. You spank your child with your hand when he/she has done something wrong.	1	2	3	4	5
34. You ignore your child when he/she is misbehaving.	1	2	3	4	5
35. You slap your child when he/she has done something wrong.	1	2	3	4	5
36. You take away privileges or money from your child as a punishment.	1	2	3	4	5
37. You send your child to his room as a punishment.	1	2	3	4	5

	Always				
	Often				
	Sometimes				
	Almost Never				
	Never				
38. You hit your child with a belt, switch, or other object when he/she has done something wrong.	1	2	3	4	5
39. You yell or scream at your child when he/she has done something wrong.	1	2	3	4	5
40. You calmly explain to your child why his/her behavior was wrong when he/she misbehaves.	1	2	3	4	5
41. You use time out (make him/her sit or stand in a corner) as a punishment.	1	2	3	4	5
42. You give your child extra chores as a punishment.	1	2	3	4	5

## APPENDIX C

## CBQ-SF

Instructions: Please read carefully before starting:

On the next pages you will see a set of statements that describe children's reactions to a number of situations. We would like you to tell us what your child's reaction is likely to be in those situations. There are of course no "correct" ways of reacting; children differ widely in their reactions, and it is these differences we are trying to learn about. Please read each statement and decide whether it is a "true" or "untrue" description of your child's reaction within the past six months. Use the following scale to indicate how well a statement describes your child:

Circle #	If the statement is:
1	extremely untrue of your child
2	quite untrue of your child
3	slightly untrue of your child
4	neither true nor false of your child
5	slightly true of your child
6	quite true of your child
7	extremely true of your child

If you cannot answer one of the items because you have never seen the child in that situation, for example, if the statement is about the child's reaction to your singing and you have never sung to your child, then circle NA (not applicable). Please be sure to circle a number or NA for every item.

1. Seems always in a big hurry to get from one place to another.  
1    2    3    4    5    6    7    NA
2. Gets angry when told s/he has to go to bed.  
1    2    3    4    5    6    7    NA
3. Is not very bothered by pain.  
1    2    3    4    5    6    7    NA
4. Likes going down high slides or other adventurous activities.  
1    2    3    4    5    6    7    NA
5. Notices the smoothness or roughness of objects s/he touches.  
1    2    3    4    5    6    7    NA
6. Gets so worked up before an exciting event that s/he has trouble sitting still.  
1    2    3    4    5    6    7    NA
7. Usually rushes into an activity without thinking about it.  
1    2    3    4    5    6    7    NA
8. Cries sadly when a favorite toy gets lost or broken.  
1    2    3    4    5    6    7    NA
9. Becomes quite uncomfortable when cold and/or wet.  
1    2    3    4    5    6    7    NA
10. Likes to play so wild and recklessly that s/he might get hurt.

	1	2	3	4	5	6	7	NA
11.	Seems to be at ease with almost any person.							
	1	2	3	4	5	6	7	NA
12.	Tends to run rather than walk from room to room.							
	1	2	3	4	5	6	7	NA
13.	Notices it when parents are wearing new clothing.							
	1	2	3	4	5	6	7	NA
14.	Has temper tantrums when s/he doesn't get what s/he wants.							
	1	2	3	4	5	6	7	NA
15.	Gets very enthusiastic about the things s/he does							
	1	2	3	4	5	6	7	NA
16.	When practicing an activity, has a hard time keeping her/his mind on it.							
	1	2	3	4	5	6	7	NA
17.	Is afraid of burglars or the "boogie man."							
	1	2	3	4	5	6	7	NA
18.	When outside, often sits quietly.							
	1	2	3	4	5	6	7	NA
19.	Enjoys funny stories but usually doesn't laugh at them.							
	1	2	3	4	5	6	7	NA
20.	Tends to become sad if the family's plans don't work out.							
	1	2	3	4	5	6	7	NA
21.	Will move from one task to another without completing any of them.							
	1	2	3	4	5	6	7	NA
22.	Moves about actively (runs, climbs, jumps) when playing in the house.							
	1	2	3	4	5	6	7	NA
23.	Is afraid of loud noises.							
	1	2	3	4	5	6	7	NA
24.	Seems to listen to even quiet sounds.							
	1	2	3	4	5	6	7	NA
25.	Has a hard time settling down after an exciting activity.							
	1	2	3	4	5	6	7	NA
26.	Enjoys taking warm baths.							
	1	2	3	4	5	6	7	NA
27.	Seems to feel depressed when unable to accomplish some task.							
	1	2	3	4	5	6	7	NA
28.	Often rushes into new situations.							
	1	2	3	4	5	6	7	NA
29.	Is quite upset by a little cut or bruise.							
	1	2	3	4	5	6	7	NA
30.	Gets quite frustrated when prevented from doing something s/he wants to do.							
	1	2	3	4	5	6	7	NA

31.	Becomes upset when loved relatives or friends are getting ready to leave following a visit.	1	2	3	4	5	6	7	NA
32.	Comments when a parent has changed his/her appearance.	1	2	3	4	5	6	7	NA
33.	Enjoys activities such as being chased, spun around by the arms, etc.	1	2	3	4	5	6	7	NA
34.	When angry about something, s/he tends to stay upset for ten minutes or longer.	1	2	3	4	5	6	7	NA
35.	Is not afraid of the dark.	1	2	3	4	5	6	7	NA
36.	Takes a long time in approaching new situations.	1	2	3	4	5	6	7	NA
37.	Is sometimes shy even around people s/he has known a long time.	1	2	3	4	5	6	7	NA
38.	Can wait before entering into new activities if s/he is asked to.	1	2	3	4	5	6	7	NA
39.	Enjoys "snuggling up" next to a parent or babysitter.	1	2	3	4	5	6	7	NA
40.	Gets angry when s/he can't find something s/he wants to play with.	1	2	3	4	5	6	7	NA
41.	Is afraid of fire.	1	2	3	4	5	6	7	NA
42.	Sometimes seems nervous when talking to adults s/he has just met.	1	2	3	4	5	6	7	NA
43.	Is slow and unhurried in deciding what to do next.	1	2	3	4	5	6	7	NA
44.	Changes from being upset to feeling much better within a few minutes.	1	2	3	4	5	6	7	NA
45.	Prepares for trips and outings by planning things s/he will need..	1	2	3	4	5	6	7	NA
46.	Becomes very excited while planning for trips.	1	2	3	4	5	6	7	NA
47.	Is quickly aware of some new item in the living room.	1	2	3	4	5	6	7	NA
48.	Hardly ever laughs out loud during play with other children.	1	2	3	4	5	6	7	NA
49.	Is not very upset at minor cuts or bruises.	1	2	3	4	5	6	7	NA
50.	Prefers quiet activities to active games.	1	2	3	4	5	6	7	NA

51. Tends to say the first thing that comes to mind, without stopping to think about it.  
1 2 3 4 5 6 7 NA
52. Acts shy around new people.  
1 2 3 4 5 6 7 NA
53. Has trouble sitting still when s/he is told to (at movies, church, etc.).  
1 2 3 4 5 6 7 NA
54. Rarely cries when s/he hears a sad story.  
1 2 3 4 5 6 7 NA
55. Sometimes smiles or giggles playing by her/himself.  
1 2 3 4 5 6 7 NA
56. Rarely becomes upset when watching a sad event in a TV show.  
1 2 3 4 5 6 7 NA
57. Enjoys just being talked to.  
1 2 3 4 5 6 7 NA
58. Becomes very excited before an outing (e.g., picnic, party).  
1 2 3 4 5 6 7 NA
59. If upset, cheers up quickly when s/he thinks about something else.  
1 2 3 4 5 6 7 NA
60. Is comfortable asking other children to play.  
1 2 3 4 5 6 7 NA
61. Rarely gets upset when told s/he has to go to bed.  
1 2 3 4 5 6 7 NA
62. When drawing or coloring in a book, shows strong concentration.  
1 2 3 4 5 6 7 NA
63. Is afraid of the dark.  
1 2 3 4 5 6 7 NA
64. Is likely to cry when even a little bit hurt.  
1 2 3 4 5 6 7 NA
65. Enjoys looking at picture books.  
1 2 3 4 5 6 7 NA
66. Is easy to soothe when s/he is upset.  
1 2 3 4 5 6 7 NA
67. Is good at following instructions.  
1 2 3 4 5 6 7 NA
68. Is rarely frightened by "monsters" seen on TV or at movies.  
1 2 3 4 5 6 7 NA
69. Likes to go high and fast when pushed on a swing.  
1 2 3 4 5 6 7 NA
70. Sometimes turns away shyly from new acquaintances.  
1 2 3 4 5 6 7 NA
71. 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 NA
72. Likes being sung to.  
1 2 3 4 5 6 7 NA
73. Approaches places s/he has been told are dangerous slowly and cautiously.  
1 2 3 4 5 6 7 NA
74. Rarely becomes discouraged when s/he has trouble making something work.  
1 2 3 4 5 6 7 NA
75. Is very difficult to soothe when s/he has become upset.  
1 2 3 4 5 6 7 NA
76. Likes the sound of words, such as nursery rhymes.  
1 2 3 4 5 6 7 NA
77. Smiles a lot at people s/he likes.  
1 2 3 4 5 6 7 NA
78. Dislikes rough and rowdy games.  
1 2 3 4 5 6 7 NA
79. Often laughs out loud in play with other children.  
1 2 3 4 5 6 7 NA
80. Rarely laughs aloud while watching TV or movie comedies.  
1 2 3 4 5 6 7 NA
81. Can easily stop an activity when s/he is told "no."  
1 2 3 4 5 6 7 NA
82. Is among the last children to try out a new activity.  
1 2 3 4 5 6 7 NA
83. Doesn't usually notice odors such as perfume, smoke, cooking, etc.  
1 2 3 4 5 6 7 NA
84. Is easily distracted when listening to a story.  
1 2 3 4 5 6 7 NA
85. Is full of energy, even in the evening.  
1 2 3 4 5 6 7 NA
86. Enjoys sitting on parent's lap.  
1 2 3 4 5 6 7 NA
87. Gets angry when called in from play before s/he is ready to quit.  
1 2 3 4 5 6 7 NA
88. Enjoys riding a tricycle or bicycle fast and recklessly.  
1 2 3 4 5 6 7 NA
89. Sometimes becomes absorbed in a picture book and looks at it for a long time.  
1 2 3 4 5 6 7 NA
90. Remains pretty calm about upcoming desserts like ice cream.  
1 2 3 4 5 6 7 NA
91. Hardly ever complains when ill with a cold.



- |     |   |   |   |   |   |   |   |    |
|-----|---|---|---|---|---|---|---|----|
|     | 1   | 2 | 3 | 4 | 5 | 6 | 7 | NA |
| 92. | Looks forward to family outings, but does not get too excited about them. |   |   |   |   |   |   |    |
|     | 1   | 2 | 3 | 4 | 5 | 6 | 7 | NA |
| 93. | Likes to sit quietly and watch people do things.                          |   |   |   |   |   |   |    |
|     | 1   | 2 | 3 | 4 | 5 | 6 | 7 | NA |
| 94. | Enjoys gentle rhythmic activities, such as rocking or swaying.            |   |   |   |   |   |   |    |
|     | 1   | 2 | 3 | 4 | 5 | 6 | 7 | NA |

## IRB APPROVAL




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 THE UNIVERSITY OF SOUTHERN MISSISSIPPI
 

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Institutional Review Board

118 College Drive #5147  
 Hattiesburg, MS 39406-0001  
 Tel: 601.266.6820  
 Fax: 601.266.5509  
 www.usm.edu/irb

**HUMAN SUBJECTS PROTECTION REVIEW COMMITTEE  
 NOTICE OF COMMITTEE ACTION**

The project has been reviewed by The University of Southern Mississippi Human Subjects Protection Review Committee in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: **28100902**

PROJECT TITLE: **Relation of Child Temperament, Executive Functioning, and Parenting Practices to Child Externalizing Behaviors in Preschoolers**

PROPOSED PROJECT DATES: **10/15/08 to 08/31/2010**

PROJECT TYPE: **New Project**

PRINCIPAL INVESTIGATORS: **Ferne Pinard**

COLLEGE/DIVISION: **College of Education & Psychology**

DEPARTMENT: **Clinical Psychology**

FUNDING AGENCY: **N/A**

HSPRC COMMITTEE ACTION: **Expedited Review Approval**

PERIOD OF APPROVAL: **10/13/08 to 10/12/09**

*Lawrence A. Hosman*  
 Lawrence A. Hosman, Ph.D.  
 HSPRC Chair

10-22-08  
 Date



## THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Institutional Review Board

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www.usm.edu/irb

### HUMAN SUBJECTS PROTECTION REVIEW COMMITTEE NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Human Subjects Protection Review Committee in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: **C28100902**  
 PROJECT TITLE: **Relation of Child Temperament, Executive Functioning, and Parenting Practices to Child Externalizing Behaviors in Preschoolers**  
 PROPOSED PROJECT DATES: **09/30/09 to 09/29/11**  
 PROJECT TYPE: **Previously Approved Project**  
 PRINCIPAL INVESTIGATORS: **Ferne A. Pinard**  
 COLLEGE/DIVISION: **College of Education & Psychology**  
 DEPARTMENT: **Clinical Psychology**  
 FUNDING AGENCY: **N/A**  
 HSPRC COMMITTEE ACTION: **Expedited Review Approval**  
 PERIOD OF APPROVAL: **10/05/09 to 10/04/10**

Lawrence A. Hosman  
 Lawrence A. Hosman, Ph.D.  
 HSPRC Chair

10-6-09  
 Date

## APPENDIX E

## PARENT – RESEARCH CONSENT FORM

**Consent is hereby given to participate in the study titled:** Relation of Child Temperament, Executive Functioning, and Parenting Practices to Child Externalizing Behaviors in Preschoolers.

**Purpose:** We invite you and your child to participate in a project concerning the factors that may influence your child's behavior at home and at school. We would like to know whether contextual (e.g., parenting practices) and biological (e.g., your child's temperament) influences his/her behavior at home and at school.

**Description of Study:** One hundred typical developing preschoolers between the ages of 3 and 5 will be recruited to participate in this study. Children with major developmental disabilities cannot participate in this study. If you choose to participate, you will be asked to complete some forms about you and your child. You have the choice of completing the forms on your own at home or a research assistant can help you by setting up a meeting with you. You will decide where you want these meetings to take place. Parent meetings can be held at the Head Start Centers, preschools, Child Care Centers, the campus research offices, or your home. If you choose to complete the forms by yourself, you will either be given these materials directly or they will be sent home to you with your child. The complete set of measures should take approximately one hour to complete.

Your child will be asked to do a brief test of his/her cognitive abilities. Your child will also be asked to complete a series of activities that will measure his/her brain functioning. Testing for your child will be scheduled at your child's preschool, child care center, or The University of Southern Mississippi research offices. The total testing time per child will be approximately one and a half to two hours. Testing will be broken up in several short sessions across different days to minimize both fatigue for the child and disruption in the child's school day. Your child's teacher will also be asked to complete a form regarding your child's behavior in the classroom.

All parents who have participated in this study will receive a \$10 gift card to a local store (e.g., Wal-Mart). In addition, you can ask the researcher for feedback about your child's performance. However, if test results indicate areas of concern about your child's functioning, you will be informed of this and will be provided with recommendations for addressing the concerns. Your child will be given stickers throughout the testing session and a small prize at the end of each testing session, for completion of the tests.

If you would like more information about the procedures used in this project or your child's rights as a research subject, please contact Tammy Barry, Ph.D. at (601)-266-5514 ([tammy.barry@usm.edu](mailto:tammy.barry@usm.edu)).

**Benefits:** Although the personal benefits for participation are very limited, this research should lead to a better understanding of the contextual and biological predictors of child externalizing behaviors. A better understanding of these factors will help in the design and implementation of interventions.

**Risks:** There are no risks associated with this study. This study can be stopped if you become tired of answering the questionnaires or otherwise want to quit. Testing will also be discontinued if your child becomes distressed by the testing and/or says that he/she would like to stop.

**Confidentiality:** All data will be kept strictly confidential and numbers will be assigned to the data of each child, so that there is complete confidentiality and no way of knowing the participant's identity in the computer database. Data will be analyzed and reported for groups of children, and identity of these children, as well as specific data on any given child, will not be reported. All data will be kept in a filing cabinet in a locked research lab and will only be reviewed by the principal investigator, supervising professor, and other trained and authorized research assistants. In addition, the Head Start Center, preschools, or Child Care Centers will not receive feedback based on what you have reported.

**Subject's Assurance:** Whereas no assurance can be made concerning results that may be obtained (since results from investigational studies cannot be predicted) the researcher will take every precaution consistent with the best scientific practice. Participation in this project is completely voluntary, and subjects may withdraw from this study at any time without penalty, prejudice, or loss of benefits. **Questions concerning the research should be directed to Ferne Pinard, M.A., at (305) 409-8173 or Tammy D. Barry, Ph.D., at (601) 266-5514.** This project and this consent form have been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820. A copy of this form will be given to the participant.

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE RESEARCH PROJECT AND AM PREPARED TO ALLOW MY CHILD TO PARTICIPATE IN THIS PROJECT AND ALSO BE CONTACTED FOR FUTURE RESEARCH PROJECTS.

**My child has a major developmental disability. Circle one: Yes No.**

**I would like a research assistant to help me complete the forms. Circle One: Yes No.**

\_\_\_\_\_  
Child's Name (Please Print)

\_\_\_\_\_  
Child's Teacher's Name (Please Print)

\_\_\_\_\_  
Child's School & Classroom Number

\_\_\_\_\_  
Name of Parent or Legal Guardian (Please Print)

\_\_\_\_\_  
Parent's Phone Number

\_\_\_\_\_  
Parent's Address

\_\_\_\_\_  
Signature of Parent or Legal Guardian

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Research Team Staff

\_\_\_\_\_  
Date

## APPENDIX F

## TEACHER – RESEARCH CONSENT FORM

**Consent is hereby given to participate in the study titled:**

Relation of Child Temperament, Executive Functioning, and Parenting Practices to Child Externalizing Behaviors in Preschoolers.

**Purpose:** We invite you to participate in a project concerning the factors that may influence your students' behavior. We would like to know whether contextual (e.g., parenting practices) and biological (e.g., your child's temperament) influences his/her behavior at home and at school.

**Description of Study:** One hundred typical developing preschoolers between the ages of 3 and 5 will be recruited to participate in this study. If you choose to participate, you will be asked to complete some forms about your student's behavior in the classroom. You will only be asked to complete forms for students whose parents have consented to participate in the study. This form should take you approximately 10 minutes per child in the study to complete. You will receive a \$5 gift card to a local store (e.g., Wal-Mart) for each child you complete questionnaires on.

If you would like more information about the procedures used in this project or your child's rights as a research subject, please contact Tammy Barry, Ph.D. at (601)-266-5514 ([tammy.barry@usm.edu](mailto:tammy.barry@usm.edu)).

**Benefits:** Although the personal benefits for participation are very limited, this research should lead to a better understanding of the contextual and biological predictors of child externalizing behaviors. A better understanding of these factors will facilitate the design and implementation of interventions.

**Risks:** There are no risks associated with this study. This study can be stopped if you become tired of answering the questionnaires or otherwise want to quit.

**Confidentiality:** All data will be kept strictly confidential and numbers will be assigned to the data of each child and your data so, that there is complete confidentiality and no way of knowing the participant's identity in the computer database. All data will be kept in a filing cabinet in a locked research lab and will only be reviewed by the principal investigator, supervising professor, and other trained and authorized research assistants.

**Subject's Assurance:** Whereas no assurance can be made concerning results that may be obtained (since results from investigational studies cannot be predicted) the researcher will take every precaution consistent with the best scientific practice. Participation in this project is completely voluntary, and subjects may withdraw from this study at any time without penalty, prejudice, or loss of benefits. **Questions concerning the research should be directed to Ferne Pinard, M.A., at (305) 409-8173 or Tammy D. Barry, Ph.D., at (601) 266-5514.** This project and this consent form have been reviewed by the Institutional

Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820. A copy of this form will be given to the participant.

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE RESEARCH PROJECT AND AM PREPARED TO PARTICIPATE IN THIS PROJECT AND ALSO BE CONTACTED FOR FUTURE RESEARCH PROJECTS.

---

Teacher's Name (Please Print)

---

School & Classroom Number

---

Signature of the Teacher

---

Date

---

Signature of Research Team Staff

---

Date

## REFERENCES

- Adler, L.A., Chua, H.C. (2002). Management of ADHD in adults. *Journal of Clinical Psychiatry* 63, 29-35.
- Akker, A., Deković, M., Prinzie, P., & Asscher, J. (2010). Toddlers' temperament profiles: Stability and relations to negative and positive parenting. *Journal of Abnormal Child Psychology*, 38, 485-495.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4<sup>th</sup> ed., text revision). Washington, DC: American Psychiatric Association.
- Amone-P'Olak, K., Burger, H., Ormel, J., Huisman, M., Verhulst, F. C., & Oldehinkel, A. J. (2009). Socioeconomic position and mental health problems in pre- and early-adolescents: The TRAILS study. *Social Psychiatry and Psychiatric Epidemiology*, 44, 231-238.
- Appleyard, K., Egeland, B., Van Dulmen, M. H. M. & Sroufe, L. A. (2005). When more is not better: The role of cumulative risk in child behavior outcomes. *Journal of Child Psychology and Psychiatry*, 46, 235-245.
- Arnsten, A. F.T., & Li, B. M (2005) Neurobiology of executive functions: Catecholamine influences on prefrontal cortical functions. *Biological Psychiatry*, 57, 1377-1384.
- Askan, N., Goldsmith, H. H., Smider, N. A., Essex, M. J., Clark, R., Hyde, J. S., ... Vandell, D. L (1999) Derivation and prediction of temperamental types among preschoolers. *Developmental Psychology*, 35, 958-971.



- Atzaba-Poria, N., Pike, A., & Deater-Deckard, K. (2004). Do risk factors for problem behavior act in a cumulative manner? An examination of ethnic minority and majority children through an ecological perspective. *Journal of Child Psychology and Psychiatry, 45*, 707-718.
- Bailey, J. A., Hill, K. G., Oesterle, S., & Hawkins, J. D. (2009). Parenting practices and problem behavior across three generations: Monitoring, harsh discipline, and drug use in the intergenerational transmission of externalizing behavior. *Developmental Psychology, 45*, 1214-1226.
- Barkley, R. A. (1997). Behavioural inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin, 121*, 65-94.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.
- Barry, T. D., Dunlap, S. T., Cotten, S. J., Lochman, J. E., & Wells, K. C. (2005). The influence of maternal stress and distress on disruptive behavior problems in boys. *Journal of the American Academy of Child and Adolescent Psychiatry, 44*, 265-273.
- Bayless, S., & Stevenson, J., (2007) Executive functions in school-age children born very prematurely. *Early Human Development, 83*, 247-254.
- Belsky, J. (1984). The determinants of parenting: A process model. *Child Development, 55*, 83-96.

- Belsky, J., Bell, B., Bradley, R. H., Stallard, N., & Stewart-Brown, S. L. (2007). Socioeconomic risk, parenting during the preschool years and child health age 6 years. *European Journal of Public Health, 17*, 508-513.
- Belsky, J., Hsieh, K., & Crnic, K. (1998). Mothering, fathering, and infant negativity as antecedents of boys' externalizing problems and inhibition at 3 years: Differential susceptibility to rearing experience? *Development and Psychopathology, 10*, 301-319.
- Berwid, O. G., Kera, E. A., Marks, D. J., Santra, A., Bender, H. A., & Halperin, J. M. (2005). Sustained attention and response inhibition in young children at risk for attention/deficit disorder. *Journal of Child Psychology and Psychiatry, 46*, 1219-1229.
- Biederman, J., Faraone, S., Keenan, K., Knee, D., & Tsuang, M.T. (1990). Family-genetic and psychosocial risk factors in DSM-III attention deficit disorder. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 526-533.
- Biederman, J., Monuteaux, M. C., Doyle, A. E., Seidman, L. J., Wilens, T. E., Ferrero, F., ... Faraone, S. V. (2004). Impact of executive function deficits and attention deficit/hyperactivity disorder (ADHD) on academic outcomes in children. *Journal of Consulting and Clinical Psychology, 72*, 757-766.
- Böhm, B., Katz-Salamon, M., Smedler, A. C., Lagercrantz, H., & Forsberg, H. (2002). Developmental risks and protective factors for influencing cognitive outcome at 5 1/2 years of age in very-low-birth weight children. *Developmental Medicine & Child Neurology, 44*, 508-516

- Brocki, K. C., & Bohlin, G. (2006). Developmental change in the relation between executive functions and symptoms of ADHD and co-occurring behavior problems. *Infant and Child Development, 15*, 19-40.
- Brocki, K. C., Eninger, L., Thorell, L. B., & Bohlin, G. (2010). Interrelations between executive function and symptoms of hyperactivity/impulsivity and inattention in preschoolers: A two year longitudinal study. *Journal of Abnormal Child Psychology, 38*, 163-171.
- Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children's theory of mind. *Child Development, 72*, 1032-1053.
- Caspi, A., Henry, B., McGee, R. O., Moffitt, T. E., & Silva, P. A. (1995). Temperamental origins of child and adolescent behavior problems: From age three to age fifteen. *Child Development, 66*, 55-68.
- Chang, F., & Burns, B. M. (2005). Attention in preschoolers: Associations with effortful control and motivation. *Child Development, 76*, 247-263.
- Clerkin, S. M., Marks, D. J., Policaro, K. L., & Halperin, J. M. (2007). Psychometric properties of the Alabama parenting questionnaire-preschool revision. *Journal of Clinical Child and Adolescent Psychology, 36*, 19-28.
- Colder, C. R., Lengua, L. J., Fite, P. J., Mott, J. A., & Bush, N. R. (2006) Temperament in context: Infant temperament moderates the relationship between perceived neighborhood quality and behavior problems. *Journal of Applied Developmental Psychology, 27*, 456-467.

- Coolidge, F. L., Thede, L. L., & Young, S. E. (2000). Heritability and the comorbidity of Attention Deficit Hyperactivity Disorder with behavioral disorders and executive function deficits: A preliminary investigation. *Developmental Neuropsychology, 17*, 273-287.
- Copland, R. J., Bowker, A., & Cooper, S. M. (2003). Parenting daily hassles, child temperament and social adjustment in preschool. *Early Childhood Research Quarterly, 18*, 376-395.
- Crockenberg, S. C., & Leerkes, E. M. (2005). Infant temperament moderates associations between childcare type and quantity and externalizing and internalizing behaviors at 2 ½ years. *Infant Behavior and Development, 28*, 20-35.
- Deater-Deckard, K., Dodge, K. A., Bates, J. E., & Pettit, G. S. (1998). Multiple risk factors in the development of externalizing behavior problems: Group and individual differences. *Development and Psychopathology, 10*, 469-493.
- Derryberry, D., & Rothbart, M. K. (1984). Emotion, attention, and temperament. In C. E. Izard, J. Kagan, & R. Zajonc (Eds.), *Emotion, cognition, and behavior* (pp.132-166). New York, NY: Cambridge University Press.
- Diamond, A., Kirkham, N., & Amso, D. (2002). Conditions under which young children can hold two rules in mind and inhibit a prepotent response. *Developmental Psychology, 38*, 352-362.
- Dolan, M., & Anderson, I. M. (2002) Executive and memory function and its relationship to trait impulsivity and aggression in personality disordered offenders. *The Journal of Forensic Psychiatry, 13*, 503-526.

- DuBois, D. L., Felner, R. D., Meares, H., & Krier, M. (1994). Prospective investigation of the effects of socioeconomic disadvantage, life stress, and social support on early adolescent adjustment. *Journal of Abnormal Psychology, 103*, 511-522.
- Ehrensaft, M. K., Wasserman, G. A., Verdelli, L., Greenwald, S., Miller, L. S., & Davies, M. (2003). Maternal antisocial behavior, parenting practices, and behavior problems in boys at risk for antisocial behavior. *Journal of Child and Family Studies, 12*, 27-40.
- Eiden, R. D., Edwards, E. P., & Leonard, K. E. (2007). A conceptual model for the development of externalizing behavior problems among kindergarten children of alcoholic families: Role of parenting and children's self-regulation. *Developmental Psychology, 43*, 1187-1201.
- Eisenberg, N. E., Zhou, Q., Spinrad, T. L., Valiente, C., Abes, R. A. & Liew, J. (2005). Relations among positive parenting, children's effortful control and externalizing problems: A three-wave longitudinal study. *Child Development, 76*, 1055-1071.
- Eisenberg, N., Haugen, R., Spinrad, T. L., Hofer, C., Chassin, L., Qing, Z., ... Liew, J. (2010). Relations of temperament to maladjustment and ego resiliency in at-risk children. *Social Development, 19*, 577-600.
- Ellis, M. L., Weiss, B., & Lochman, J. E. (2009). Executive functions in children: Associations with aggressive behavior and appraisal processing. *Journal of Abnormal Child Psychology, 37*, 945-956.
- Faraone, S. V., Biederman, J., Wieffenback, B., Keith, T., Chu, M. P., Weaver, A., ... Sakai, J. (1999) Dopamine D4 gene 7-repeat allele and attention deficit hyperactivity disorder. *American Journal of Psychiatry, 156*, 768-770.

- Feldman, M. A., Hancock, C. L., Rielly, N., Minnes P., & Cairns, C. (2000). Behavior problems in young children with or at risk for developmental delay. *Journal of Child and Family Studies, 9*, 247-261.
- Fish, M., Stifter, C. A., & Belsky, J. (1991). Conditions of continuity and discontinuity in infant negative emotionality: Newborn to five months. *Child Development, 62*, 1525-1537.
- Fite, P. J., Colder, C. R., Lochman, J. E., & Wells, K. C. (2006). The mutual influence of parenting and boy's externalizing behavior problems. *Applied Developmental Psychology, 27*, 151-164.
- Flouri, E. (2008) Temperament influences on parenting and child psychopathology: Socio-economic disadvantage as moderator. *Child Psychiatry and Human Development, 39*, 369-379.
- Frick, P. J. (1991). *The Alabama Parenting Questionnaire*. Unpublished instrument, University of Alabama, Tuscaloosa, AL.
- Frick, P. J., Christian, R. E., & Wootton, J. M. (1999). Age trends in the association between parenting practices and conduct problem. *Behavior Modification, 23*, 106-128.
- Gartstein, M. A., & Fagot, B. I. (2003). Parental depression, parenting and family adjustment, and child effortful control: Explaining externalizing behaviors for preschooler children. *Applied Developmental Psychology, 24*, 143-177.
- Giancola, P. R., Mezzich, A. C. & Tarter, R. E. (1998) Executive cognitive functioning, temperament, and anti-social behavior in conduct-disordered adolescent females. *Journal of Abnormal Psychology, 107*, 629-641.

- Goldsmith, H. H., Buss, K. A., & Lemery, K.S. (1997). Toddler and childhood temperament: Expanded content, stronger genetic evidence, new evidence for the importance of environment. *Developmental Psychology, 33*, 891-905.
- Goldsmith, H. H., Lemery, K. S., Buss, K. A., & Campos, J. J. (1999). Genetic analyses of focal aspects of infant temperament. *Developmental Psychology, 35*, 972-985.
- Griffin, K. W., Botvin, G. J., Scheier, L. M., Diaz, T. & Miller, N. L. (2000). Parenting practices as predictors of substance use, delinquency and aggression among urban minority youth: Moderating effects of family structure and gender. *Psychology of Addictive Behaviors, 14*, 174-184.
- Guerin, D. W., Gottfried, A. W., & Thomas, C. W. (1997). Difficult temperament and behavior problems: A longitudinal study from 1.5 to 12 years. *International Journal of Behavioral Development, 21*, 71-90.
- Henningsgaard, J. M., & Arnau, R. C. (2008). Relationships between religiosity, spirituality, and personality: A multivariate analysis. *Personality and Individual Differences, 45*, 703-708.
- Henry, B., Caspi, A., Moffitt, T. E., & Silva, P. A. (1996). Temperamental and familial predictors of violent and nonviolent criminal convictions: Age 3 to age 18. *Developmental Psychology, 32*, 614-623.
- Hinshaw, S. P, Carte, E. T., Sami, N., Treuting, J. J., & Zupan, B. A. (2002). Preadolescent girls with Attention-Deficit/Hyperactivity Disorder: II. Neuropsychological performance in relation to subtypes and individual classification. *Journal of Consulting and Clinical Psychology, 70*, 1099-1111.

- Hinshaw, S. P., Carte, E. T., Fan, C., Jassy, J. S., & Owens, E. B. (2007). Neuropsychological functioning of girls with attention-deficit/hyperactivity disorder followed prospectively into adolescence: Evidence for continuing deficits? *Neuropsychology, 21*, 263–273.
- Hoaken, P. N., Shaughnessy, V. K., & Pihl, R. O. (2003). Executive functioning and aggression: Is it an issue of impulsivity? *Aggressive Behavior, 29*, 15-30.
- Hollingshead, A. B. (1975). *Four factor index of social status*. Unpublished manuscript, Yale University, New Haven, CT.
- Holmbeck, G. N. (2002). Post-hoc probing of significant moderational and mediational effects in studies of pediatric populations. *Journal of Pediatric psychology, 27*, 87-96.
- Hughes, C., & Ensor, R. (2006). Behavioural problems in 2-year-olds: Links with individual differences in theory of mind, executive function and harsh parenting. *Journal of Child Psychology & Psychiatry, 47*, 488-497.
- Hughes, C., White, A., Sharp, J., & Dunn, J. (2000). Antisocial, angry, and unsympathetic: “Hard-to-manage” pre-schoolers’ peer problems and possible cognitive influences. *Journal of Child Psychology and Psychiatry, 41*, 169–179.
- Jaffee, S., Caspi, A., Moffitt, T. E., Belsky, J., & Silva, P. (2001). Why are children born to teen mothers at risk for adverse outcomes in young adulthood? Results from a 20-year longitudinal study. *Development and Psychopathology, 13*, 377-397.
- Jong, J., Kao, T., Lee, L., Huang, H., Lo, P., & Wang, H. (2010). Can temperament be understood at birth? The relationship between neonatal pain cry and their temperament: A preliminary study. *Infant Behavior & Development, 33*, 266-272.



- Karreman, A., de Haas, S., van Tuijl, C., van Aken, M. A. G., & Deković, M. (2010). Relations among temperament, parenting and problem behavior in young children. *Infant Behavior & Development, 33*, 39-49.
- Kim-Cohen, J., Moffitt, T. E., Caspi, A., & Taylor, A. (2004). Genetic and environmental processes in young children's resilience and vulnerability to socioeconomic deprivation. *Child Development, 75*, 651-668.
- Korkman, M., Kirk, U., & Kemp, S. (1998). *A developmental neuropsychological assessment (NEPSY)*. San Antonio, TX: Harcourt Assessment Inc.
- Korkman, M., Kirk, U., & Kemp, S. (2007). *A developmental neuropsychological assessment, 2<sup>nd</sup> ed. (NEPSY II)*. San Antonio, TX: Harcourt Assessment Inc.
- Lahey, B. B., Van Hulle, C. A., Keenan, K., Rathouz, P. J., D'Onofrio, B. M., Rodgers, J. L., & Walman, I. D. (2008). Temperament and parenting during the first year of life predict future child conduct problems. *Journal of Abnormal Child Psychology, 36*, 1139-1158.
- Lau, M. A., & Pihl, R. O. (1996) Cognitive performance, monetary incentive and aggression. *Aggressive Behavior, 22*, 417-430.
- LeMarquand, D. G., Pihl, R. O., Young, S. N., Tremblay, R. E., Séguin, J. R., Palmour, R. M., & Benkelfat, C. (1998). Tryptophan depletion, executive functions, and disinhibition in aggressive, adolescent males. *Neuropsychopharmacology, 19*, 333-341.
- Lemery, K. S., Essex, M., & Smider, N. A. (2002). Revealing the relation between child temperament and behavior symptoms by eliminating measurement confounding: Expert ratings and factor analyses. *Child Development, 73*, 867-882.

- Lemery, K. S., Goldsmith, H. H., Klinnert, M. D., & Mrazek, D. A. (1999). Developmental models of infant and childhood temperament. *Developmental Psychology, 35*, 189-204.
- Lengua, L. J., & Kovacs, E. A. (2005). Bidirectional associations between temperament and parenting and the prediction of adjustment problems in middle childhood. *Applied Developmental Psychology, 26*, 21-38.
- Lengua, L. J., West, S. G. & Sandler, I. N. (1998). Temperament as a predictor of symptomatology in children: Addressing contamination of measures. *Child Development, 69*, 164-181.
- Lengua, L. J., Wolchik, S. A., Sandler, I. N., & West, S. G. (2000). The additive and interactive effects of parenting and temperament in predicting adjustment problems of children of divorce. *Journal of Clinical Child Psychology, 29*, 232-244.
- Lessov-Schlaggar, C. N., Swan, G. E., Reed, T., Wolf, P. A., & Carmelli, D. (2007). Longitudinal genetic analysis of executive function in elderly men. *Neurobiology of Aging, 28*, 1759-1768.
- Leve, L. D., Kim, H. K., & Pears, K. C. (2005). Childhood temperament and family environment as predictors of internalizing and externalizing trajectories from 5 to 7. *Journal of Abnormal Child Psychology, 33*, 505-520.
- Marchand, J. F., Hock, E., & Widaman, K. (2002). Mutual relations between mothers' depressive symptoms and hostile-controlling behavior and young children's externalizing behavior problems. *Parenting: Science and Practice, 2*, 335-353.

- Marks, D. J., Berwid, O. G., Santra, A., Kera, E. C., Cydulnik, S. E., & Halperin, J. M. (2005). Neuropsychological correlates of ADHD symptoms in preschoolers. *Neuropsychology, 19*, 446-455.
- Martel, M. M., Pierce, L., Nigg, J. T., Jester, J. M., Adams, K., Puttler, L. I., ... Zucker, R. A. (2009). Temperament pathways to childhood disruptive behavior and adolescent substance abuse: Testing a cascade model. *Journal of Abnormal Child Psychology, 37*, 363-373.
- Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradović, J., Riley, J. R., ... Tellegen, A. (2005). Developing cascades: Linking academic achievement and externalizing symptoms over 20 years. *Developmental Psychology, 41*, 733-746.
- Matheny, A. P., Wilson, R. S., & Nuss, S. M. (1984). Toddler temperament: Stability across settings and over ages. *Child Development, 55*, 1200-1211.
- McGee, R., & Williams, S. (1999). Environmental risk factors in oppositional defiant disorder and conduct disorder. In H. C. Quay & A. E. Hogan (Eds.), *Handbook of disruptive behavior disorders* (pp. 419-440). New York, NY: Kluwer Academic/Plenum.
- Mesman, J., Stoel, R., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Juffer, F., Koot, H. M., & Alink, L. R. A. (2009). Predicting growth curves of early childhood externalizing problems: Differential susceptibility of children with difficult temperament. *Journal of Abnormal Child Psychology, 37*, 625-636.
- Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review, 4*, 674-701.

- Morgan, A. B., & Lilienfeld, S. O. (2000). A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function. *Clinical Psychology Review, 20*, 113–136.
- Muir-Broaddus, J. E., Rosenstein, L. D., Medina, D. E., & Soderberg, C. (2002). Neuropsychological test performance of children with ADHD relative to test norms and parent behavioral ratings. *Archives of Clinical Neuropsychology, 17*, 671–689.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2005). Duration and developmental timing of poverty and children's cognitive and social development from birth through third grade. *Child Development, 76*, 795-810.
- National Institute of Child Health and Human Development Early Child Care Research Network. (2003). Do attentional processes mediate the link between family predictors and school readiness? *Developmental Psychology, 39*, 581-593.
- Nigg, J. T., Goldsmith, H. H. & Sachek, J. (2004). Temperament and attention deficit hyperactive disorder: The development of a multiple pathway model. *Journal of Clinical Child and Adolescent Psychology, 33*, 42-53.
- Pardini, D. A., Fite, P. J., & Burke, J. D. (2008). Bidirectional associations between parenting practices and conduct problems in boys from childhood to adolescence: The moderating effect of age and African-American ethnicity. *Journal of Abnormal Child Psychology, 36*, 647-662.

- Paterson, G., & Sanson, A. (1999). The association of behavioral adjustment to temperament, parenting and family characteristics among 5-year-old children. *Social Development, 8*, 293-309.
- Patterson, G. R. (1982). *Coercive family process*. Eugene, OR: Castalia.
- Patterson, G. R., DeBaryshe, D. & Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist, 44*, 329-335.
- Patterson, G. R., Reid, J. B., & Dishion, T. J. (1992). *Antisocial boys (Vol. 4)*, Eugene, OR: Castalia.
- Pedlow, R., Sanson, A., Prior, M., & Oberklaid, F. (1993). Stability of maternally reported temperament from infancy to 8 years. *Developmental Psychology, 29*, 998-1007.
- Pennington, B. F., & Ozonoff, S. (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry, 37*, 51-87.
- Pettit, G. S., Laird, R. D., Dodge, K. A., Bates, J. E., & Criss, M. M. (2001). Antecedents and behavior-problem outcomes of parental monitoring and psychological control in early adolescence. *Child Development, 72*, 583-598.
- Pinard, F. A. (2007). *Temperament as a moderator in the relation between parental characteristics and externalizing behaviors in preschoolers* (Unpublished master's thesis). The University of Southern Mississippi, Hattiesburg, Mississippi.
- Pineda, D. A., Ardila, A., Rosselli, M., Arias, B. E., Henao, G. C, Gomez, L. F., ... Miranda, M. L. (1999). Prevalence of attention-deficit/hyperactivity disorder symptoms in 4- to 17-year-old children in the general population. *Journal of Abnormal Child Psychology, 27*, 455-462.

- Putnam, S. P., & Rothbart, M. K. (2006). Development of Short and Very Short Forms of the Children's Behavior Questionnaire. *Journal of Personality Assessment*, *87*, 103-113.
- Ramos, M. C., Guerin, D. W., Gottfried, A. W., Bathurst, K., & Oliver, P. H. (2005). Family conflict and children's behavior problems: The moderating role of child temperament. *Structural Equation Modeling*, *12*, 278-298.
- Rettew, D. C. & McKee, L. (2005). Temperament and its role in developmental psychopathology. *Harvard Review of Psychiatry*, *13*, 14-27.
- Reynolds, C. R., & Kamphaus, R. W. (2004). *Behavioral assessment system for children (BASC-2)*. Circle Pines, MN: AGS.
- Rieppi, R., Greenhill, L. L., Ford, R. E., Chuang S., Wu, M., Davies, M.,... Wigal, T. (2002). Socioeconomic status as a moderator of ADHD treatment outcomes. *Journal of the American Academy of Child Adolescent Psychiatry*, *41*, 269-277.
- Rothbart, M. K., & Derryberry, D. (1981). Development of individual differences in temperament. In M. E. Lamb & A. L. Brown (Eds.), *Advances in developmental psychology* (pp. 37-86). Hillsdale, NJ: Erlbaum.
- Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The children's behavior questionnaire. *Child Development*, *72*, 1394-1408.
- Rubin, K. H., Burgess, K. B., Dwyer, K. M., & Hastings, P. D. (2003). Predicting preschoolers externalizing behaviors from toddler temperament, conflict, and maternal negativity. *Developmental Psychology*, *39*, 164-176.

- Scaramella, L. V., Neppl, T. K., Ontai, L. L., & Conger, R. D. (2008). Consequences of socioeconomic disadvantage across three generations: Parenting behavior and child externalizing problems. *Journal of Family Psychology, 22*, 725-733.
- Schmidt, L. A., Fox, N. A., Perez-Edgar, K., & Hamer, D. H. (2009). Linking gene, brain, and behavior: DRD4, frontal asymmetry, and temperament. *Psychological Science, 20*, 831-837.
- Seidman, L. J. (2006). Neuropsychological functioning in people with ADHD across the lifespan. *Clinical Psychology Review, 26*, 466-485.
- Serper, M., Beech, D. R., Harvey, P. D., & Dill, C. (2008). Neuropsychological and symptom predictors of aggression on the psychiatric inpatient service. *Journal of Clinical & Experimental Neuropsychology, 30*, 700-709.
- Shelton, K. K., Frick, P. J., & Wootton, J. (1996). Assessment of parenting practices in families of elementary school-age children. *Journal of Clinical Child Psychology, 25*, 317-329.
- Silva, R. B., Measelle, J. R., Armstrong, J. M., & Essex, M. J. (2005). Trajectories of classroom externalizing behaviors: Contributions of child characteristics, family characteristics, and the teacher-child relationships during the school transition. *Journal of School Psychology, 43*, 39-60.
- Sonuga-Barke, E. J. S., Dalen, L., Daley, D., & Remington, B. (2002). Are planning, working memory, and inhibition associated with individual differences in preschool ADHD? *Developmental Neuropsychology, 21*, 255-272.

- Speltz, M. L., DeKlyen, M., Calderon, R., Greenberg, M. T., & Fisher, P. A. (1999). Neuropsychological characteristics and test behaviors of boys with early onset conduct problems. *Journal of Abnormal Psychology, 108*, 315-325.
- St. Sauver, J. L., Barbaresi, W. J., Katusic, S. K., Colligan, R. C., Weaver, A. L., & Jacobsen, S. J. (2004). Early risk factors for attention-deficit/hyperactivity disorder: A population-based cohort study. *Mayo Clinic Proceedings, 79*, 1121-1131.
- Stanger, C., Dumenci, L., Kamon, J., & Burstein, M. (2004). Parenting and children's externalizing problems in substance-abusing families. *Journal of Clinical Child and Adolescent Psychology, 33*, 590-600.
- Steiner, H., & Dunne, J. E. (1997). Summary of the practice parameters for the assessment and treatment of children and adolescents with conduct disorder. *Journal of the American Academy of Child Adolescent Psychiatry, 36*, 1482-1485.
- Stice, E., & Gonzales, N. (1998). Adolescent temperament moderates the relation of parenting to antisocial behavior and substance use. *Journal of Adolescent Research, 13*, 5-31.
- Stormshak, E. A., Bierman, K. L., McMahon, R. J., Lengua, L. J., & The Conduct Problems Prevention Research Group. (2000). Parenting practices and child disruptive behavior problems in early elementary school. *Journal of Clinical Child Psychology, 29*, 17-29.
- Thomas, A., & Chess, S. (1977). *Temperament and development*. New York, NY: Brunner/Mazel.



- Thompson, B. (2000). Canonical correlation analysis. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding more multivariate statistics* (pp. 285–316). Washington, DC: American Psychological Association.
- Thorell, L. B., Lindqvist, S., Nutley, S. B., Bohlin, G., & Klingberg, T. (2009). Training and transfer effects of executive functions in preschool children. *Developmental Science, 12*, 106-113.
- Thorell, L. B., & Wåhlstedt, C. (2006). Executive functioning deficits in relation to symptoms of ADHD and/or ODD in preschool children. *Infant and Child Development, 15*, 503-518.
- van Aken, C, Junger, M., Verhoeven, M., van Aken, M. A. G., & Deković, M. (2007). The interactive effects of temperament and maternal parenting on toddlers' externalizing behaviors. *Infant and Child Development, 16*, 553-572.
- van Aken, C, Junger, M., Verhoeven, M., van Aken, M. A. G., & Deković, M. (2008). The longitudinal relations between parenting and toddlers' attention problems and aggressive behaviors. *Infant Behavior and Development, 31*, 432-446.
- Villemarette-Pittman, N. R., Stanford, M. S., & Greve, K. W. (2002). Language and executive function in self-reported impulsive aggression. *Personality and Individual Differences, 34*, 533–1544.
- Wåhlstedt, C., Thorell, L. B., & Bohlin, G. (2008). ADHD symptoms and executive function impairment: Early predictors of later behavioral problems. *Developmental Neuropsychology, 33*, 160-178.

- Wakschlag, L. S., & Keenan, K. (2001). Clinical significance and correlates of disruptive behavior in environmentally at-risk preschoolers. *Journal of Clinical Child Psychology, 30*, 262-275.
- Whiteside-Mansell, L., Bradley, R. H., Casey, P. H., Fussell, J. J., & Conners-Burrow, N. A. (2009). Triple risk: Do difficult temperament and family conflict increase the likelihood of behavioral maladjustment in children born low birth weight and preterm? *Journal of Pediatric Psychology, 34*, 396-405.
- Whittle, S., Allen, N. B., Lubman, D. I., & Yücel, M. (2006). The neurobiological basis of temperament: Towards a better understanding of psychopathology. *Neuroscience and Biobehavioral Reviews, 30*, 511-525.
- Wills, T. A., Sandy, J. M., & Yaeger, A. (2001). Family risk factors and adolescent substance use: Moderation effects for temperament dimensions. *Developmental Psychology, 37*, 283-297.
- Woodcock, R. W., McGrew, K. S., Mather, N., & Schrank, F. A. (2001). *Woodcock-Johnson- III: Test of cognitive abilities, 3<sup>rd</sup> ed.* Itasca, IL: Riverside.
- Zhou, Q., Hofer, C., Eisenberg, N., Reiser, N., Spinrad, T. L., & Fabes, R. A. (2007). The developmental trajectories of attention focusing, attentional and behavioral persistence and externalizing problems during school-age years. *Developmental Psychology, 43*, 369-385.