

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND EXECUTIVE  
FUNCTIONS: POTENTIAL VULNERABILITIES FOR BULLY/VICTIMIZATION  
BEHAVIORS

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*To Kari, Logan, and Joshua*

*in hope that each of you will have one of your own some day*

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by

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Children diagnosed with Attention-Deficit/Hyperactivity Disorder can present with numerous difficulties in several areas of life, and particularly within the social realm. These interpersonal problems are linked to deficits in executive functions, which are the most prominent neuropsychological defects found in children with Attention-Deficit/Hyperactivity Disorder. Previous literature highlights the specific components of executive functions often problematic in children with Attention-Deficit/Hyperactivity Disorder including inhibition, set-shifting, working memory, planning, verbal fluency, and emotional regulation. Further, problems in executive functions appear to exacerbate the unsatisfactory interpersonal relationships these children experience. Additionally, Attention-Deficit/Hyperactivity Disorder is more prevalent among children identified as bullies and victims, and literature



indicates that certain interpersonal problems children with Attention-Deficit/Hyperactivity Disorder experience, also increase the risk for involvement in bully/victimization behaviors. This involvement in bully/victimization behaviors among children with Attention-Deficit/Hyperactivity Disorder also appears to be related to deficits in executive functions.

A group of children diagnosed with Attention-Deficit/Hyperactivity Disorder were assessed with performance-based executive functioning measures and self-reported questionnaires on bully/victimization behaviors. Parents completed a measure of emotional regulation, and the child's teacher completed an informant-rating scale on executive functions and equivalent measures on bully/victimization behaviors. Analyses of the data demonstrated that several of the teacher-reported executive function measures were related to, and predictive of, the teacher-reported bully/victimization behaviors. The performance-based executive function measures routinely demonstrated non-significant correlational and predictive findings with the bully/victimization measures. Additionally, the self-reported bullying measures had no significant relationships with any of the executive functioning measures. These results were consistent with literature questioning the validity of these types of measures. The results did show that executive functions, particularly those related to social skills, and emotional regulation, and the symptoms of Attention-Deficit/Hyperactivity Disorder, predict involvement with bully/victimization behaviors.

Additional research is needed on the complex relationship among Attention-Deficit/Hyperactivity Disorder, executive functions, and bully/victimization behaviors. Specifically, potential studies should focus on utilizing a broader sample of participants, informants, and measures of executive functions and bully/victimization. Future research

investigating the relationship among Attention-Deficit/Hyperactivity Disorder, executive dysfunction, and bully/victimization should focus on advancing beneficial interventions to comprehensively address these conditions in order to improve the child's overall quality of life.

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## LIST OF ABBREVIATIONS

ADD.....	Attention Deficit Disorder
ADD/W.....	Attention Deficit Disorder with Hyperactivity
ADD/WO.....	Attention Deficit Disorder without Hyperactivity
ADHD.....	Attention-Deficit/Hyperactivity Disorder
ADHD-CT.....	ADHD Combined Type
ADHD-HT .....	ADHD Predominantly Hyperactive/Impulsive Type
ADHD-IT .....	ADHD Predominantly Inattentive Type
ADHD NOS .....	ADHD Not Otherwise Specified
BD.....	Behavior Disorders
BRIEF.....	Behavioral Rating Inventory of Executive Function
BVs.....	Bully/Victims
CAPD.....	Central Auditory Processing Disorders
CBCL.....	Child Behavior Checklist
CD.....	Conduct Disorder
CEFS.....	Children’s Executive Function Scale
COWAT.....	Controlled Oral Word Association Test
CPNI.....	Coolidge Personality and Neuropsychological Inventory
CPRS-R: S.....	Connors’ Parent Rating Scale-Revised: Short Form
CPT.....	Continuous Performance Test
CT.....	Category Test
D-KEFS.....	Delis-Kaplan Executive Function System

DS.....	Digit Span
DS-B.....	Digit Span Backward
DS-F.....	Digit Span Forward
DSM-II.....	Diagnostic and Statistical Manual of Mental Disorders-2 <sup>nd</sup> Edition
DSM-III.....	Diagnostic and Statistical Manual of Mental Disorders-3 <sup>rd</sup> Edition
DSM-III-R.....	Diagnostic and Statistical Manual of Mental Disorders-3 <sup>rd</sup> Edition Revised
DSM-IV.....	Diagnostic and Statistical Manual of Mental Disorders-4 <sup>th</sup> Edition
DSM-IV-TR...	Diagnostic and Statistical Manual of Mental Disorders-4 <sup>th</sup> Edition-Text Revision
EBD.....	Emotionally and Behaviorally Disturbed
EF.....	Executive Functions
EV.....	Ecological Validity
FSIQ.....	Full Scale IQ
FSTC.....	Frontal-Striatal-Thalamic-Cortical
GAD.....	Generalized Anxiety Disorder
IBCT.....	Intermediate Booklet Category Test
ICD-10.....	International Classification of Diseases-10 <sup>th</sup> Edition
IRB.....	Institutional Review Board
LDs.....	Learning Disabilities
ODD.....	Oppositional Defiant Disorder
PEQ.....	The Peer Experiences Questionnaire
PIQ.....	Performance Scale IQ

PRI.....	Perceptual Reasoning Index
PSI.....	Processing Speed Index
RD.....	Reading Disability
RE.....	Regular Education
SEQ-P.....	Social Experience Questionnaire-Peer Report
SEQ-S.....	Social Experience Questionnaire Self Report
SEQ-T.....	The Social Experience Questionnaire-Teacher Report
TOH.....	Tower of Hanoi
TOL.....	Tower of London
VCI.....	Verbal Comprehension Index
VIQ.....	Verbal Scale IQ
VO.....	Victimization of Others
VS.....	Victimization of Self
UADD.....	Undifferentiated Attention Deficit Disorder
WCST.....	Wisconsin Card Sorting Test
WHO.....	World Health Organization
WISC-III.....	Wechsler Intelligence Scale for Children-3 <sup>rd</sup> Edition
WISC-IV.....	Wechsler Intelligence Scale for Children-4 <sup>th</sup> Edition
WM.....	Working Memory
WMI.....	Working Memory Index

## CHAPTER 1

### INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental behavior diagnoses, which causes significant and widespread disruption in several major components in a child's life including academic, interpersonal, social, and the family environment. While the core symptoms of ADHD including inattention, hyperactivity, and impulsivity define the disorder, other interrelated facets of the disorder seem to negatively disrupt the child's quality of life, and impair adaptive functioning. These include, but are not limited to, deficits in neuropsychological functions, impairments in regulation of emotional experiences, and significant disruptions in the child's ability to engage in appropriate and satisfactory peer relations and social discourse.

Specifically, research has shown that ADHD is associated with deficits within the neuropsychological realm of executive functions (EF). These include the higher-order cognitive functions of the brain, and have been associated with the frontal lobe system. Executive dysfunction is characteristically described as a constellation of behavioral symptoms that brings about devastating effects to the individual's cognitive, emotional, and social world. For several decades the literature on ADHD has suggested that the behaviors associated with deficits in EF, (e.g., distractibility, inattention, impulsivity, diminished flexibility in thinking and perseverance, poor planning ability, changes in emotional regulation, difficulty sustaining friendships, and impaired self regulation of cognitive and social behavior), are consistent with the descriptions of the problems individuals with ADHD also experience.

Recent literature also suggests that the diagnosis of ADHD is more prevalent among children and adolescents who have been identified as bullies, victims of bullying behavior, and bully/victims, who are individuals known to exhibit behaviors consistent with those of both bullies and victims. Coolidge, Den Boer, and Segal (2004) have additionally suggested that the relationship between deficits in EF common to children diagnosed with ADHD may be tied to the display of bullying behaviors. However, this study assessed only bullying behaviors, and did not assess victimization. Furthermore, Coolidge, Den Boer, and Segal's (2004) study did not evaluate EF with well-established measures of this construct. The present study intends to advance the preceding research by utilizing performance-based measures of EF that have demonstrated good psychometric properties discriminating children diagnosed with ADHD. Further, informant-report of EF will also be utilized to enhance the ecological validity in measuring EF for this study. Parents and teachers of children diagnosed with ADHD will be asked questions about the child's EF utilizing rating scales for EF, and both the teachers and the children will be asked to complete equivalent questionnaires related to bully/victimization behaviors.

Analyses in the current study will be conducted to determine whether a relationship emerges among both the performance-based and informant-report ratings of EF, and bully/victimization behaviors in a sample of children diagnosed with ADHD. This study aims to evaluate multiple types of bully/victimization behaviors, and the specific components of EF found to be problematic in children with ADHD in a more comprehensive and valid manner than has been done previously. In addition, this study anticipates the results may

provide suggestions for targeting prevention and amelioration of the interpersonal difficulties children diagnosed with ADHD experience.

## CHAPTER 2

### LITERATURE REVIEW

#### Attention-Deficit/Hyperactivity Disorder

##### General Definition

Attention-Deficit/Hyperactivity Disorder (ADHD) is a pattern of persistent inattention and/or hyperactivity-impulsivity that is more frequent and severe than what is expected developmentally, and that manifests in a variety of contexts (American Psychiatric Association, 2000). By definition, the disorder causes significant impairment in the individual's social, academic, and occupational functioning (APA, 2000). While ADHD is defined as a disruptive behavior disorder, specific deficits in neuropsychological processing are not incorporated into the Diagnostic and Statistical Manual (DSM-IV-TR; American Psychiatric Association, 2000) criteria, although ADHD is believed to have a neuropsychological basis (Tannock & Brown, 2000). One influential theory on ADHD (Barkley, 1997a, 1997b) views ADHD as a developmental disorder mainly involving deficits in executive functions, with the primary deficit in behavioral inhibition. This principal deficit in behavioral inhibition, as a consequence leads to deficits in other areas of executive functioning such as working memory, planning, and verbal fluency (Barkley, 1997a, 1997b). Many studies have extensively supported these deficits in executive functions among individuals diagnosed with ADHD (Berlin, Bohli, Nyberg, & Janols, 2004; Berlin, Bohli, & Rydell, 2003; Boucugnani & Jones, 1989; Chhabildas, Pennington, & Willcutt, 2001; Chelune, Ferguson, Koon, & Dickey, 1986; Doyle, Biederman, Seidman, Weber, & Faraone, 2000; Faraone, Biederman, Weber, & Russell, 1998; Houghton, Douglas, West, Whiting,

Wall, Langsford, et al., 1999; Lawrence, Houghton, Tannock, Douglas, Durkin, & Whiting, 2002; Muir-Broaddus, Rosenstein, Medina, & Soderberg, 2002; Nigg, Hinshaw, Carte, & Treuting, 1998; Pennington & Ozonoff, 1996; Scheres, Oosterlaan, Geurts, Morein-Zamir, Meiran, Schut, et al., 2000; Shallice, Marzocchi, Coser, Del Shavio, Meuter, & Rumiat, 2002; Shue & Douglas, 1992; Seidman, Biederman, Faraone, Weber, & Oellete, 1997; Sergeant, Geurts, & Oosterlaan, 2002). These cognitive impairments in executive functioning further manifest in problems with social and emotional functions (DeBonis, Ylvisaker, & Kundert, 2000).

#### Diagnostic and Statistical Manual (DSM) Definitions

Attention-Deficit/Hyperactivity Disorder was one of the few disorders that attained significant revisions in the DSM-IV (Wolraich, Hannah, Baugaertel, & Feurer, 1998). Initially, what is now referred to as ADHD was introduced by Still (1902) and Tredgold (1908), who first detailed case histories of children with the disorder known as a “defect in moral control.” This occurred at the end of the 19<sup>th</sup> century when the features of inattention, hyperactivity, and impulsivity were being discussed in the medical literature (Logan, Schachar, & Tannock, 2000). In the 1940’s and 1950’s, ADHD was referred to as “minimal brain dysfunction,” and no known etiology was presented, but the cause was hypothesized to be neurologically-related. With the publication of the DSM-II (American Psychiatric Association, 1968), ADHD was named “hyperkinetic reaction of childhood,” a unitary disorder with the cardinal feature of motoric disinhibition, and with less emphasis on the inattentive symptoms of the disorder (Goodyear & Hynd, 1992; Wolraich, Hannah, Baugaertel, & Feurer, 1998).



A controversial change occurred in defining the disorder with the DSM-III (American Psychiatric Association, 1980), when two subtypes were created. The diagnosis was renamed, introducing the term Attention Deficit Disorder (ADD), and the diagnosis was subdivided into ADD with (ADD/W) or without hyperactivity (ADD/WO). This shifted the diagnosis into two categories of ADD/W and ADD/WO, with explicit emphasis on the attentional symptoms. Therefore it became possible to diagnose impairment in attention without heightened hyperactivity (Goodyear & Hynd, 1992). In the DSM-III (American Psychiatric Association, 1980) the presence of excessive motor activity became the basis of differential diagnosis of the two subtypes (Lamminmaki, Ahonen, Narhi, & de Berra, 1995). This was later abolished in the next edition, DSM-III-R (1987), when once again ADD became a unitary disorder of inattention, impulsivity, and hyperactivity.

In the DSM-III-R edition, the ADD/WO subtype was removed, and the two disorders, ADHD and Undifferentiated Attention Deficit Disorder (UADD) were created. Behavioral descriptions of hyperactivity, impulsivity, or both accounted for two-thirds of the symptoms, while one-third referred to inattention symptoms; however, the DSM-III-R (1987) did retain the concept that an attention disorder may occur without hyperactivity (Goodyear & Hynd, 1992). At the time of the publication of the DSM-III-R there was not enough support for two subtypes created by the DSM-III, so the diagnosis was replaced with single unidimensional diagnostic category ADHD, which is known as the polythetic model of ADHD (Lamminmaki, Ahonen, Narhi, & de Berra, 1995). Later studies, however, did find more support for the DSM-III diagnostic classification system than the polythetic approach of the DSM-III-R (Goodyear & Hynd, 1992).

As stated previously, the diagnostic criteria for ADHD underwent significant revisions with the publication of the DSM-IV (1994), and the criteria again highlighted the disorder's diagnostic heterogeneity. This change resulted from factor analytic studies that showed the disorder encompassed two dimensions of inattention and hyperactivity/impulsivity. Further, studies differentiating among populations having inattention, hyperactive/impulsive symptoms, or both were also able to identify clinically meaningful differences within these subtypes (Faraone, Biederman, Weber, & Russell, 1998; Wolraich, Hannah, Baugaertel, & Feurer, 1998). These new subtypes include ADHD Predominantly Inattentive Type (ADHD-IT), Predominantly Hyperactive/Impulsive Type (ADHD-HT), Combined Type (ADHD-CT), and ADHD Not Otherwise Specified (ADHD NOS), all of which will be discussed later in greater detail. Moreover, the addition of the new DSM-IV subtypes has increased overall prevalence rates for the disorder (Wolraich, Hannah, Baugaertel, & Feurer, 1998), although individuals diagnosed with ADHD display a wider array of chronic impairment than has been incorporated in DSM-IV criteria (Brown, 2000). For a complete listing of the DSM-IV-TR (2000) diagnostic criteria for ADHD see Appendix A.

#### Definition of Core ADHD Symptoms

As seen in the DSM-IV-TR diagnostic criteria for ADHD (Appendix A), there are specific descriptors for the symptoms of inattention and hyperactivity/impulsivity. This section outlines more elaborated descriptions of the core symptoms reflective of ADHD.

Inattention: Children with ADHD do not appear to have deficits in their attentional capacity, which is the amount of information that can be remembered for a brief time period.

Another component of attention, selective attention, is the ability to concentrate on relevant information when distracters are introduced (Mash & Wolfe, 2002). The accompanying deficits in selective attention, known as distractibility, can present problems for children with ADHD especially when distracters are highly salient and appealing. This means there is a tendency for individuals with ADHD to be more distracted in comparison to normal peers when irrelevant material is embedded in tasks. The main attention deficit in ADHD seems to be one of sustained attention, or what is referred to as vigilance (Mash & Wolfe, 2002). Children with ADHD often have difficulties persisting on tasks over long periods of time, and in particular when the task is tedious and mundane. Hence, the inattention typically seen in ADHD is manifested by distractibility and trouble sustaining attention. These attentional deficits are moderated in tasks or situations that are novel and stimulating, and when rates of reinforcement are high (Teeter & Semud-Clíkeman, 1995).

Hyperactivity: Hyperactivity in ADHD presents as restlessness, fidgeting, and general unnecessary gross body movements, although it maybe absent in novel situations (Sagvolden & Sergeant, 1998). This finding will later be highlighted in the section on neuropsychological tests of EF as a possible reason for lack of ecological validity in findings. The excessive activity seen in children with ADHD is often described as a child constantly being on the go, as if run by a motor. Nonetheless, the excessive energy seen in children with ADHD is often unproductive and misdirected (Mash & Wolfe, 2002). While hyperactivity is thought to be the hallmark symptom of the disorder, and it is often the first symptom to appear in preschool-aged children diagnosed with ADHD, hyperactivity is also the first symptom to disappear as the child develops (Hart, Lahey, Loeber, Applegate, &

Frick, 1995; Wilens, Spencer, & Biederman, 2004). Severe hyperactivity manifested in children has also been shown to be associated with signs of the disorder at an earlier age, lower scores on IQ tests, neurodevelopmental problems, and language delays compared to other children with moderate levels of hyperactivity (Teeter & Semud-Clikeman, 1995).

Impulsivity: Impulsivity is indicated as an inability to withhold inappropriate responses such as rash responding, hasty responsiveness, an excessive attraction to immediate rewards, acting without reflecting, thoughtless, and reckless behavior (Sagvolden & Sergeant, 1998). Solanto, Abikoff, Sonuga-Barke, Schachar, Logan, et al. (2001) defined an impulsive response as “one that is executed with insufficient forethought, planning or control, and is therefore inaccurate or maladaptive” (p. 215). While there is little consensus in the literature with respect to the explicit characterization for this behavioral construct in general, the DSM-IV-TR outlines the specific criteria for the impulsivity defined by ADHD (American Psychiatric Association, 2000). There has been some suggestion in the literature that a distinction should be made between two components of impulsivity: cognitive and behavioral. The cognitive component of impulsivity indicates disorganization, rushed thinking, and need for structure and support, and it is measured by psychometric tests of mental control. Behavioral impulsivity encompasses actions taken without consideration of the possible consequences of that action. Measurement of behavioral impulsivity is reflected in tests of resistance to temptation and behavioral observations and ratings of motor restlessness, undercontrol, and impatience or impersistence (Mariani & Barkley, 1997; Milich & Kramer, 1984).

While hyperactivity and impulsivity are presented separately in the DSM-IV-TR criteria, children who display deficits in one area usually present additional difficulties in the other (Mash & Wolfe, 2002). Some theorists believe that the strong link between the two symptoms of hyperactivity and behavioral impulsivity highlight a more principal deficit in response inhibition (Barkley, 1997a, 1997b; Quay, 1988), which is further explored in the section on the Neuropsychology of ADHD.

### Diagnosis of ADHD

Typically, identification of ADHD is during the elementary school years, but symptoms usually present earlier in the preschool years (American Psychiatric Association, 2000; Mariani & Barkley, 1997). While symptoms associated with ADHD have been identified as early as toddlerhood, the peak age for symptoms to appear is three to four years old. Symptoms have additionally been noted to occur in utero (Pennington & Ozonoff, 1996). Currently there are no laboratory tests, or set of tests utilized to make a definitive diagnosis of ADHD (Cantwell, 1996). The diagnosis is typically made using behavioral criteria utilizing not only direct observations in the clinical setting, but also parental and teacher observation in naturalistic settings (Swanson, 2003; Teeter & Semud-Clikeman, 1995). This is because the diagnostic criteria require that symptoms present in multiple settings, such as in the home and school setting. Additionally, the DSM-IV-TR criteria require that the problems are persistent, in that symptoms have lasted for at least six months (American Psychiatric Association, 2000).

The diagnosis of ADHD can involve a combination of clinical interviews with the parents, teacher, and possibility a developmentally appropriate interview with the child.

Cantwell (1996) reports that behavioral rating scales specific to ADHD such as the Connors Rating Scales-Revised (Connors, 1997), or more broad-based measures such as the Child Behavioral Checklist (CBCL; Achenbach, 1991), are commonly utilized to confirm the diagnosis of ADHD. Further, observations, neuropsychological testing, and medical/sensory/neurological evaluations are occasionally used as rule outs for other disorders (American Academy of Child & Adolescent Psychiatry Official Action, 1997), as are adjunct assessments of speech and language functioning, and evaluations of fine and gross motor skills (Cantwell, 1996).

### Epidemiology

ADHD is one of the most prevalent childhood disorders, making up as much as 50% of the referrals in pediatric psychiatry populations (Biederman, Newcorn, & Sprich, 1991; Cantwell, 1996; Casey, Castellanos, Xavier, Giedd, Marsh, Hamburger, et al., 1997). As reported in DSM-IV, 3% to 5% of school-aged children are diagnosed with ADHD, although these prevalence rates do not necessarily consider preschool aged children, adolescents, and adults with the diagnosis. Furthermore, some epidemiological studies suggest that the prevalence rate among school-aged children may be as high as 20% (Barbarese, Katusic, Colligan, Pankratz, Weaver, Weber, et al., 2002; Biederman, Newcorn, & Sprich, 1991; Cantwell, 1996; Wolraich, Hannah, Baugaertel, & Feurer, 1998). Studies have shown that the diagnosis of ADHD is higher in community versus school samples, and also higher in males (Brown, 2000), which will be further explored in the next section on gender differences in ADHD. With regard to the developmental course of ADHD into adolescence

and adulthood, the literature indicates the symptoms of ADHD persist into adulthood in 30% to 70% of children diagnosed with the disorder (Roth & Saykin, 2004).

### Gender

Overall, males are more likely than females to be diagnosed with ADHD, with the gender ratio reported as 9 to 1 for clinical samples, and 4 to 1 for epidemiological samples (American Psychiatric Association, 1994). These gender ratios may reflect a selective gender bias since females are quieter and suffer less from hyperactive/impulsive symptoms and behavioral/conduct problems that frequently initiate earlier referrals (American Psychiatric Association, 2000; Cantwell, 1996; Wolraich, Hannah, Baugaertel, & Feurer, 1998). Moreover, Mash and Wolfe (2002) report that girls with ADHD are more likely to be unrecognized because teachers fail to report inattentive behaviors unless they are accompanied by the disruptive behaviors often seen in boys. The DSM criteria were additionally tested primarily with boys, which further may be a factor in the sampling, referral, and definition biases contributing to the reported higher prevalence of males with ADHD (Mash & Wolfe, 2002). However, when girls with ADHD do display oppositional behaviors, they are referred at younger ages than their male counterparts (Mash & Wolfe, 2002). Silverthorn, Frick, Kuper, and Otto (1996) suggest this referral pattern is due to even less tolerance for this type of behavior when manifested in females.

### Etiology

ADHD is a heterogeneous disorder and research has suggested, but not firmly established ADHD as a central nervous system disorder (NIH, 2000), although it is suggested that an interplay of both genetic/biological factors and psychosocial factors contribute to the

final common pathway of the disorder (Houghton, Douglas, West, Whiting, Wall, Langsford, et al., 1999). Whereas environmental factors such as poverty, family chaos, diet, or poor parental management of children can exacerbate the symptoms of ADHD, there is little evidence that social factors cause the disorder (Barkley, 2000; Teeter & Semrud-Clikeman, 1995). Certain conditions such as Fragile X Syndrome, Fetal Alcohol Syndrome, low birth weight, and rare genetically transmitted thyroid disorder can contribute to manifestations of an ADHD-like disorder (Hechtman, 1994). Nonetheless, these conditions constitute a small percentage of the total population diagnosed with ADHD (Cantwell, 1996). Castellanos and Tannock (2002) identified certain environmental etiologies responsible for the *de novo* development of ADHD including traumatic brain injury and stroke. Additional risk factors indicated were pre-and perinatal abnormalities, viral infections, exposure to lead (Cantwell, 1996), severe early deprivation, family psychosocial adversity, and prenatal maternal smoking and substance abuse. Several sources point to genetic influences as important causal factors in the etiology of ADHD (Mash & Wolfe, 2002). The following sections further discuss these etiological factors, and specifically the ADHD-familial subtype.

#### ADHD and Neurotransmitters

While no single neurotransmitter is involved in ADHD (Pennington & Ozonoff, 1996), both dopaminergic and noradrenergic hypotheses have been offered for the etiology and/or contribution to ADHD. These neurotransmitter systems appear to affect a variety of cognitive domains including attention, inhibition, and response of the motor system, as well as motivation, all of which can be critically disrupted in ADHD (Riccio, Hynd, Cohen, & Gonzalez, 1993). Barkley (1990) emphasized that a genetic predisposition towards



dopamine depletion in, or underactivity of the prefrontal-striatal-limbic regions occurs in individuals with ADHD. This dopamine hypofunctioning additionally appears to cause the behavioral symptoms common to ADHD (Sagvolden & Sergeant, 1998).

### Genetics and Familial Subtype of ADHD

Genetic factors contribute a significant proportion of the phenotypic variance in the expression of ADHD (Castellanos & Tannock, 2002), and familial genetic influence is more important in the etiology of ADHD in comparison to psychosocial adversity (Jensen, Martin, & Cantwell, 1997). According to Barkley, (1998) genetic studies find that psychosocial factors in the family account for only a small amount of the variance (e.g., 15%) in ADHD symptoms. The heritability of ADHD is estimated from 0.55 to 0.92, and concordance rates have been reported at 51% to 81% in monozygotic twins versus 29% to 31% in dizygotic twins (Hechtman, 1994; Levy, Hay, McStephen, Wood, & Waldman, 1997; Lovejoy, Ball, Keats, Stutts, Spain, Janda, & Janusz, 1999; Sharp, Gottesman, Greenstein, Ebens, Rapoport, & Castellanos, 2003; Teeter & Semrud-Clikeman, 1995). Levy, Hay, McStephen, Wood, and Waldman (1997) noted the exceptionally high rates of heritability of ADHD compared with other behavioral disorders, and Wilens, Faraone, and Biederman (2004) additionally reported that the heritability estimates for ADHD are highest among the psychiatric disorders.

Adoption studies have further suggested that the etiological manifestation of the disorder has a stronger genetic component rather than environmental (Cantwell, 1996). This is indicated by the biological relatives of children with ADHD performing worse on attention measures, and being more likely also diagnosed with ADHD than the adoptive relatives

(Alberts-Corush, Firestone, & Goodman, 1986; Hechtman, 1994). It is important to note that there also appears to be strong familial contributions to ADHD not only as a diagnosis, but also to the comorbid diagnoses associated with ADHD, which is discussed in a later section on comorbidity in ADHD.

### Neurophysiology and Brain Imaging

Brain imaging and neurophysiological studies are inconsistent in finding reliable differences in the brain integrity of individual with ADHD (American Academy of Pediatrics, 2000), although some research studies do indicate subtle brain abnormalities in this population (Clark, Prior, & Kinsella, 2000; Tannock & Brown, 2000; Sagvolden & Sergeant, 1998). The neuroimaging and neurophysiological literature points to abnormalities in frontal networks (e.g., frontostriatal dysfunction) and in networks that control attention and motor intentional behavior (Seidman, Biederman, Faraone, Weber, & Oellete, 1997) in ADHD.

Additionally, a “frontal lobe hypothesis” of ADHD has been suggested. This premise implies that the possible frontal lobe deficits seen in individuals diagnosed with ADHD result in the disorganized behaviors associated with problems of behavioral inhibition. These problematic behaviors common to individuals with ADHD are presumed to be mediated by genetically-based abnormalities in the functioning of frontal structures responsible for executive functioning (Sagvolden & Sergeant, 1998). Executive functions (EF), which will be discussed in greater detail later, have been consistently suggested as the primary neuropsychological deficit in ADHD. Executive functions have been associated with the integrity of the frontal-striatal-thalamic-cortical (FSTC) circuitry (Roth & Saykin, 2004).

Results from tomographical or structural studies point to frontostriatal disturbances in individuals with ADHD that may reflect an unusual symmetry of function (Oades, 1998), metabolic deficiencies of blood glucose metabolism in cortical areas and subcortical structures (Lovejoy, Ball, Keats, Stutts, Spain, Janda, & Janusz, 1999), and underarousal of the cerebral cortex (Barkley, 1997a, 1997b). From both neurophysiological and neuroimaging data, Roth and Saykin (2004) suggest the possibility that ADHD involves a neurodevelopmental immaturity of the frontal-striatal-thalamic-cortical (FSTC) circuitry subserving executive functioning.

#### Developmental Presentation of ADHD Symptoms

The core symptoms of ADHD, including inattention and hyperactivity-impulsivity, can seriously interfere in a multitude of areas including the child's behavior, academic/cognitive, social, and emotional functioning. Additionally, ADHD is a complex disorder that does not present as static over the course of the child's development. Brown (2000) and Cantwell (1996) noted that there are age differences in the presentation of symptoms, and a changing profile of complex symptoms. Further, it has been suggested that children diagnosed with ADHD demonstrate developmental delay around 2 years old (Sergeant, Geurts, & Oosterlaan 2002), but that the symptoms associated with ADHD decrease with central nervous system maturation (Pineda, Ardila, Rossell, Arias, Henao, Gomez, et al., 1998). This section outlines how each of the principal characteristic symptoms of ADHD, including inattention and hyperactivity-impulsivity, may present developmentally within the four areas of behavior, cognitive-related activities, emotional, and social functioning. The section on social deficits and ADHD also concludes with an

outline of how particular interactions seen in children with ADHD can possibly lead to behaviors related to bully/victimization.

### Behavioral Manifestations of ADHD

In the infant and toddler years, symptoms of ADHD can present behaviorally as excessive crying, feeding problems, sleep disturbance in infants, and toilet training difficulties. In the preschool years, ADHD can present in temper tantrums, as well as argumentative, aggressive, and fearless behaviors. Noncompliance is additionally common, and can also manifest in elementary school years. Sleep disturbances are prominent. Severe symptoms in preschool are likely to lead into more persistent ADHD over time (Cantwell, 1996), and if the child is diagnosed with ADHD in childhood, as opposed to adolescence, the symptom presentation also may be more severe (Biederman, Faraone, Taylor, Sienna, Williamson, & Fine, 1998). Certain behaviors further consistently contrast children with ADHD from control children including excessive activity levels, negative verbalizations, and off-task behaviors (Teeter & Semud-Clikeman, 1995). Despite the significant difficulties most children with ADHD face in terms of overactivity, Barkley (1997b) noted they show reduced stamina and strength as measured by physical fitness tests. In adolescence, ADHD is revealed in risky behaviors such as participating in antisocial acts, erratic and unsafe driving practices, and participation in sexual activities at an earlier age. Moreover, adolescents with ADHD are less likely to use contraception (Barkley, 2002; Cantwell, 1996).

### Academic/Cognitive-Related Difficulties noted in ADHD

The school environment is difficult, if not the most challenging, area that children with ADHD have to endure. ADHD is generally associated with chronic underachievement

and school failure (Biederman, Newcorn, & Sprich, 1991). Academic outcomes are some of the areas in which children diagnosed with ADHD fair the worst. According to Barkley (2002), over 90% of children with ADHD perform poorly in school. Other academic difficulties experienced by children with ADHD in comparison to their non-ADHD peers include greater risks for grade repetitions, suspensions, or expulsion from school, and inferior grades (AACAP, 1997). They furthermore require more special education classes and more tutoring. Thirty-two to 38% of individuals diagnosed with ADHD do not graduate from high school, in comparison to the national average of 5%, and fewer individuals with ADHD progress on to college (Barkley, 2002; Biederman, Newcorn, & Sprich 1991).

Cognitively effortful work appears to be the most difficult area related to the complications children with ADHD confront. Adolescents with ADHD are noted to have poorly organized approaches to school and work, and often fail to complete independent school work. The disorganized character of ADHD appears to contribute to this failure to complete school and homework tasks (Zentall, Gary, & Stomont-Spurgin, 1993). In adulthood, the disorganization accompanying the disorder continues with poor concentration and procrastination, as well (Cantwell, 1996). Furthermore, ADHD is not only a costly issue to the children and parents contending with the disorder; the National Institutes of Health reported in 2000 that national public school expenditures for students diagnosed with ADHD may have exceeded \$3 billion in 1995.

#### Affective/Emotional Issues in ADHD

Children and adolescents with ADHD appear to demonstrate dysfunctional affect regulation as noted by their general emotional hyper-responsiveness towards others (Barkley,

1997a, 1997b), overreactivity in their emotional displays, and poor emotional control, which seems to be linked to decreased popularity with peers (Maedgen & Carlson, 2000). Barkley (1997a, 1997b) reports that negative affective and motivational states are more problematic for children with ADHD because they are more emotionally impulsive and less adept at self-regulating their emotional states. Brown (2000) described two subgroups within the population of individuals diagnosed with ADHD that have even greater difficulties with emotional regulation. One subgroup is noted by their displays of sudden and sustained catastrophic emotions in reaction to minor frustrations, while the other group exhibited relatively absent emotional expression (Brown, 2000). This is consistent with findings from a study assessing emotional regulation among children diagnosed with ADHD-CT and IT. Maedgen and Carlson (2000) found that children diagnosed with ADHD-CT displayed emotional dysregulation characterized by intense negative and positive affect in comparison to children diagnosed with ADHD-IT, and comparison control children. Comorbid aggressiveness also may partly explain these findings of catastrophic emotional displays among subgroups of individuals with ADHD. Hinshaw and Melnick (1995) found that children with ADHD and high levels of comorbid aggression displayed greater expressed negative emotions than the low aggressive and comparison peers.

Parents of children with ADHD report that these children, as infants, had difficult temperaments and were more irritable (Mash & Wolfe, 2000). Cole, Zahn-Waxler, and Smith (1994) found that levels of negative affect were positively and significantly correlated with risk for, and symptoms of, ADHD for boys, while the converse was discerned for girls. The emotional deficits seen in children with ADHD intensifies the significant problems

within their family system, difficulties in the school setting including academic underachievement and troublesome peer relationships, which further contributes to their lowered self-esteem (American Academy of Pediatrics, 2000). In adolescence, ADHD may present as an internal sense of restlessness, and in adulthood as intermittent explosive outbursts (Cantwell, 1996). Brown (2000) noted that the DSM-IV ironically contains no affective symptoms in the diagnostic criteria, even though it appears ADHD creates numerous problems in the emotional sphere that only further compound the obstacles of the disorder. As described later in the section on EF, emotional regulation and motivation are hypothesized as principal components of EF, and are likely major contributors to an interconnected web of issues leading to behavioral problems experienced by children with ADHD.

#### Social Deficits Common in ADHD

While the social deficits common to children with ADHD are numerous, Wheeler and Carlson (1994) noted that, unfortunately, social problems are not incorporated into the DSM-IV diagnostic criteria. Further, the primary treatment of ADHD, stimulant medications, does not necessarily normalize other related behavioral problems of the disorder, including the dysfunctional social skills commonly seen in children with ADHD (NIH, 2000). The families of children with ADHD are more conflicted and stressed, and half of the children with ADHD have serious peer relationship difficulties (Barkley, 2002). The observance of problematic interpersonal relations is seen at an early age as demonstrated by lower attachment ratings by mothers of 12 to 18 month old children, and by the fewer positive, and more negative mother-child interactions (Teeter & Semud-Clikeman, 1995).

Later in childhood, when peer relationships and the negotiation of social interactions become prominent, children with ADHD are often rejected by peers, have lower social status, and are described as more unpopular than other children. Problematic peer relationships, which are due to the primary symptoms associated with the disorder, additionally create an even more challenging school environment. This is likely due to the fact that children with ADHD act in an aggressive manner with their peers, and receive more negative attention from their teachers. Cantwell (1996) described the social style of the child with ADHD as having “lack of social savoir-faire” (p. 981), or an inability to recognize and appropriately respond to social cues, further leading to difficult interpersonal relationships.

Social difficulties experienced by children with ADHD additionally appear exacerbated by their off-task and rule-breaking behaviors, and their perceived bossy and intrusive nature when interacting with others. There also is a tendency for the individual with ADHD to misinterpret social cues and ascribe negative intentions in neutral situations, a type of cognitive bias commonly found in children with behavioral disorders. Research on the social status of children with ADHD has shown differences among the ADHD subtypes. Teeter and Semud-Clikeman (1995) indicated that children diagnosed with ADHD-HT are often rejected by their peers, while children with ADHD-IT find themselves isolated from their peers. The social emotional impairments found in children and adolescents with ADHD have been captured through parent report, peer sociometrics, and videotape interactions (Barkley, 2002).

Family relationships between children diagnosed with ADHD and their parents are often more conflicted and stressful, and as noted previously, children with ADHD fair no



better in their peer relationships. Some of the peer-related deficits demonstrated by children with ADHD include an inability to participate in such social exchanges as cooperative play and sharing. This may be a manifestation of the ways children with ADHD interact with their peers including behaving in hostile, intrusive, and commanding ways. These interactions become more harsh when the child also suffers from a comorbid diagnosis of Conduct Disorder or Oppositional Defiant Disorder (Barkley, 2002), which will be discussed further in the section on comorbid diagnoses.

#### Social Deficits and Behaviors of ADHD Associated with Bully/Victimization

Based on their review of the literature, Shea and Wiener (2003) convey that interpersonal relationships during childhood and adolescence provide the individual with experiences that cultivate the social skills essential for successful functioning within the social world, such as cooperation, negotiation, and communication. These relationships further support a developing discernment and mutual understanding of the appropriate interactions involved in interpersonal relationships (Boivin, Hymel, & Hodges, 2001). Children with ADHD appear to be excluded from the social sphere, and they suffer from disappointing interpersonal relationships characterized by negative and unsatisfactory interactions. This further places them at a disadvantage because of the loss of significant opportunities to develop the skills necessary for maneuvering in the social world (Shea & Wiener, 2003).

Negative peer relationships in childhood have been found to be strong predictors of adult mental health problems, and the poor peer adjustment of children with ADHD has been shown to have damaging effects on their self esteem, the behavior of those around them, and

their adult prognosis (Wheeler & Carlson, 1994). Maedgen and Carlson (2000) noted that peer rejection and social skills deficits in childhood appear to predispose children to school difficulties, delinquency, and later psychopathology. Further, the characterization of the social and peer interactions commonly observed in children with ADHD, in combination with other deficits noted in this population, have suggested a link between the disorder and behaviors associated with bully/victimization. This section will briefly outline suggested social and interpersonal facets of ADHD that likely contribute to this interaction, while later a more comprehensive outline of bully/victimization behaviors, the relationship between bully/victimization behaviors and ADHD, and the relationships among bully/victimization behaviors, ADHD, and EF will be discussed.

Children with ADHD are at high risk for peer rejection, and it appears that this social isolation may constitute a risk factor in bully/victimization behaviors. Additionally, social isolation can occur as consequence of the peer victimization some children with ADHD experience. This is because of the lack of friends in these children's lives who could provide support to protect the bullying from happening in the first place. Research does support that lack of a stable and consistent social support network also appears to be a factor allowing bullying to continue (Olweus, 1994). The poor social skills and emotional immaturity demonstrated by some children with ADHD are often a reason why these children are rejected and victimized by their peers. Schwatz, McFadyen-Ketchum, Dodge, Pettit, and Bates (1998) found concurrent and predictive associations between maternal ratings of children's immature social behavior and peer victimization, further supporting the relationship between victimization and emotional immaturity. Shea and Wiener (2003),

utilizing a qualitative research design, found that children diagnosed with ADHD suffer from chronic peer victimization, and that social exclusion was the most salient form of peer harassment. The authors suggested that one factor more likely contributing to the peer victimization was that the children with ADHD were perceived as being different from their peers, which led to the social isolation. Additionally, social skills deficits, emotional volatility, immaturity, and a lack of insight characterized this group of children with ADHD, and appeared to exacerbate their social problems. Moreover, peer victimization appears to have long term consequences that could lead to additional behavioral problems later in life. Shea and Wiener (2003) reported that longitudinal studies found that peer victimization predicted an increase in externalizing problems two years later.

Children with ADHD have been referred to as “negative social catalysts” (p. 448) since they often elicit maladaptive behaviors from individuals around them (Whalen & Henker, 1985). This serves to increase controlling behaviors in peers, which serves to further reinforce and escalate the negative social behaviors of the child with ADHD. This maladaptive interactional style of children with ADHD impacts others, whose reactions may even perpetuate the behavioral problems of children with ADHD. Research has shown that children diagnosed with ADD with hyperactivity (ADD/W) engage in a higher frequency of undesirable acts. They are often found bothersome and behaving in an objectionable manner, which frequently annoys others (Wheeler & Carlson, 1994). Certain specific symptoms associated with ADHD contribute to this interactional style. Impulsivity has been hypothesized to serve as an influential interfering response in social behavior, and may

account for some of the negative quality seen in the interactions of children with ADHD (Wheeler & Carlson, 1994).

Some additional potential factors contributing to the social skills deficiencies in ADHD maybe related to the dysfunctional affective regulation seen in this population (Maedgen & Carlson, 2000). Shea and Wiener (2003) found that the “emotionally volatile retaliation style” (p. 73) seen in children with ADHD as a reaction to bullying behavior led teachers to view children with ADHD as “troublemakers.” This emotional dysregulation, particularly with regard to negative affect, has been hypothesized to potentiate and sustain bullying, because this reaction rewards the provocation with excessive displays of anger and emotional distress seen in the child with ADHD (Shea & Wiener, 2003).

Other research has demonstrated specific characteristics among the DSM-IV ADHD subtypes that may contribute to the relationship among ADHD, deficits in social skills, and bully/victimization behaviors. Maedgen and Carlson (2000) indicated that children diagnosed with ADHD-CT are suggested to have severe social problems, and teachers often rate children with the CT as more deviant and aggressive in their peer relations and peer provocation. However, children with ADHD-CT are still rated as less popular regardless if they are aggressive or not, and their severe social problems may be associated with the difficulty they experience self-monitoring their own behavior (Barkley, 1997b).

Additionally, children diagnosed with ADHD-IT also display poorer social functions compared to children diagnosed with other disorders, such as learning disabilities, and comparison control children (Barkley, DePaul, & McMurray, 1990). Some research has suggested that parents and teachers rate children diagnosed with ADHD-IT differently in

regard to social characteristics related to bully/victimization behaviors. While only parents rate children with the IT as more deviant, parents and teachers both rate children with the IT as more passive in social interactions (Maedgen & Carlson, 2000).

Related to some forms of bullying, research has shown a strong association with ADD/W and aggression. It has been suggested that this is due to the overlap of ADD/W with Conduct Disorders, although they are distinct disorders (Hinshaw, 1987). Wheeler and Carlson (1994) reported that children with ADD/W and aggression engage in significantly more negative interactions, and receive more negative teacher interactions than nonaggressive ADD/H, nondisabled, and aggressive groups. This subgroup is also more likely to receive “fights most” nominations by their peers. It appears that by behaving aggressively, children with ADD/H evoke negative reactions from peers, which may serve to escalate aggressive behavior (Wheeler & Carlson, 1994). It has been shown that children with ADHD have higher rates of aggression, less joint activity, and less verbal reciprocity for dyads when the groups contain both children with and without ADHD (Hoza, Waschbusch, Pelham, Molina, & Milich, 2000).

As stated initially, neuropsychological deficits, namely in executive functions (EF), that are common to children diagnosed with ADHD may be tied to the display of bully/victimization behaviors. The social behaviors seen in children with ADHD are consistent with some of the results in the neuropsychological profiles of these children, such as deficits in behavioral inhibition, cognitive flexibility, and self-regulation. These parallels will be discussed in more detail in the section on the Neuropsychology of ADHD. These behaviors appear to contribute to poor peer relationships, which in turn could progress into

bully/victimization behaviors. Shea and Wiener (2003) noted several social skills deficits observed in children with ADHD including difficulty switching roles during peer interactions, understanding ambiguous situations, and making accurate judgments about self and others. Children with ADHD have been noted to dominate conversations with others, and failing to adjust their behavior in accordance with shifts in situational demands. These deficits in the ability to adapt behavior to changing situational demands may underlie social problems, and children with ADHD have significantly more difficulty modifying their behavior to fit social roles (Hoza, Waschbusch, Pelham, Molina, & Milich, 2000). This difficulty in 'switching set' means that the behavior of children with ADHD does not change despite a change in the environmental conditions (Maedgen & Carlson, 2000). Further, they have difficulty learning and performing new roles, which prevents them from behaving in appropriate ways, since they are unable to adjust their style of responding to switching in task demands (Wheeler & Carlson, 1994). Whalen and Henker (1992) described children with ADHD as out of synchrony with ongoing events, in that they appear insensitive to the needs of others, and unresponsive to cues and feedback.

In the following section, a more comprehensive outline of the comorbidity of ADHD and other disorders will be discussed. The issue of comorbidity is important given that the majority of children with ADHD will also meet criteria for another disorder, and that several of these comorbid disorders are associated with bully/victimization behaviors.

#### Comorbidities with ADHD

A diagnosis of ADHD in childhood is one of the strongest risk factors for mental illness later in life (Sagvolden & Sergeant, 1998). At least two-thirds of elementary school-

aged children with ADHD meet criteria for another comorbid psychiatric diagnosis (Cantwell, 1996).

The high comorbidity rates indicate that ADHD is a group of conditions, as opposed to a homogeneous disorder, with potentially differing etiological and risk factors, and likewise diverse outcomes (Biederman, Newcorn, & Sprich, 1991). Additionally, estimates of comorbidity rates with ADHD range from 10% to 92% (Wu, Anderson, & Castiello, 2002), and it is possible psychiatric comorbidity leads to an underdiagnosis of ADHD (Biederman, Faraone, Taylor, Sienna, Williamson, & Fine, 1998). Attention-Deficit/Hyperactivity Disorder with comorbid psychiatric diagnoses leads to worse outcome because of the significantly greater social, emotional, psychological difficulties experienced (Biederman, Newcorn, & Sprich, 1991). Seidman, Faraone, Milberger, Norman, Seiverd, Benedict, et al., (1995) additionally reported that psychiatric comorbidity affects school placement more than school failure, but that psychiatric comorbidity has less influence on cognitive functioning than other factors.

#### Comorbidity with Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD)

Children with ADHD are seen as more defiant and oppositional, and often have more aggression and conduct problems than comparison children without ADHD. Comorbid Oppositional Defiant Disorder (ODD) occurs at a rate of 40% to 65% in pediatric populations (Biederman, Newcorn, & Sprich, 1991), and appears to be tied to the inability of children diagnosed with ADHD to self-regulate emotional states, particularly anger and hostility. There additionally appear to be some differences among the subtypes of ADHD and prevalence rates of comorbid ODD. Faraone, Biederman, Weber, and Russell (1998) found

the CT had higher rates of comorbid ODD (e.g., 50%), in comparison to HT and the IT (30% and 7%, respectively).

Conduct Disorder (CD) comorbidity occurs at a rate of 30% to 90% (Barkley, 2002; Biederman, Newcorn, & Sprich, 1991; Clark, Prior, & Kinsella, 2000), and in some cases, this may be a progression in severity for the child initially diagnosed with ADHD and ODD. Additionally, approximately 25% to 35% of children with ADHD and comorbid ODD or CD continue in adolescence to participate in delinquent or antisocial acts (Barkley, 2002). Child onset of CD with ADHD has poorer outcome and a more serious clinical outcome than ADHD alone (Biederman, Newcorn, & Sprich, 1991). The American Academy of Pediatrics (2000) reported that higher rates of police contact and self-reported delinquency occur in ADHD with CD (30.8%), than in ADHD (3.4%), or CD alone (20.7%). Most evidence suggests that CD and ADHD are at least partially independent dimensions, and distinct disorders (Biederman, Newcorn, & Sprich, 1991; Hechtman, 1994; Jensen, Martin, & Cantwell, 1997). Overall, CD is more prevalent in the HT and CT subtypes; however, children with ADHD-HT are more likely to have symptoms of aggression, antisocial activity, and impulsivity even if the criteria for CD are not met (Teeter & Semud-Clikeman, 1995).

#### Comorbidity with Learning Disabilities (LDs)

Attention-Deficit/Hyperactivity Disorder additionally has been associated with several developmental disorders including learning disabilities (LDs) and/or language disorders, and developmental coordination disorder. Generally, children diagnosed with ADHD demonstrate more impairment on cognitive and academic variables than comparison children without ADHD (Biederman, Faraone, Taylor, Sienna, Williamson, & Fine, 1998).



As with IQ tests, children with ADHD tend to perform 10 to 15 points lower on standardized achievement tests (Barkley, 2002). Previous studies have found children with ADHD to be delayed in their academic achievement, and this is likely due to a lag in the acquisition of basic academic skills.

In general, the literature shows a range of 10% to 92% in the overlap of ADHD with LDs (Biederman, Newcorn, & Sprich, 1991), and suggests that LDs are more common among ADHD-IT and ADHD-CT. The American Academy of Pediatrics (2000) reported ADHD showed comorbidities with LD at a range from 12% to 60%, including 15% to 30% for reading, 26% for spelling, and 10% to 60% for mathematics LD utilizing DSM-IV criteria (Barkley, 2002; Tannock & Brown, 2000).

There has been some debate and confusion in the literature whether ADHD and LD are distinct clinical disorders. The confusion appears related to difficulties discriminating between ADHD and LD, and previous research suggesting that ADHD and reading disability (RD), in particular, have a shared genetic etiology (Gilger, Pennington, & DeFries, 1992). However, more recent research suggests that ADHD and RD are in fact genetically independent (Jensen, Martin, & Cantwell, 1997). While these disorders commonly do occur in the same individual, ADHD and LDs can be distinguished from one another (Jensen, Martin, & Cantwell, 1997; Tannock & Brown, 2000). Several studies have been able to differentiate between ADHD subtypes and RD based on behavioral and neuropsychological factors. Stanford and Hynd (1994) observed that children with ADD/WO and LD share similar behavioral patterns in comparison to ADD/W, but that all three were susceptible to learning problems. The study revealed that children with ADD/W demonstrate more

behavioral problems, ADD/WO have greater attention impairments, and children with LDs show more processing deficits. Additionally the authors noted that ADD/WO and LD are not the same disorder, because children with ADD in general display more inattention. In a study comparing ADHD, RD, ADHD with RD, and controls, Pennington, Grossier, and Welsh (1993) found that children with ADHD and RD have both deficits in EF and phonological processing, children with ADHD had only impairments in EF, and children with RD only had impairments in phonological processing.

Overall, estimates of comorbidity of ADHD and language or communication disorders is 8% to 90%, varying on the definitions and methods utilized to diagnose each of the disorders (Tannock & Brown, 2000). Barkley (1997b) noted that 1% to 54% of individuals diagnosed with ADHD have speech problems. Some communication issues seen in children with ADHD include deficits in expressive language, or what Barkley (2002) stated as the ability to use language as a social tool to communicate with others, which is paramount for the reported deficits some children with ADHD demonstrate in their peer relationships. Central auditory processing disorders (CAPD), or deficits in receptive language processing (Barkley, 2002), also appear to be highly prevalent among children diagnosed with ADHD, with comorbidity estimates at 45% to 75% (Riccio, Hall, Morgan, Hynd, Gonzalez, & Marshall, 1994; Tannock & Brown, 2000). Tannock and Brown (2000), however, noted that children with ADHD have more impaired expressive language problems than receptive. Language impairments and hyperactivity early on can signal future chronic language issues.

Additionally, children with ADHD are noted to suffer from comorbid developmental coordination disorder. One study found that over 50% of children who met criteria for ADHD also met criteria for a developmental coordination disorder (Kadesjo & Gillberg, 1998). Children with both motor/perceptual deficits and ADHD, or motor/perceptual problems alone fare much worse in terms of poorer health and psychiatric outcomes than children with either ADHD only, or control groups (Hellgren, Gillberg, Gillberg, & Enershkog, 1993; Hellgren, Gillberg, Carina, Bagenholm, & Gillberg, 1994). Tannock and Brown (2000) suggest that the poorer long-term outcome and prognosis in these groups, including higher frequencies of depressive disorders, accidents, clumsiness, and speech/language difficulties, are more likely attributable to the motor/perceptual problems than specific factors associated with ADHD.

#### Cormorbidity with Mood and Anxiety Disorders

As with ODD, it seems that the poor regulation of emotions, namely fear and panic, increase the occurrence of anxiety disorders in this population. One study found a mean odds ratio for comorbid anxiety and ADHD at 1.3 (Angold, Costello, & Erkanli, 1999), and other studies have reported a comorbid association at 25% (Biederman, Newcorn, & Sprich, 1991). Attention-Deficit/Hyperactivity Disorder and Anxiety Disorders appear to transmit independently in families (Biederman, Newcorn, & Sprich, 1991; Hechtman, 1994), and cormorbid anxiety with ADHD is more prevalent in the IT and CT (Teeter & Semud-Clikeman, 1995).

Angold, Costello, and Erkanli (1999) additionally found a mean odds ratio of 5.5 for comorbid ADHD and depression, and other research has cited a lifetime diagnosis rate for

Major Depressive Disorder (MDD) in children also diagnosed with ADHD at 49% over a four-year period (Biederman, Faraone, Milberger, Curtis, Chen, Marres, et al., 1996). Other studies have reported the co-occurrence of mood disorders and ADHD ranging from 15% to 75% in both epidemiological and clinical studies (Biederman, Newcorn, & Sprich, 1991). Children of parents with mood disorders are also more likely to be diagnosed with ADHD, particularly if the parent is the biological parent of the child. This indicates that MDD and ADHD share common familial vulnerabilities and may represent different expressions of the same etiologic factors responsible for the manifestation of ADHD (Biederman, Newcorn, & Sprich, 1991; Hetchman, 1994).

The comorbidity of ADHD and depression also is associated with substantial long-term psychiatric morbidity, and increases the risk for suicide completion in adolescents (Brent, Perper, Goldstein, Kolko, Allan, Allman, & Zelenak, 1988; Pineda, Ardila, Rossell, Arias, Henao, Gomez, et al., 1998). There is some suggestion in the literature that this risk is due to the impulsive symptoms associated with ADHD (Teeter & Semud-Clíkeman, 1995). Overall, internalized diagnoses such as anxiety and depressive disorders appear to be more prevalent in the IT (Biederman, Newcorn, & Sprich, 1991), and children diagnosed with HT do not differ from normal controls for the prevalence of depression (Faraone, Biederman, Weber, & Russell, 1998). Conversely, the prevalence rate of Bipolar Disorder remains somewhat more controversial given the overlap of symptoms between the two disorders; however, some studies have reported comorbidity rates at 6% to 10% for ADHD and Bipolar Disorder (Barkley, 2002).

#### Substance Abuse

Attention-Deficit/Hyperactivity Disorder appears to be a significant risk factor for early initiation of cigarette smoking and substance abuse and this is likely because developmentally, ADHD manifests earlier (Barkley, 1991; Mash & Wolfe, 2000; NIH, 2000; Teeter & Semud-Clikeman, 1995; Wilens, Spencer, & Biederman, 2000). Research shows significant overlap between ADHD and substance use disorders given both disorders are highly prevalent, have considerable familial/genetic risks, and have high rates of comorbidity with other disorders (Wilens, Spencer, & Biederman, 2000). Wilens, Spencer, and Biederman (2000) estimate that 23% to 31% of adolescents and juvenile offenders with substance use disorders have comorbid ADHD. Longitudinal studies show high rates of substance abuse disorders in children with ADHD who were followed into adulthood (Milberger, Biederman, Faraone, Murphy, & Tsuang, 1995). The rates of ADHD among adults with alcoholism ranges from 35% to 71%, and 15 % to 25% of adults with addictions and alcoholism also have comorbid ADHD (Wilens, Faraone, & Biederman, 2004; Wilens, Spencer, & Biederman, 2000).

Evidence points to mitigating factors in this association between ADHD and substance use disorders. Adolescents with ADHD are more likely than non-ADHD peers to experiment with drugs and use cigarettes in adolescence, and are more likely to develop significant substance abuse problems; however, this issue may be related to the associated conduct problems common to ADHD, rather than diagnosis of ADHD itself (American Academy of Child & Adolescent Psychiatry Official Action, 1997). In a study conducted by Pihl and Peterson (1991) the authors found that having ADHD was not a greater risk factor

for later alcoholism, but those adolescents who displayed both aggressive behavior and suffered from ADHD were at high risk for developing alcohol abuse.

### Treatment of ADHD

The following section succinctly summarizes the conventional treatments for ADHD. This section additionally devotes specific attention to identifying the neglected areas of the traditional treatment that may improve upon the social/interpersonal issues and neuropsychological problems some children with ADHD confront. These issues become progressively more important as the next major sections on the neuropsychological deficits of ADHD are presented, followed by a review of the literature on bully/victimization behaviors, and concluding with sections covering the relationship among these three topics.

The literature on the interventions and treatments for ADHD support a multifaceted, multiple-modality approach (Cantwell, 1996), including psychosocial and pharmacological interventions that are developmentally-based (Teeter & Semud-Clikeman, 1995). Short-term studies on ADHD demonstrate the efficacy of combined psychosocial/behavioral and pharmacological therapies for alleviating the core symptoms of the disorder (NIH, 2000), because these approaches provide greater symptom relief and therapeutic gains than any single therapy approach (DeBonis, Ylviasker, & Kundert, 2000).

Cantwell (1996) further notes that if ADHD does go untreated, this predisposes the child to greater psychiatric and social pathology later in life. However, the literature shows that stimulant medications do not normalize the entire range of behavioral problems, given that the children with ADHD who are treated with stimulants continue to manifest a higher level of behavioral problems than non-ADHD children. It seems likely even with

psychopharmacological interventions that children diagnosed with ADHD are still at-risk for problems with the interpersonal domain. There are consistent findings that stimulants improve the core symptoms of ADHD, but still there is little improvement in academic achievement or social skills deficits commonly seen in children diagnosed with ADHD (NIH, 2000). The behavioral symptoms necessitate environmental modification, and the skill deficits in academic and social domains require specific remediation and do not respond to medications or behavior modifications. Psychotherapy or some type of psychosocial intervention is usually required to address the secondary relationship problems associated with the core symptoms (American Academy of Child & Adolescent Psychiatry Official Action, 1997).

The idea with psychosocial and behavioral interventions is that the treatment will compensate for the lack of internal structure and organizational skills the child with ADHD has by restructuring environmental factors, and creating external structure (Barkley, 1997b; Mash & Wolfe, 2002). However, as will be discussed at length in the next section on the neuropsychology of ADHD, most literature points to ADHD as a disorder of executive functions (EF). DeBonis, Ylviasker, and Kundert (2000) highlighted that contingency management procedures, which are common interventions utilized with individuals diagnosed with ADHD, are not consistent with an ADHD-EF deficit orientation. Further, the authors noted that these treatments are less effective than proactive, antecedent-focused management strategies that aid in the facilitation of EF development. The next section will highlight the neuropsychological difficulties confronted by some children diagnosed with ADHD, and specifically focuses on the common EF deficits found in this population.

## Neuropsychology of ADHD

Earlier sections on the developmental presentation of ADHD revealed how the core symptoms, including inattention and hyperactivity/impulsivity, can lead to disrupted adaptive functioning in several key areas of a child's life including behavioral, academic/cognitive, social, and emotional functioning. A brief introduction to the relationship between the social deficits found in some children with ADHD, and bullying/victimization behaviors was presented. This section outlines the research and theories on the neuropsychology of ADHD, and how neuropsychological deficits found in this population, namely in the domain of executive functioning, can possibly produce, and exacerbate deficits in the previous developmental areas discussed. The importance of the deficits in EF that children with ADHD is foremost given that executive functioning, which develops throughout childhood and adolescence, plays an important purpose in the child's cognitive functioning, emotional and behavioral control, and interpersonal interactions (Anderson, P., 2002). Further, there is some suggestion in the literature that the three cardinal symptoms of ADHD including inattention, hyperactivity, and impulsivity may be due to a deficit in EF, namely in the component of inhibition (Barkley, 1997a, 1997b Pennington & Ozonoff, 1996). Additionally, the section on neurophysiology and brain imaging pinpointed evidence of frontal lobe/system dysfunction in ADHD, which is also consistent with the neuroanatomical areas associated with EF.

Several decades of research have focused on the neuropsychological deficits common to ADHD. While no clear pathognomic profile has been identified for ADHD, and there is considerable variation within this population (Oades, 1998; Roth & Saykin, 2004), most



evidence points to deficits primarily in the area of EF. Seidman, Biederman, Faraone, Weber, and Oellete (1997) suggested that the cognitive deficits in EF frequently seen in children with ADHD play a major role in their adaptive functioning difficulties. Nigg, Quamma, Greenberg, and Kusche (1999) concurred with this viewpoint, relating that cognitive or neuropsychological functioning is often seen as a causal mediator for the developmental of psychopathology or normal adjustment in childhood. Another area of difficulty in the neuropsychological realm for children and adolescents with ADHD is in intellectual functioning, although there is controversy about how this deficit in intellectual functioning relates to the diagnosis of ADHD. This next section will outline the research on ADHD and IQ and the related controversy, followed by a more detailed account of executive functioning and ADHD.

#### IQ findings

Several studies report children and adolescents diagnosed with ADHD have IQs below normal controls, performing 7 points to one standard deviation lower on standardized intelligence tests (Barkley, 2002; Teeter & Semud-Clikeman, 1995). There is some debate whether the deficiency sometimes seen with children diagnosed with ADHD is a function of attention difficulties that may interfere in IQ testing or, in fact, real cognitive deficits possibly related to frequency of comorbid LDs (Teeter & Semud-Clikeman, 1995). While other comorbid conditions common to ADHD have been suggested as possible contributors to lower IQ findings among some individuals with ADHD, several authors (Hinshaw, Morrison, Carte, & Cornsweet, 1987; McGee, Williams, Moffitt, & Anderson, 1989; Mariani & Barkley, 1997; Nigg, Blaskey, Huang-Pollock, & Rappley, 2002; Sonuga-Barke,

Lamparelli, Stevenson, Thompson, & Henry, 1994) reported that lower intellectual ability among children was associated with ADHD, and not to related comorbid conditions such as aggression or conduct problems. Nigg, Blaskey, Huang-Pollock, and Rappley's (2002) study did find that children diagnosed with ADHD-CT had significant lower IQ in comparison to control children.

Moreover, there has been some suggestion in the literature that because of the differences in intelligence scores between children with ADHD in comparison to control populations, that controlling for IQ in research designs by matching may be inappropriate. Oades (1998) contends since these groups could feasibly mature at different rates, this would contribute to the expression of the condition, and differences noted between children with and without ADHD. Several researchers (Doyle, Biederman, Seidman, Weber, & Faraone, 2000; Scheres, Oosterlaan, Geurts, Morein-Zamir, Meiran, Schut, et al., 2000; Seidman, Biederman, Faraone, Weber, & Oellete, 1997) also emphasize not controlling for IQ in research utilizing ADHD populations. The rationale for not controlling for IQ in research designs studying ADHD is because controlling for this variable may remove the effect ADHD has on lowering IQ, which may be an essential feature of the disorder. A discussion on the relationship between IQ and EF will be elaborated in the next section on EF and ADHD.

### Executive Functions (EF) and ADHD

The literature shows that the most prominent neuropsychological deficit in ADHD appears to be in the domain of EF. The section initiates a discussion on the description of EF, including related definitional concerns, and the developmental progression of EF. This is

followed by an introduction to the “frontal lobe hypothesis” and how it is related to theoretical notions of the EF deficit in ADHD, with a brief consideration of the specific brain structures contributing to this theory. Additionally, a section on measurement issues including the relationship between IQ and EF, neuropsychological and informant report measurements of EF, and issues related to the ecological validity of EF measures will be discussed. Lastly, theories and research studies on ADHD and EF will be presented that support the notion that ADHD is a disorder of executive dysfunction.

#### Definition of EF

Executive functioning delineates a multidimensional construct encapsulating higher-order cognitive processes that control and regulate cognitive activities, emotional responses, and behavioral functions. Sergeant, Geurts, and Oosterlaan (2002) reported that over 33 definitions have been offered in the literature on EF, and this section details the most comprehensive and accepted definitions of EF found in the literature. Lezak, Howieson, and Loring (2004) state that “EF are intrinsic to the ability to respond in an adaptive manner to novel situations, and are the basis for cognitive, emotional, and social skills” (pg. 611). Executive functions are defined as a set of functions, at the most supraordinate level in the cognitive hierarchy (Tranel, Anderson, & Benton, 1994), which facilitate goal-directed behavior, usually in novel contexts with competing alternative responses (Deckla, 1996; Welsh & Pennington, 1996). Executive functions additionally are viewed as abilities that enable an individual to maintain an appropriate problem solving set for attaining future goals including strategic planning, impulse control, organized search and flexibility of thought and action (Weyandt & Willis, 1994).

Aside from the difficulties attempting to define EF, the literature points to EF as a vague concept, or what has been referred to as a catch-all, umbrella term used to identify high-order cognitive processes (Barkley, 2001; Wu, Anderson, & Castiello, 2002). Nigg, Blaskey, Huang-Pollock, and Rappley (2002) highlight that definitions offered for EF are preliminary and unspecified, but that EF are a nonunitary concept, reflecting an array of correlated but distinct cognitive processes. An additional problem concerning defining EF is the inconsistent and interchangeable use of both the neuropsychological and anatomical definitions of EF (Stuss & Alexander, 2000). Evidence suggests that EF are what the frontal lobes do (Barkley, 2001), and specifically EF may be subserved by the prefrontal cortical region (Weyandt & Willis, 1994), which will be discussed in more detail in the section on associated brain structures and the frontal lobe hypothesis.

Recently in the literature, the importance of adequate EF throughout an individual's lifetime and particularly in one's childhood, has been noted in developing adaptive functioning in a number of contexts. Denckla and Riess (1997) indicate that EF are a domain that includes an extensive scope of skills that develop progressively in childhood, and may not be fully operational until the fourth decade of life. Executive functions are now seen as an important factor for successful negotiating in both social and academic environments, and childhood impairment in EF is often manifested in problems in learning, and regulating behavior in both school and social situations (Slomine, 2002). Given that the frontal lobes are implicated in the symptomatology of ADHD, and that this area of the brain is considered the one that controls the EF (Corbett & Stanczak, 1999), it is not surprising the enormous difficulties children with ADHD face in both the interpersonal and academic spheres. The

specific difficulties seen in children with ADHD are elaborated upon later, and this next section continues on describing EF, starting with the various factors that encompass EF.

### Components of EF

The components described as comprising EF vary considerably across theorists and researchers (Tranel, Anderson, & Benton, 1994). Lezak, Howieson, and Loring (2004) note that EF are conceptualized as having the four components of volition, planning, purposive action, and effective performance. Pennington and Ozonoff (1996) report that the typical components included under EF are set-shifting and set maintenance, interference control, inhibition, integration across space and time, and working memory, with working memory being considered the most important component by several theorists (Barkley, 1997a, 1997b; Brown, 2000; Tranel, Anderson, & Benton, 1994). Other factors included as EF components include selective and sustained attention, inhibition of verbal and nonverbal responses, strategic memorization, organization, self monitoring, and planning and sequencing of complex behaviors (Lovejoy, Ball, Keats, Stutts, Spain, Janda, & Janusz, 1999).

Benton (1991) indicated that EF designate several mental processes such as foresight and planning, abstract reasoning, self awareness, empathy and social sensitivity, and the control, elaboration, and modulation of emotional behavior, noting the more emotional and affective aspects of EF. Additional theories on the components of EF emphasize the motivational aspects and self regulation of behavior as crucial to the definition (Barkley, 1997a, 1997b; Roth & Saykin, 2004), particularly since EF are seen as a requirement for the complexities of human social behavior (Pennington & Ozonoff, 1996).

Given the components of EF, and possible deficits in the various areas associated with EF, it can be appreciated why some children diagnosed with ADHD are thought to have deficits in this area. Further, research has shown that in particular, children with ADHD show difficulties in the EF areas of inhibition, set shifting, working memory, planning, verbal fluency, and self or emotional regulation (Pennington & Ozonoff, 1996; Scheres, Oosterlaan, Geurts, Morein-Zamir, Meiran et al., 2000; Sergeant, Geurts, & Oosterlaan, 2002), which will be the specific components of EF assessed in this research. A description of these EF components will be presented in the section on the neuropsychological components related to ADHD, in addition to the research and theories demonstrating that children with ADHD show notable deficits in these particular areas. First, the following section outlines the developmental literature on the ontogeny of EF.

#### Development of EF

While there is extensive empirical literature relating to EF in adults, the literature on EF in pediatric populations is less extensive (Anderson, V., 2002; Weyandt & Willis, 1994). Recent attention is shifting towards understanding the developmental progression of EF throughout childhood, and developing EF measurements relevant to pediatric populations. This section outlines the ontogeny of EF, and how children and adolescents with ADHD may differ in the normal developmental progression of EF. Measurement of EF will be covered in a later section.

Executive functions develop rapidly in children, and this developmental progression occurs in spurts, as opposed to a linear sequence (Anderson, P., 2002), and as a multistage process (Passler, Isaac, & Hynd, 1985). Further, different domains mature at different rates,

and while EF is evident in the first few years of life, considerable maturation occurs between the ages of 3 and 12, with particular gains from ages 6 to 12. Several studies have addressed the development of EF children (Levin, Culhane, Hartmann, Evankovich, Mattson, Harward, et al., 1991; Passler, Isaac, & Hynd, 1985; Welsh, Pennington, & Groisser, 1991). Overall, the greatest period in the development of EF occurs around 6 to 8 years, with mastery of several EF components evident by age 10 to 12. Passler, Isaac, and Hynd (1985) explicitly proposed that most behaviors associated with frontal lobe functioning become fully developed by age 12. Welsh and Pennington (1988) supported this contention by this utilizing adult neuropsychological tests with children; they found that adult level performance emerged by 10 to 12 years old, indicating that the emergence of frontal lobe functioning in normal children is again a multistage process.

Shue and Douglas (1992) indicated that the performance of children less than eight years of age on EF tasks resembled findings from studies on patients with frontal lobe damage. Several research studies (Boucugnani & Jones, 1989; Chelune, Ferguson, Koon, & Dickey, 1986; Oades, 1998; Sergeant, Geurts, & Oosterlaan, 2002; Shue & Douglas, 1992) support the finding that children with ADHD make the appropriate developmental gains in regard to EF, but at a rate two to three years behind their age-matched cohorts. This is consistent with Grodzinsky and Diamond's (1992) implications that children with ADHD are delayed relative to controls in maturation of the prefrontal cortex, also supporting Barkley's (1997a, 1997b) view that the deficits in EF found in children with ADHD are developmental delays. These results further support a "developmental lag hypothesis" of ADHD, although Clark, Prior, and Kinsella (2000) indicate that this delay in brain maturation continues to be

evident in adolescence, given the poor performance of adolescents diagnosed with ADHD; meaning that there is no developmental lag since the deficits are not overcome with increasing age. However, Barkley (1996) suggests that the EF profile and deficits of an adolescent with ADHD are far more complicated, given the greater demand on EF as one matures, in comparison to a preschooler with ADHD. The relationship between maturation of the prefrontal cortex and the EF deficits seen in some individuals with ADHD is detailed in the next section, including an introduction to the “frontal lobe hypothesis” of ADHD.

#### Executive Dysfunction & the Frontal Lobe Hypothesis

Several researchers have noted similarities between the symptoms of ADHD and those produced by lesions or injuries to the prefrontal cortex, suggesting the cause of ADHD symptomatology is associated with the frontal lobes of the brain, or what is known as the “frontal lobe hypothesis” (Berlin, 2004; Boucugnani & Jones, 1989; Grodzinsky & Diamond, 1992; Loge, Staton, & Beatty, 1990; Pennington & Ozonoff, 1996; Shue & Douglas, 1992). Bigler (1988) described the frontal lobe syndrome as manifested by changes in emotional regulation, poor impulse control, distractibility and impaired concentration, and changes in memory along with diminished flexibility in thinking and perseveration. Prefrontal damage in children has also been associated with difficulty sustaining friendships, inattention, impulsivity, irritability, mood swings, inappropriate social conduct, and impaired self regulation of cognitive and social behavior (Riccio, Hall, Morgan, Hynd, Gonzalez, & Marshall, 1994).

Further, the frontal lobes are implicated as the area of the brain that controls EF (Boucugnani & Jones, 1989; Corbett & Stanczak, 1999). Not only have EF been suggested



to be subserved by the prefrontal cortical regions in the brain; additionally, the behavioral deficits associated with ADHD are tied to the prefrontal regions as observed in imaging studies (Anderson, P., 2002; Barkley, 1997a, 1997b; Berlin, Bohlin, Nyberg, & Janols, 2004; Lou, Henrikson, & Bruhn, 1984). Recently the frontal lobe hypothesis of ADHD has been re-expressed as a disorder of EF (Sergeant, Geurts, & Oosterlaan, 2002).

Descriptions in the literature reveal on frontal lobe dysfunction reveal a constellation of symptoms or deficits mirroring those found in children with ADHD as “executive dysfunction.” Executive dysfunction manifests as disinhibition, impulsivity, poor planning ability, impaired organization and monitoring of complex social responses, and perseveration (Lezak, 1983; Luria, 1966). In children, cognitive deficits associated with executive dysfunction include poor impulse control, difficulties monitoring or regulating performance, planning and organizing, poor reasoning abilities, difficulties generating or implementing strategies, preservation and mental inflexibility, poor utilization of feedback, and reduced working memory (Anderson, P., 2002).

Stuss and Alexander (2000) note that the most important role of the frontal lobes may be affective responsiveness, social and personality development, and self awareness, which can be seriously compromised in a child with executive dysfunction. Anderson, P. (2002) described the more interpersonal consequences of executive dysfunction in children as being disrupted mood, affect and social behavior, a disregard for the consequences of behavior and ignoring social rules, inflexibility and rigidity often manifested as a resistance to change one’s activities, an inability to modify previous learned behaviors, and failing to learn from mistakes. Children may also display poor interpersonal skills and experience difficulties

maintaining meaningful social relationships, social disinhibition, and difficulty reading social cues (Slomine, 2002).

This evidence of frontal lobe dysfunction and executive dysfunction summarizes several of the difficulties some children with ADHD display, and coincide with some of the observations in the literature noted in the section on Social Deficits and Behaviors of ADHD Associated with Bully/Victimization. Additionally, given that ADHD is associated with executive dysfunction and the symptoms associated with frontal lobe dysfunction, it is possible that the interpersonal relationships that children with ADHD attempt to foster could likely progress into negative interactions. These interactions could be further characterized by bully/victimization behaviors given the numerous interpersonal problems these children face. This will be covered more fully in the section on Executive Functions, ADHD, and Bully/Victimization. This next section first will describe issues related to measurement of EF, including the ecological validity of this measurement, and attempts to create more ecologically-valid assessment of EF.

### Measurement of EF

As previously discussed in the section on Definition of EF, given the nature of this construct and the difficulties defining and operationalizing what EF is (Stuss & Alexander, 2000), it is equally difficult to determine an accurate way of measuring EF. Clark, Prior, and Kinsella (2000) mention that since EF is not a unitary concept, different tests of EF will tap different aspects of the construct. It appears that the multi-factorial nature of EF is, to a certain extent, accountable for the low correlations found among frontal lobe tests (Stuss & Alexander, 2000). Further, Slomine, Gerring, Grados, Vasa, Brady, Christensen, and

Denckla (2002) report that EF is a complex and dynamic process often difficult to capture singularly by one test.

The structure and environment in which testing occurs also contribute to the difficulties accurately measuring EF. Slomine, Gerring, Grados, Vasa, Brady, Christensen, and Denckla (2002) state EF deficits are more evident in challenging and unstructured environments, but observing deficits in EF is more difficult utilizing standardized neuropsychological measures. Given that neuropsychological assessment occurs within well-structured settings where the evaluator plans and initiates the majority of the evaluation (Anderson, 1998; Anderson, V., 2002; Lezak, Howieson, & Loring, 2004), deficits in EF may be masked because of the structure imposed by the testing environment (Lezak, Howieson, & Loring, 2004; Slomine, Gerring, Grados, Vasa, Brady, Christensen, & Denckla, 2002).

In order to assess EF, tests need to be novel, complex, and involve the integration of information. Most current tests involve complex, multi-faceted tasks that tap both EF and non-EF processes (Anderson, V., 2002). Performance on tests of EF is multifactorial in that it requires the simultaneous function and integration of several cognitive processes such as memory, attention, and inhibition; deficits in any of these domains can result in performance failure (Barnett, Maruff, Vance, Luk, Costin, Wood, & Pantelis, 2001). Therefore, performance on measures of EF may tap other underlying cognitive skill deficits rather than EF deficits directly (Slomine, Gerring, Grados, Vasa, Brady, Christensen, & Denckla, 2002).

Another issue related to measurement of EF specific to pediatric populations is the fact that the majority of EF tests utilized in pediatric populations initially were developed and

validated in adult populations. Since these tests were designed and validated for adults, it is unlikely a developmental framework was taken, which is necessary for assessment of pediatric populations (Anderson, V., 2002). Given this lack of consideration to developmental progression, impairment in the realm of EF may not be as obvious in younger children (Slomine, Gerring, Grados, Vasa, Brady, Christensen, & Denckla, 2002), or the deficits found may change, develop, or disappear over time. The most common approach to assessing children, and specifically deficits in EF, is to add information from parents and teachers via interview and questionnaires (Anderson, V., 2002). Both parent and teacher report questionnaires on EF have been introduced in the literature. These questionnaires, which will be utilized in the current study, will be further elaborated in the section on Informant Rating Scales of EF.

#### IQ/EF Distinction

Earlier in the section on the neuropsychology of ADHD, the controversy over whether researchers should control for IQ in studies assessing EF was introduced. Briefly, this current section outlines evidence citing the distinction between the assessment of the constructs of IQ and EF. Studies assessing the cognitive decline of individuals with frontal lobe damage initially indicated that EF and IQ were not uniform measures, given the relative absence of EF requirements in IQ tests (Welsh & Pennington, 1988). Evidence of this comes from studies assessing patients with frontal lobe damage with measures of intellectual and executive functioning. Pennington and Ozonoff (1996) summarized this literature stating that the IQ tests are insensitive to frontal lobe damage, given that these patients were impaired on planning and problem solving, but with preserved intellectual abilities.

Additionally, it has been maintained that despite higher than normal levels of IQ in individuals, executive dysfunction can impact a wide variety of other abilities, leading to impairment in academic, interpersonal, and occupational realms (Denckla, 1993; Lovejoy, Ball, Keats, Stutts, Spain, Janda, & Janusz, 1999). Lovejoy, Ball, Keats, Stutts, Spain, Janda, and Janusz (1999) further differentiated EF from IQ by conceptualizing EF as extending above and beyond intelligence; EF being the mechanism enabling individuals to effectively employ and utilize one's intellectual abilities, rather than EF being equivalently measured by assessment of IQ.

Several researchers have suggested that EF, specifically problem solving, tends to be relatively independent of IQ when novel situations are used, and that most EF tasks are not correlated with IQ (Riccio, Hall, Morgan, Hynd, Gonzalez, & Marshall, 1994; Welsh, Pennington, & Groisser, 1991; Welsh & Pennington, 1988). This appears to be consistent not only in children assessed with tests of IQ and EF (Weyandt & Willis, 1994), but also assessing individuals from childhood to early adulthood (Welsh, Grossier, & Pennington, 1988). Reader, Harris, Schuerholz, and Denckla (1994) made the distinction between IQ and EF with the observation that EF relates most to "how we use what we know" rather than the actual storage of information or "what we know" (p. 508). The following section more specifically defines several components of EF that children with ADHD more consistently demonstrate deficits in, and that will be of particular interest in the current study.

#### Studies on ADHD and EF

Knowledge from research assessing the EF of children with ADHD comes primarily from three meta-analytical studies. These three studies include Barkley, Grodzinsky, and

DuPaul's (1992) meta-analysis outlining the research on ADHD and EF from 1972-1991, Pennington and Ozonoff's (1996) review of the literature from 1972 to 1994, and Sergeant, Geurts, and Oosterlann's (2002) review of studies from 1990 to 2000. Overall, Pennington, and Ozonoff (1996) indicated that 15 of the 18 studies included in their meta-analysis found significant differences between children with ADHD and controls on one or more EF measures. This included a total of 60 EF measures, and 40 (67%) of these EF measures demonstrated significantly worse performance in the groups diagnosed with ADHD, while only 19 (35%) of the non-EF measures found significant differences.

The EF components of interest in individuals with ADHD include inhibition, also known as response or behavioral inhibition, set-shifting, working memory, planning, and verbal fluency. Another EF factor of abstraction, or concept formation, as measured by the Category Test (Reitan & Wolfson, 1992), which has been less studied in the literature on ADHD will additionally be discussed. Each of these constructs will be defined, and information will be provided on the typical neuropsychological measure employed in the literature on ADHD, the neuroanatomical sites related to the EF component and its neuropsychological measure, and the research suggesting that children with ADHD show deficits on these measures. Additionally, a section outlining the less commonly studied feature of EF, emotional regulation, will be discussed given this is also noted in the research as a probable deficit among children with ADHD.

### Inhibition

Behavioral or response inhibition is conceptualized as a multidimensional construct (Lawrence, Houghton, Tannock, Douglas, Durkin, & Whiting, 2002). Inhibition is the ability

to engage in the appropriate response instead of the more likely, albeit maladaptive response (Welsh, 2002). Inhibition also involves one's ability to cease responding to irrelevant information, or to cease a certain behavior at the appropriate time (Roth & Saykin, 2004). Most definitions of inhibition also involve some aspect of attention, given that this component of EF involves the ability to focus one's attention on one aspect of a stimulus, while inhibiting a normally more automatic response (Mapou & Spector, 1995).

Inhibition is additionally tied to another aspect of EF, working memory (WM), which will be defined and discussed in more detail in the next section. Inhibition is thought to be the ability to inhibit irrelevant information from entering into working memory, by providing the initial delay to an event during which WM is often activated (Bull & Scerif, 2001; Osmon, 1999). Barkley (2000) indicates this protection of WM is provided in the inhibition of the prepotent response (e.g., a response that has immediate reinforcement, or has been previously associated with that response; Barkley, 1997a), interruption of an ongoing response, and interference (e.g., distraction) control. Inhibition additionally provides impulse control, self regulation, and delay of gratification.

Interference control, or resistance to distraction, is considered a type of inhibition (Barkley, 1997a, 1997b), and is measured by such neuropsychological tasks as the Stroop (Bull & Scerif, 2001). The Stroop measures inhibition in that the examinee is asked to inhibit a more prepotent response in favor of a less automatic response. Specifically when presented with a color word printed in a different color ink, the examinee is instructed to ignore the habitual response to name the color word, in favor of naming the color in ink the word is printed. This Stroop effect equates to a failure of response inhibition, or difficulties

in concentrating observed by failure to ignore distractions (Osmon, 1999). Neuroimaging studies with the Stroop indicate activation of the right orbital prefrontal cortex during the Interference part of this task (Barkley, 1997b). In functional imaging experiments, the Stroop activates extensive frontal lobe areas including the medial frontal lobe, especially in the right hemisphere (Osmon, 1999), and the anterior cingulate (Shallice, Marzocchi, Coser, Del Shavio, Meuter, & Rumiati, 2002). During the Stroop task the act of ignoring the word, or suppressing the distracting tendency to read a word itself, while instead naming the color in which the word is written, activates areas of the anterior cingulate, medial prefrontal, and lateral prefrontal cortices (Stuss & Knight, 2002). Errors made during this task are attributed to orbitalfrontal dysfunction, a sign of impulsivity, since medial frontal structures are involved in attentional aspects while orbital frontal structures are involved in inhibition aspects of task (Osmon, 1999).

In Barkley, Grodzinsky, and DuPaul's (1992) meta-analytical study, five of six studies found that children with ADHD (e.g., ADD/+H) take more time, and make more errors than control children during the Interference portion of the Stroop. Barkley (1997a, 1997b) later hypothesized that activation of the orbital prefrontal area, particularly in the right hemisphere accounted for these deficits, since this area of the brain is found to be smaller and less activated in some individuals with ADHD. Further, Grodzinsky and Diamond (1992) stated that Stroop deficits were a stable feature of ADHD from 6 to 11 years old, compared to controls, despite normal advances in other cognitive skills. Pennington and Ozonoff (1996) report that 3/3 studies utilizing the Stroop found differences between



children with ADHD compared to controls, suggesting that the Stroop interference deficit is a consistent discriminator of individuals diagnosed with ADHD.

### Set shifting

Set shifting is defined as the ability to flexibility switch to a more appropriate response (Welsh, 2002), or the processes that enable a shift from one response to another (Snyder & Nussbaum, 1998). This ability to switch between tasks or strategies is measured by complex tasks such as the Wisconsin Card Sorting Test (WCST; Heaton, Chelune, Tally, Kay, & Curtiss, 1993) (Bull & Scerif, 2001).

The WCST is a global measure of EF, and while considered primarily a measure of set-shifting, the WCST also measures aspects of WM, interference, and inhibition (Osmon, 1999). This test also taps a wide variety of EF including maintenance of a set task, flexibility and sensitivity in response to feedback or changing cues, and perseverative tendencies (Sergeant, Geurts, & Oosterlaan, 2002; Snyder & Nussbaum, 1998). Neuroimaging research indicates performance during the WCST activates dorsolateral prefrontal cortex (Barkley, 2002), and the lateral prefrontal cortex during category shifts.

Studies assessing children with ADHD found that perseverative responses were the most frequently occurring errors, reflecting problems in the capacity to use rules to govern behavior and to inhibit automatic forms of behavior when new rules become operative (Barkley, 1997a, 1997b). Poor performance on the variable of number of Categories Completed was noted, and Barkley (1997a, 1997b) suggested this is due to difficulties with concept formation, or capacity to derive rules from ambiguous information about performance. The WCST overall has shown modest reliability in discriminating between

pediatric ADHD (e.g., ADD/+H) and normal populations; however, the WCST is more reliable in discriminating children with ADHD in younger populations than adolescents. Barkley, Grodzinsky, and DuPaul (1992) reported that 8 of 13 studies found differences between pediatric populations with ADHD and control comparison groups on the WCST. Of the five studies with no differences, three utilized adolescent populations, whereas none of the affirmative studies did so, indicating that performance improves with age; however, at older ages, individuals with ADHD still make more errors (Barkley, 1997b). Sergeant, Geurts, and Oosterlaan's (2002) meta analysis affirms this effect of age on performance, given that 17 out of 26 studies found significant differences between children with ADHD and comparison controls, but only at younger ages. Pennington and Ozonoff (1996) found that overall, the WCST had an average effect size of 0.45, with significant differences on perseverative responses in 3 of 5 studies, suggesting this variable is a significant discriminator between children with ADHD and normal controls.

#### Abstraction or Concept Formation

Lezak, Howieson, and Loring (2004) describe concrete thinking "as the most typical indicator of impaired concept formation" (p. 569), which emerges as an inability to reason in practical generalizations, and difficulty forming concepts or using categories. While the Category Test (CT; Halstead, 1947) has been compared to the WCST as a measure of similar cognitive processes, the CT is considered a better measure of concept formation, abstraction, and problem solving (Lezak, Howieson, & Loring, 2004; Osmon, 1999; Reitan & Wolfson, 1992). The CT additionally has been described in the literature as a measure of attention and concentration, memory, conceptual learning and verbal learning, set maintenance, cognitive

flexibility, with an emphasis on visuospatial abilities (Johnstone, Holland, & Hewett, 1997; Lezak, Howieson, & Loring, 2004; Snyder & Nussbaum, 1998; Tranel, Anderson, & Benton, 1994). The CT is often employed as a measure of dorsolateral functioning (Synder & Nussbaum, 1998), while it is generally considered a globally sensitive measure of brain integrity (Osmon, 1999). During the CT, the examinee is presented with multiple elements of the problem to consider and attend while coming up with the appropriate solution. Reitan and Wolfson (1992) report that given these conditions during the task, the CT demonstrates ecological validity in that it simulates everyday occurrences. Additionally, the authors indicate that individuals who perform poorly on this abstraction task may have difficulties in the real world in a number of areas. Reitan and Wolfson (1992) stated these areas include responding and behaving in an appropriate manner towards others and in certain events, determining the most relevant aspect of a given task or situation to attend, and reaching faulty conclusions. However, the CT has not been utilized frequently in research assessing the EF abilities of pediatric populations diagnosed with ADHD.

#### Working Memory (Verbal)

Working memory (WM) is considered a system for the temporary storing and manipulation of information during a range of cognitive tasks, which involves the simultaneous processing of incoming input and its integration with other information (Berlin, Bohlin, & Rydell, 2003; Dennis, 1991). It is seen as one's ability to retain and manipulate information in memory "online" over time (Gnys & Willis, 1991; Roth & Saykin, 2004), and this online holding aspect of WM plays an important role in shifting the focus of attention from external events to their internal representation (Stuss & Knight, 2002). Specifically,

verbal WM is conceptualized as internalization of speech (Barkley, 2000), and verbal WM tasks reflect what Welsh (2002) calls “the operation of the articulatory loop in conjunction with the central executive” (p. 154).

Working memory requires frontal activity and regions in the dorsolateral, usually right, and inferior prefrontal cortex (Barkley, 2000; Dennis, 1991; Lezak, Howieson, & Loring, 2004; Osmon, 1999). Traditional measures of verbal working memory include digit span tasks (Berlin, Bohli, Nyberg, & Janols, 2004; Welsh, 2002). Digit span reverse requires manipulation of internalized information (Stuss & Knight, 2002), which both children and adults with ADHD have particular difficulty performing. Children with ADHD also perform worse than controls on the Freedom from Distractibility Index from the Wechsler Intelligence Scale for Children-3<sup>rd</sup> Edition (WISC-III; Wechsler, 1991), which includes Digit Span and Arithmetic, and is also considered a measure of WM (Barkley, 1997a).

### Planning

Planning involves the ability to conceptualize a strategy or plan, including the steps needed to achieve a sought-after goal (Dennis, 1991; Osmon, 1999). Successful planning involves organizing one’s thoughts and behaviors by considering different options and the details needed to solve the problem, with an ability to think towards the future (Roth & Saykin, 2004; Tranel, Anderson, & Benton, 1994). This future orientation becomes important in that impulsivity, shown by failing to consider the future consequences of behavior before initiating a response, can lead to errors (Goldstein & Green, 1995; Mapou & Spector, 1995; Osmon, 1999). Additionally, planning requires a capacity for sustained

attention (Lezak, Howieson, & Loring, 2004), and ability to manipulate visual information in WM (Nigg, Blaskey, Huang-Pollock, & Rappley, 2002).

Planning abilities have commonly been measured utilizing tower tasks such as the Tower of London (TOL; Shallice, 1988) and the Tower of Hanoi (TOH; Simon, 1975). However, these tasks do not solely measure planning abilities, since tower tasks employ several EF including inhibition, nonverbal WM, rule formation, persistence of effort, and visuospatial memory (Barkley, 1997a; Lezak, Howieson, & Loring, 2004; Sergeant, Geurts, & Oosterlaan, 2002). Adults with frontal damage and children with immature frontal systems often demonstrate deficits in planning, and Welsh and Pennington (1988) hypothesize this is somewhat due to perseverative tendencies. During planning tasks, bilateral activation of the dorsolateral prefrontal cortex and the occipito-parietal lobes is seen, and the anterior frontal cortex especially seems to be involved in planning (Osmon, 1999; Sergeant, Geurts, & Oosterlaan, 2002). Welsh and Pennington's (1996) meta-analytic studies found that 3/3 studies could differentiate children with ADHD from normal controls on the TOH, and this task had an average effect size of 1.08. Sergeant, Geurts, and Oosterlaan (2002) found 3 of 5 studies discriminated children with ADHD from controls on the TOL task.

### Verbal Fluency

Simply put, fluency is the quality of production of speech (Lezak, Howieson, & Loring, 2004). Fluency is considered a measure of EF since this process involves forming and switching mental sets in order to generate numerous responses (Osmon, 1999). Verbal fluency involves cognitive processes of processing speed, size of vocabulary, semantic

memory, WM, inhibition, and set maintenance (Sergeant, Geurts, & Oosterlaan, 2002). Fluency assesses divergent thinking, or as Goldstein and Green (1995) define the ability to produce alternative approaches, which is critical to problem solving. Denckla (1996) additionally indicates how fluency tasks involve the individual working under time constraints that employ rule-governed behavior, and responses that are self-generated. Denckla further comments how these processes are sensitive to WM for the rules and constraints needed for successful performance, including responses free from repetition or perseverations.

Imaging studies utilizing verbal fluency tasks emphasize the involvement of the frontal lobes, particularly the left dorsolateral and the superior medial area during phonemic (e.g., letter) tasks, while the right dorsolateral demonstrates more activation with semantic (e.g., category) fluency tasks (Barkley, 1997a, 1997b; Lezak, Howieson, & Loring, 2004; Osmon, 1999; Shallice, Marzocchi, Coser, Del Shavio, Meuter, & Rumiati, 2002; Stuss & Knight, 2002). Verbal fluency tasks have shown mixed results in identifying children with ADHD (Barkley, 1992). Significant differences found on semantic fluency, such as fruits and animals, are less likely to be found than on letter fluency tasks (Barkley, 1997a, 1997b). Pennington and Ozonoff's (1996) meta-analytic study supported this finding, reporting that 1/3 studies comparing children with ADHD and controls on phonemic fluency found differences, with an average effect size of 0.27, while category fluency differentiated groups in 0/3 studies. In Sergeant, Geurts, and Oosterlaan's (2002) article, of a total of nine studies, six found differences between children with ADHD and normal children, using letter fluency.

Whereas, only two of the nine studies utilizing semantic fluency found differences, again suggesting phonemic fluency differentiates better than semantic fluency.

### Emotional Regulation

While previous literature and theory on EF primarily focused on the cognitive aspects, more current orientations have concentrated on the emotional aspects of EF. Stuss and Alexander (2000) commented that “the most important role of frontal lobes may not be for executive cognitive processes but for affective responsiveness, social and personality development and self awareness and consciousness” (p. 291). Barkley (1997a) remarked on the self-regulatory role of the executive system, emphasizing that the self-directed executive actions are what modulates emotions once they are elicited. This function of emotional regulation has been defined by Gioia, Isquith, and Guy (2001) as “modulating or controlling one’s own emotional responsiveness appropriate to the situation or stressor” (p. 321). Traditional neuropsychological tests rarely assess this aspect of EF (Osmon, 1999), even though most would agree that EF are not restricted solely to cognitive functions (Gioia, Isquith, & Guy, 2001), given this supervisory function provides the organization and direction required for appropriate cognition, observable behavior, and emotional responding (Gioia & Isquith, 2004).

Both Barkley (1997a) and Gioia, Isquith, and Guy (2001) remarked on the importance of emotional regulation in a child’s development, and how it relates to the progression of EF. Emotional regulation is seen as crucial to adaptive problem solving and goal accomplishment. Barkley (1997a, 1997b) further relates other components of EF, specifically inhibition, as being important in the development of emotional control. He

believes that deficits in the area of inhibition further lead to predicted deficits in the child's ability to regulate his/her emotional states, a decrease in one's ability to judge the impact of his/her emotional reactions on others, and in general more intense and greater emotional reactivity. Gioia, Isquith, and Guy (2001) indicate the importance of emotional regulation particularly in the middle school years. During this time greater demands are placed on a child within his/her social interactions, and it becomes important for the child to inhibit impulsive responses when faced with stress and additional challenges from the environment.

As with other EF, the role of the frontal lobes has been explicitly linked, and appears integral to emotional regulation (Anderson, Anderson, Northham, Jacobs, & Mikiewicz, 2002). Specifically, Barkley (2000) hypothesizes that the ventromedial and prefrontal regions are involved in the regulation of emotional states. Disorders of emotion are also viewed as common to individuals who have sustained injury to prefrontal cortex (Barkley, 1997a). Neuroatomically, it appears that one way the frontal lobes influence emotional responsiveness is through the pathway to the amygdala, which is essential for the modulation of emotion (Stuss & Alexander, 2000).

Children with ADHD are perceived as having difficulties self-regulating affect (Gioia & Isquith, 2004). In Berlin, Bohlin, Nyberg, and Janols' (2004) logistical regression analysis comparing children with ADHD and controls on various measures of EF, in the best model emotional regulation made an independent and strong contribution in classifying the groups. Barkley (1997b) believes that children with ADHD who have difficulties inhibiting and delaying their prepotent responses to events, will also demonstrate a weakened capacity to inhibit their emotional responses. This makes it less likely that the affective experiences of



those children diagnosed with ADHD will proceed through a period of contemplation, modification, and eventually reformulation by executive system if a suspension in emotional responding is deficient. Barkley (1997b) further believes, as with other EF, that maturation of emotional self-control is delayed in ADHD, and that ADHD impairs social interactions through the accumulation of deficits it creates throughout the executive, emotional self-regulating system (Barkley, 2000).

### Informant Rating Scales of EF

Given the inherent difficulties attempting to assess and measure EF, efforts have been made to devise alternative methods to evaluate this construct. Two rating scales of EF have been introduced, specifically assessing EF in pediatric populations. These two scales include the Children's Executive Function Scale (CEFS; Silver, Kolitz-Russell, Bordini, & Fairbanks, 1993) and the Behavioral Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000), which will be discussed briefly.

#### CEFS

The Children's Executive Functions Scale (CEFS; Silver, Kolitz-Russell, Bordini, & Fairbanks, 1993) is an informant report measure of executive functioning in children. The CEFS was developed by a group of pediatric neuropsychologists within the Research Consortium of the National Academy of Neuropsychology, and the items were constructed on the basis of theory and the clinical experience of the members of the group. The CEFS was developed as an ecologically-valid measure of EF in pediatric populations, targeting behaviors that occur in everyday life, and that are relevant in the real world. The goals in comprising one of the first informant questionnaires on EF included evaluating EF in both a

time and cost effective manner, utilization as a screening tool to aid in determining further evaluation measures may be needed, and monitoring prognosis over time. While the CEFS has not been formally published, preliminary research using this measure has consistently validated its usefulness as a measure of EF for pediatric populations, and in particular children diagnosed with ADHD. The CEFS contains five subdomains including Social Appropriateness, Inhibition, Problem-Solving, Initiative, and Motor Planning, and an overall Total Score.

### BRIEF

Gioia, Isquith, Guy, and Kenworthy (2000) designed the BRIEF as a measure of EF for a broad range of children and adolescents. The BRIEF is a standardized inventory utilized to assess behavioral aspects of executive dysfunction in the child or adolescent's everyday activities environment (Anderson, P., 2002; Mangeot, Armstrong, Colvin, Yeates, & Taylor, 2002). The BRIEF has both a parent and teacher form to provide profiles of EF behaviors in home, school, and social environments. Anderson, Anderson, Northam, Jacobs, and Mikiewicz (2002) reported on the benefit of this standardized pediatric measure of EF, including that it presents information on a child's day-to-day functioning that may be critical to the diagnosis, management, and treatment of the child's difficulties. The BRIEF also is developmentally appropriate and focuses on real life behavior, supporting the ecological validity of the measure.

Anderson, P. (2002) indicated that research has shown that the BRIEF's level of agreement with other validated cognitive measures is modest at best, supporting the view that utilizing the BRIEF provides additional distinctive information. The BRIEF consists of eight

interrelated domains of EF including Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor. Gioia and Isquith (2004) report that the BRIEF is an effective assessment device, which can be utilized as part of a comprehensive assessment to depict information about the child's EF difficulties in a variety of settings. Furthermore, this rating scale enables a more complex observation of EF, rather than in isolation or based solely on clinically-based performance, and captures the integrated and multidimensional nature of the EF system as required in real-world circumstances (Gioia, Isquith, Retzlaff, & Espy, 2002).

Both the CEFS and BRIEF have been utilized as assessment tools for EF that provide a more ecologically-valid measure of this construct. The following sections provide an introduction to the concept of ecological validity (EV), how it relates to EF, and the importance of utilizing ecologically-valid measurements of EF in the present study.

#### Ecological Validity (EV): Definition and Measurement

Ecological validity (EV), which is sometimes considered an element of predictive or concurrent validity (Barkley, 1991), has a variety of meanings depending on the context in which it is measured. In general, EV refers to the degree to which results obtained in controlled experimental or clinical conditions are related to those obtained in naturalistic settings or environments, and the real world (Chaytor & Schmitter-Edgecombe, 2003; Gioia, Isquith, Kenworthy, & Barton, 2002; Gioia & Isquith, 2004; Norris & Tate, 2000; Silver, 2000). The EV of a neuropsychological test encompasses both the theoretical relationship between the test and real world behaviors, and a conceptual correspondence between the demands of the task, and the demands that occur in everyday life (Shallice & Burgess,

1991). In the context of neuropsychological assessment, EV is defined by how well the data have a functional and predictive relationship for future behavior, or behavioral outcomes in a variety of settings (Lezak, Howieson, & Loring, 2004; Sbordone, 2000). Recently, more research has attempted to address the issue of the EV of tests (Ready, Stierman, & Paulsen, 2001), although research establishing the EV of neuropsychological tests has been limited (Kibby, Schmitter-Edgecombr, & Long, 1998).

Some tests are naturally ecologically valid since they are basically formalized versions of real world activities (Burgess, Alderman, Evans, Emslie, & Wilson, 1998). Other measures, such as laboratory measures or standardized tests, usually are specifically designed to measure some construct such as EF, while measures taken in naturalistic settings are usually less precise behavioral descriptors. Consequently, the lack of consistency on the same measured construct often found between these two types of methods may suggest different meanings of terminology utilized for the measures (Wu, Anderson, & Castiello, 2002).

#### EV and the association with EF

The ecological validity of tests is becoming increasingly important since the field of neuropsychology is focusing more on addressing issues related to everyday functioning, rather than pure diagnostic questions (Gioia & Isquith, 2004; Kirby, Schmitter-Edgecombr, & Long, 1998). Specifically, attention has been directed towards understanding the EV of EF, because most tasks designed to assess EF have considerable face validity, but appear lacking in other types of validity, including EV (Tranel, Anderson, & Benton, 1994). Lawrence, Houghton, Douglas, Durkin, Whiting, and Tannock (2004) emphasize the

importance of determining the EV of EF measures, stating that it is difficult to determine to what extent EF deficits revealed in neuropsychological testing are related to performance in real-world activities, mainly because sparse information has been presented outside the laboratory or clinical setting.

### EV and the definition of EF

One of the major problems with determining the EV of EF seems to be related to the definition of EF itself. As reported in the section outlining EF, there is incomplete agreement on the definition of EF, and on what components are included in the construct of EF. Chaytor and Schmitter-Edgecombe (2003) indicated that these factors contribute to the impediments demonstrating the EV of EF measures. Osmon (1999) acknowledged the difficulties demonstrating how performance measures of EF impairment relate to real-world functioning. He further contends that until the components of EF are identified and independently isolated, it would be difficult to determine how the deficits in EF manifest outside of the clinician's office in real world behaviors. Another aspect of the definition of EF that complicates the ability to assess EF in an ecologically-valid manner includes the very nature of measuring EF, which requires novelty (Anderson, P., 2002).

### Research on EV and EF

While there are many neuropsychological measures of EF utilized in clinical practice and in research studies, there is inadequate systematic research demonstrating the EV of these measures in predicting real world abilities (Sbordone & Guilmette, 2002). Overall, neuropsychological tests of EF have been shown to have low to moderate levels of EV (Anderson, P., 2002; Gioia & Isquith, 2004; Kirby, Schmitter-Edgecombr, & Long, 1998;

Silver, MacDonald, Lane, & Kulesza, 2002). Burgess reports low order correlations of EF tasks with ratings by both patients and informants on the patient's apparent EF in more naturalistic settings, and the shared variance between such measures often is below 10% (Burgess, 1997). Chaytor and Schmitter-Edgecombe's review article (2003) attempted to determine the EV of six neuropsychological studies, and found the overall self-report ratings were not related to traditional neuropsychological measures of EF. All of the studies assessed, however, did find a significant relationship between tests of EF, including both traditional neuropsychological measures and informant questionnaires on EF, and everyday skills assessed by informant questionnaires and clinician ratings. The magnitude of the effects, however, varied across each of the study, but tended to be higher when the EF measure was compared to an outcome measure measuring everyday executive skills (Chaytor & Schmitter-Edgecombe, 2003). Silver (2000) indicated that past research utilizing children diagnosed with traumatic brain injury (TBI), demonstrated only modest relationships between performance on neuropsychological tests including EF measures, and measures of classroom performance, behavior adjustment, or adaptive functioning. The author suggested that traditional neuropsychological tests have limited EV and are not strongly predictive of daily impairment that occurred subsequent to TBI (Silver, 2000).

#### Problems with Assessment of EF

Dennis (1991) conveys that standard neuropsychological assessments have been somewhat unsuccessful in providing a sufficient evaluation of regulatory and executive processes. As reported in the section on measurement of EF, the structure imposed by the testing environment makes assessment of EF difficult. This structured environment reduces

the ability to capture complexities of everyday life, and to assess EF accurately (Sbordone & Guilmette, 2000). Further the short-term, structured, and interactive nature of the neuropsychological assessment may relieve EF, thereby reducing valued opportunities to observe essential behaviors associated with EF (Chaytor & Schmitter-Edgecombe, 2003; Gioia, Isquith, Kenworthy, & Barton, 2002; Gioia & Isquith, 2004). Silver (2000) cautions that the responses elicited in the assessment situation are not as complex as those required in the natural environment, therefore also reducing EV.

Another reason for the difficulties assessing EF in an ecologically-valid manner utilizing a single neuropsychological test has to do with the partitioning of the components in this construct. Burgess (1997) suggested that the majority of neuropsychological tests in isolation are inadequate for assessing EF because these measures artificially divide the integrated functions into constituent parts, unlike what is required in everyday life. Additionally, since most EF tests simultaneously measure several components of EF, the reason for poor performance on the test may be ambiguous (Gioia, Isquith, Kenworthy, & Barton, 2002). These tests may not be sensitive to the day-to-day manifestations of EF deficits since the measurement of these processes is too narrow or specific within the testing situation (Mangeot, Armstrong, Colvin, Yeates, & Taylor, 2002). As a result, tests attempting to measure specific components of EF may not be adequate to depict more complex everyday executive problem solving (Gioia, Isquith, Retzlaff, & Espy, 2002).

#### Recommendations for Ecologically Valid Measures of EF

Ready, Stierman, and Paulsen (2001) maintain that examining the EV of neuropsychological tests of EF is especially beneficial given the importance that EF play in

the social realm, which is a motivation for the current research. Several suggestions have been offered in the literature on means to foster ecologically-valid ways of assessing EF. Since efforts to operationalize EF have focused primarily on laboratory or performance-based and clinical tests (Gioia & Isquith, 2004), an alternative approach to assessing more EV aspects of EF is to elicit ratings of everyday behavior (Mangeot, Armstrong, Colvin, Yeates, & Taylor, 2002). Silver (2000) appeals for utilizing collateral material from multiple data sources, and in multiple settings, including rating scales such as the CEFS and BRIEF, observations, and checklists to augment the ecological validity of the testing information.

#### EV, EF, and ADHD

In the research literature on ADHD, attempts have been to utilize methods that are ecologically valid. Barkley (1991) delineated several approaches to evaluate the ecological validity of common clinical and research procedures utilized in ADHD populations. Barkley advocated for utilizing direct observations of ADHD symptoms in naturalistic settings, and additionally combining several different methods in the assessment.

Other studies (Clark, Prior, & Kinsella, 2000; Muir-Broadbent, Rosenstein, Medina, & Soderberg, 2002; Solanto, Abikoff, Sonuga-Barke, Schachar, Logan, et al., 2001) have compared the neuropsychological data of children diagnosed with ADHD with informants' behavioral observations to determine the degree to which these two sources of information converge. These three pediatric ADHD studies revealed that significant associations were found between neuropsychological tests, and questionnaires and behavioral observations made by significant others in the child's life, including parents and teachers. Further, these



associations were consistent with the diagnostic criteria for ADHD, and support the EV of the EF measures.

Another group of researchers attempted to create more ecologically validate mechanisms to study ADHD by using non-laboratory tasks and settings such as videogames and field settings, since generalizability of results taken from laboratory studies has not always been tested in more real life childhood contexts. Lawrence, Houghton, Tannock, Douglas, Durkin, and Whiting (2002) utilized videogames and a naturalistic setting in an ADHD-EF study since the authors reported that videogame play is seen as a complex, multi-requirement cognitive domain and is motivating for children with ADHD, and both tasks were seen as an ecologically-valid avenue. In a second study, Lawrence, Houghton, Douglas, Durkin, Whiting, and Tannock (2004) compared performance on traditional neuropsychological tests with the naturalistic tasks. These two studies reveal that incorporating naturalistic methods of assessing EF, both in isolation and in combination with more traditional neuropsychological measures, can create ecologically-valid assessments of the EF deficits found in children and adolescents with ADHD. Additionally, these studies substantiate that both established neuropsychological measures and novel real life measures of EF demonstrate EV, and specifically when utilized in studies on pediatric populations diagnosed with ADHD.

Finally, as reported earlier, informant rating scales of EF in naturalistic settings have been introduced such as the CEFS and BRIEF, and these measures have shown some ability to differentiate children with ADHD (Roth & Saykin, 2004). In a study utilizing the CEFS, discriminant analysis of scores from an ADHD group and control group produced correct

classification of 89% of the children with ADHD and 92% of the controls (Molho, 1996). In the Gioia, Isquith, Kenworthy, and Barton (2002) study with the BRIEF, children with ADHD were differentiated among other children diagnosed with RD and TBI based on their BRIEF profiles. Further, the BRIEF profiles of each of the ADHD subtypes within the sample appeared consistent with clinical observation and experimental data, and with existing models (e.g., Barkley, 1997a, 1997b) of the disorder as an EF disorder. The current study will utilize informant rating scales of EF, including both the CEFS and BRIEF, in combination with more traditional performance-based neuropsychological measures to enhance the possibility of ecologically valid assessment of EF.

The following sections introduce the topic of bully and victimization and describe the literature on bullying/victimization behaviors, and how bully/victimization relates to ADHD and EF.

#### Introduction to Bullying and Victimization

Craig (1998) emphasizes that the recognition, understanding, and treatment of bullying/victimization behaviors are important, given that both children who bully and those who are victims, present at an increased risk for social, emotional, and psychiatric problems that could potentially persist into adulthood. More immediately related to the child's life, it is recognized that involvement in bully/victimization behaviors can significantly affect children's academic and psychosocial functioning, as well as physical health (Mishna, 2003).

Olweus (1993) elaborates that social maladjustment can present in children in two general categories: aggressive, disruptive, acting-out behaviors, or as withdrawn, anxious, and inhibited reaction patterns. These categories are defined as forming two groups of

children being “rejected-withdrawn” and “rejected-aggressive” (p. 318). These two groups may also be hypothesized to fall along two pathways of bully/victimization behaviors.

Research on social acceptance and maladjustment suggests whether the child’s unacceptance is expressed in direct harassment, bullying, rejection, or in the form of indifference or neglect defines the child’s membership in either rejected group. Colvin, Tobin, Beard, Hagan, and Sprague (1998) stated that longitudinal studies have demonstrated that social competence predicts adolescent adjustment, and that both aggressive and social withdrawal behaviors in childhood predict poor adaptation in adolescence. These authors additionally promote the importance of the development of individual interpersonal and social competence to assist children in engaging in appropriate social and interpersonal adaptation.

The subsequent sections include an introduction to the definitional components of bullying/victimization, followed by descriptions noted in the literature on bullies, victims, and bully/victims (BVs).

#### Definition of Bullying/Victimization Behaviors

Throughout the literature several characteristics are used to define bully/victimization behaviors. In bullying/victimization behaviors, there appears to be a difference of power in the relationship. Olweus (1991 & 1994) refers to this as an ‘asymmetrical power relationship,’ or an imbalance in the strength in the relationship. This power differential can be based on such factors as age, physical strength, or social/psychological issues (Coolidge, Den Boer, & Segal, 2004; Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001).

Bullying behaviors are forms of social behavior seen as either physically or psychologically aggressive acts, conducted with some threat of harm, and that are intentional

in nature (Colvin, Tobin, Beard, Hagan, & Sprague, 1998). Stephenson and Smith (1989) further elaborate that bully/victimization behaviors are aggressive acts that occur with explicit roles for both the bully and the victim. These behaviors occur repeatedly over time and are relatively stable (Pellegrini & Bartini, 2000). Craig and Pepler (2003) indicate that the consistency of bully/victimization behaviors that occur over time are a factor in reinforcing the power differential of the relationship between the bully and the victim. Bully/victimization behaviors have also both a social and emotional component. Having a large social network appears to inhibit victimization, while high emotionality seems to play a contributory role in the manifestation of some bully/victimization behaviors (Pellegrini & Bartini, 2000).

There are also several types of bully/victimization behaviors, which can take place through physical, verbal, or psychological means. Two forms of bullying recognized include direct bullying and indirect, or relational bullying. Direct bullying is defined by the use of direct aggressive physical acts or direct verbal abuse (Woods & Wolke, 2004), with direct open attacks on the victim (Olweus, 1994). Indirect or relational victimization is defined as the purposeful damage and manipulation of peer relationships, such as spreading malicious gossip or withdrawing friendship that eventually leads to social exclusion (Crothers & Levinson, 2004; Olweus, 1994; Woods & Wolke, 2004). Frequent forms of bullying include name calling, teasing, being threatened, making faces, dirty gestures, refusing to comply with another person's wishes, and spreading rumors (Espelage, Bosworth, & Simon, 2000; Olweus, 1991; Salmon, James, Cassidy, & Javaloyes, 2000). Research has demonstrated that bullying and victimization declines with age (Craig, 1998), and the youngest students within

the school system are more frequently victimized (Batsche & Knoff, 1994; Salmon, James, Cassidy, & Javaloyes, 2000). Although the use of physical violence decreases with age (Salmon, James, Cassidy, & Javaloyes, 2000), a higher level of verbal abuse remains constant (Batsche & Knoff, 1994).

The following sections detail certain behavioral, psychological, social, and academic characteristics recognized in children and adolescents identified as victims, bullies, and BVs, with particular emphasis on the difficulties children who are victimized endure.

#### Characteristics of the Victim

Kochenderfer and Ladd (1996) indicated that, in the past, less consideration was given to examining and describing peer victimization, compared with discussion of bullying and aggression. The authors further remark that previous literature has defined victimization as “a role or position that children occupy an aggressive encounter” (p. 1305). Craig (1998) describes several individual differences that are recognized as being related to bully/victimization behaviors, including characteristics such as temperament, gender, and behavioral tendencies. In particular, certain traits and characteristics of victims have been described. These characteristics range across several different areas including the environmental, behavioral, and psychosocial domains. Research has demonstrated that children who are victimized by their peers have other behavioral problems that increase the risk for victimization (Hodges, Malone, & Perry, 1997), including difficulties with self control (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001). Several authors report that victims often exhibit behaviors that indicate to their peers that they would not retaliate if they were attacked or insulted, and victims frequently react to the abuse by

crying and withdrawal. Victims, especially male victims, are noted to be physically weaker (Batsche & Knoff, 1994; Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001; Olweus, 1978 & 1994), and often present with a variety of health symptoms (Olweus, 1978). Williams, Chamber, Logan, and Robinson (1996) reported an association with being bullied and bed wetting, headaches, and stomachaches.

Psychological descriptions in the literature summarize victims as having an anxious-depressed disposition with reduced self-esteem, possibility manifesting in suicidal ideation and suicide attempts (Batsche & Knoff, 1994; Olweus, 1993). Kochenderfer and Ladd (1996), and Kumpulainen and Rasanen (2000) remarked how the experience of victimization can undermine the child's sense of security, and victims have been noted to be insecure, cautious, worried, and inhibited or fearful of new situations (Craig, 1998; Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Kochenderfer & Ladd, 1996; Olweus, 1993; Salmon, James, Cassidy, & Javaloyes, 2000). The low self-esteem observed in this population appears to manifest from the negative view of self they adopt, including viewing themselves as unattractive, stupid, and as failures (Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001; Salmon, James, Cassidy, & Javaloyes, 2000). This pessimism also colors the overall view of their situation and environment (Olweus, 1994).

Depression has been noted to be a consequence of persistent victimization (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; O'Moore, 1999), and Olweus (1993) reports that victimization is significantly correlated with depression and suicidal ideation. Olweus further comments that bullying has been reported as one of the stressors most strongly associated with suicidal behavior in adolescents, and bullying-related suicides

have been reported worldwide (O'Moore, 1999). Mishna (2003) indicates that, over time, with continued victimization, the child's options become progressively limited. Hodges, Malone, and Perry (1997) further report that as with aggression, victimization is fairly stable over time, and is associated with developmental maladjustment from childhood on to adulthood. The authors reported that victimization in kindergarten leads to school avoidance and feelings of loneliness. If the victimization continues into elementary school, children demonstrate increases in depressed feelings; the depression continues to intensify in adolescence and adulthood, along with decreases in self-esteem.

Children and adolescents who are victimized report feeling lonely, isolated, lacking friends, and they are often rejected by peers (Batsche & Knoff, 1994; Boulton & Smith, 1994; Kochenderfer & Ladd, 1996; Mishna, 2003; Olweus, 1991 & 1993; Salmon, James, Cassidy, & Javaloyes, 2000). Victims often have problems asserting themselves within the peer group, and are viewed as rather disliked by their age mates (Olweus, 1994). This further exacerbates their unfortunate situation since being surrounded by an affiliative group of peers can inhibit victimization (Pellegrini & Bartini, 2000). Children with behavior problems are at increased risk for victimization, and are also more likely to be continually abused if they lack friends that provide a protective function against the bullying (Hodges, Malone, & Perry, 1997). Espelage, Bosworth, and Simon (2000) indicated that in a group of adolescents who reported being bullied, the majority (i.e., 90%) perceived that the victimization caused them significant problems including loss of friendships, and feelings of isolation, and hopelessness.

Both victims and bullies have been shown to demonstrate less social competence. In a study by Haynie, Nansel, Eitel, Crump, Saylor, Yu, and Simons-Morton (2001), the measures of social competence highlighted the difficulties with communication, problem-solving, resistance to peer pressure, and conflict resolution. This is consistent with difficulties noted by Kumpulainen and Rasanen's (2000) study that also found victims having more internalizing problems, and troubles with communication, and deficient problem-solving skills. Further, the authors also found individuals identified as victims were seen as more immature and lonely. Since victims have been shown to be rather socially isolated, these individuals do not benefit from having friendships to provide opportunities for social learning, sources of information and mechanisms to expand self-esteem and knowledge, and resources for emotional and cognitive coping (Hodges, Malone, & Perry, 1997).

The role as a victim experienced at a young age can additionally predispose some children to develop more permanent and long-lasting negative impressions of the academic environment. This is supported in the literature that states children who are victims display poorer school functioning (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001) most likely as a result of the school avoidance, increased truancy and absenteeism, and decreased motivation in school (Kochenderfer & Ladd, 1996; Mishna, 2003; O'Moore, 1999) these victimized children experience. Additionally as a possible consequence, or reason for the peer victimization these children face, reading and writing problems are more common (Mishna, 2003), and poor concentration and impeded academic progress are evident (Colvin, Tobin, Beard, Hagan, & Sprague, 1998; O'Moore, 1999). Salmon, James, Cassidy, and Javaloyes (2000) report that the level of bullying reported by children who were either



attending remedial classes, or were only attending special education classes, was twice that of non-remedial children.

### Characteristics of the Bully

Overall, studies have demonstrated that bullies have poorer psychosocial adjustment or functioning than noninvolved children (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Mishna, 2003; Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001). Behaviorally, children and adolescents involved in bullying are also more likely to be involved in other externalizing problems such as using alcohol and smoking, and other delinquent behaviors (Baldry & Farrington, 2000; Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Mishna, 2003; Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001).

Psychologically, children and adolescents identified as bullies have been described as impulsive (Batsche & Knoff, 1994; Olweus, 1993), hyperactive and inattentive (Losel & Bliesener, 1999), with difficulties with self-control and problem-solving (Unnever & Cornell, 2003). Additionally, the parents of children recognized as bullies have also been noted to have deficits in problem-solving skills (Batsche & Knoff, 1994). Emotionally, children involved in bullying have been described as 'hot-headed' (Olweus, 1994), aggressive, hostile, domineering (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Salmon, James, Cassidy, & Javaloyes, 2000), and depressed (Coolidge, Den Boer, & Segal, 2004; Kumpulainen, Rasanen, & Puura, 2001; Mishna, 2003; Salmon, James, Cassidy, & Javaloyes, 2000).

Socially, individuals involved in bullying report poor peer relationships and demonstrate less social competence than noninvolved children (Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001). These factors seem to be associated with the child's need to dominate others, and their difficulties with communication, problem-solving, and conflict resolution (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001). In some studies they are described as rejected and unpopular, and report feeling lonely (Boulton & Smith, 1994; Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001).

Children identified as bullies also negatively perceive their school environment. This is demonstrated by their poor academic achievement (Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001), low academic attainment (Baldry & Farrington, 2000), and the fact that reading and writing problems are more common among bullies (Mishna, 2003).

#### Characteristics of the Bully/Victim (BV)

Reports in the literature suggest that anywhere from 10% to 50% of victims also act as bullies (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Mishna, 2003; Salmon, James, Cassidy, & Javaloyes, 2000). Compared with pure bullies, pure victims, and noninvolved children, BVs score more negatively on measures of psychosocial and behavioral variables, (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001), and demonstrate the greatest range of behavioral and emotional problems (Losel & Bliesener, 1999). Bully/victims are characterized by an anxious and aggressive behavior pattern (Olweus, 1991 & 1994), which is associated with provocative behaviors that peers and adults find irritating and provoking (Hodges, Malone, & Perry, 1997; Mishna, 2003; Olweus, 1994). These behaviors include behaving in disruptive and domineering ways, with

use of verbal and physical aggression (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Mishna, 2003; Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001). Bully/victims appear to become involved in aggressive conflicts through their own undercontrol and initial provocations (Losel & Bliesener, 1999). Other behavioral symptoms noted in BVs descriptive of their anxious and aggressive behavioral pattern include problems with concentration, hyperactivity, and impulsivity (Olweus, 2001; Woods & Wolke, 2004). Children and adolescents identified as BV also are seen as argumentative, hot-tempered, restless, and often will attempt to retaliate when attacked (Batsche & Knoff, 1994; Hodges, Malone, & Perry, 1997).

Not only do BVs suffer from externalizing problems as described previously, but they are also more likely to suffer from internalizing problems such as anxiety, depression, psychosomatic symptoms, and lowered self-esteem and global self-worth compared to other children involved in bully/victimization behaviors and non-involved children (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Kaltiala-Heino, Rimpela, Rantanen, & Rimpela, 2000; Kumpulainen, Rasanen, Henttonen, Almqvist, Krevanov, Linna, et al., 1998; Kumpulainen, Rasanen, & Henttonen, 1999; Kumpulainen & Rasanen, 2000; Losel & Bliesener, 1999). Bully/victims have also been reported to be more ambivalent about their own self perception (Kaltiala-Heino, Rimpela, Rantanen, & Rimpela, 2000). Kumpulainen and Rasanen's (2000) study found that BVs in elementary school had more psychiatric symptoms later at age 15 than other groups involved in bullying/victimization behaviors, and that BVs were more likely to be referred for a psychiatric consultation than

pure bullies or victims (Kumpulainen, Rasanen, Henttonen, Almqvist, Krevanov, Linna et al., 1998).

Socially, BVs are rated least popular by peers (Woods & Wolke, 2004), and have lower scores on measures of social acceptance (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Kaltiala-Heino, Rimpela, Rantanen, & Rimpela, 2000). Bully/victims are most severely rejected by peers and have especially serious adjustment problems (Mishna, 2003). This is most likely due to the behavioral problems discussed previously that provoke many students, and thus result in negative reactions from the entire class (Kaltiala-Heino, Rimpela, Rantanen, & Rimpela, 2000; Olweus, 1994). Compared to pure bullies and victims, BV have more relationship difficulties (Kumpulainen & Rasanen, 2000), report more feelings of ineffectiveness, and more interpersonal problems (Kumpulainen, Rasanen, Henttonen, Almqvist, Krevanov, Linna, et al., 1998). The following section details methodological approaches to measuring and defining each of the previous described subgroups involved in bully/victimization behaviors.

#### Measurement of Bully/Victimization Behaviors

Boulton and Underwood (1992) reported that the incidence of bully/victimization behaviors is primarily contingent on how these behaviors are defined, and the specific measure utilized in the study. Most studies rely on reports either from the child, teacher, or parent, or the use of peer nominations. Among these methods, self-report measures are the most common (Schwartz, Proctor, & Chien, 2001). In both middle school-aged children (Austin & Joseph, 1996), and younger children (Kochenderfer & Ladd, 1996), the self-report method for bully/victimization behaviors has been reported as sufficiently reliable and valid,

and self-report is a commonly utilized indicator of bullying behaviors (Colvin, Tobin, Beard, Hagan, & Sprague, 1998; Nansel, Overpeck, Pilla, Ruan, Simins-Morton, & Scheidt, 2001). Further, Ladd and Kochenderfer (2002) indicated that for reporting of victimization behaviors, self-report may be the most ecologically-valid medium to uncover these behaviors, given that the victim encounters the abusive interactions more directly than other informants. Self-report methods additionally provide information that is not often observed by teachers and parents (Kokkno & Panayiotou, 2004). However, various problems have been reported when utilizing self-reports for bullying/victimization behaviors, and in particular, self-reported bullying. Social pressure and social desirability appear to contribute to the underreporting of bully/victimization behaviors by self-report methods (Austin & Joseph, 1996; Cornell & Brockenbrough, 2004; Craig, 1998). Additional disadvantages of self-reports include the child's unwillingness to disclose painful experiences, as well as the child's ability to accurately interpret, encode, and reconstruct bully/victimization behaviors (Ladd & Kochenderfer, 2002).

Teachers are often excellent observers of children's behavior and interactions, and teacher nominations of victimization have been shown to correlate with self-report questionnaire responses, while teacher self-report questionnaire agreement for bullies is not as high (Kochenderfer & Ladd, 1996; Whitney & Smith, 1993). Teacher and parent reports further add to the convergent validity that the sole use of self-report measures does not provide (Kokkno & Panayiotou, 2004). Another method to establish incidence of bully/victimization behaviors is the peer nomination method, which is also frequently employed (Schwartz, Proctor, & Chien, 2001). Peer nomination provides advantages, given

that students witness interactions in unsupervised environments in which bully/victimization behaviors often occur; however, this method is biased by such factors as reputation effects, and the fact that witnesses are more often vigilant of the aggressor or bully's actions (Ladd & Kochenderfer, 2002). Overall, utilization of multi-informant approaches increase the validity and consistency of the findings (Pellgrini & Bartini, 2000; Schwartz, Proctor, & Chien, 2001). The subsequent section presents information regarding the problems related to the measurement of bully/victimization behaviors.

#### Problems with Measurement of Bully/Victimization Behaviors

In the section entitled Definition of Bully/Victimization Behaviors, a specific criterion was introduced by Olweus (1991, 1996), defining what constitutes bullying and bully victimization. This definition is the most influential and most widely-utilized definition of bully/victimization behaviors (Theriot, Dulmus, Sowers, & Johnson, 2005). The main components included in this definition are: (1) an imbalance of power between the bully and the victim, (2) the behaviors occur repeatedly or have some longstanding history, (3) and the behaviors occur with the intention of harm to the victim (Olweus, 1991 & 1996). Although widely utilized, these criteria have not been universally accepted, or considered the defining characteristics of bully/victimization behaviors (Smith & Brain, 2000; Stephenson & Smith, 1989; Stockdale, Hangaduambo, Duys, Larson, & Sarvela, 2002). In some instances bully/victimization behaviors may occur on one occasion, or are directed at, or carried out by a group of individuals as opposed to one individual (Olweus, 1999; Smith & Brain, 2000; Stephenson & Smith, 1989). Additionally, bully/victimization behaviors can

occur in circumstances when an imbalance of power is not as pronounced, or as apparently measured by the research methodology (Smith & Brain, 2000).

Another methodological issue surrounding measurement of bully/victimization has to do with utilizing a descriptive label and clear definition to introduce the concept of bullying/victimization, versus using specific behaviorally-based questions on bully/victimization behaviors (Stockdale, Hangaduambo, Duys, Larson, & Sarvela, 2002). The differentiating factor between these two types of assessment rests on whether a label or labels are utilized in the assessment procedure. This includes whether or not the individual reporting on the bully/victimization is given a definition with words such as “bullying” or “victim,” or whether the individual is specifically asked a subjective question in regards to bully/victimization ( e.g., “Are you a bully?”). Some researchers argue for the inclusion of a definition of bullying (Solberg & Olweus, 2003), while others believe that providing a definition and such words as “bully” decreases the validity of the reports because of such factors such as social desirability (Crothers, & Levinson, 2004; Espelage & Swearer, 2003; Pellgrini & Bartini, 2000). Further, research has demonstrated that while some children will label themselves as victims based on global questions, other students will not label themselves as victims, although they will meet criteria as a victim based on their responses to behavioral indicators of victimization (Theriot, Dulmus, Sowers, & Johnson, 2005). These issues become increasingly important when prevalence rates of bully/victimization are reported in the literature, which is the topic in the following section.

#### Prevalence of Bully/Victimization Behaviors

The majority of research on prevalence of bully/victimization behaviors has been conducted in Scandinavian countries and England (Batsche & Knoff, 1994). Although Boulton and Smith (1994) warn that data collected from one country cannot necessarily be generalized to another countries, these data give an indication of the magnitude and seriousness that bully/victimization problems present worldwide. Overall, Woods and Wolke (2004) report that bullying occurs at a rate between 3% and 23% across countries worldwide. In 1996, The World Health Organization (WHO) did one of the most comprehensive estimations of bully/victimization problems worldwide, although excluding the United States, and found 15% of students in Norway, 18% to 20% in England, and 25% of students in Australia reported taking part in bullying at least once during the current school term. These estimates ranged from a low of 13% of girls and 28% of boys in Wales, to a high of 67% of girls and 78% boys in Greenland. For victims, the estimates ranged from 13% of girls and 15% of boys in Sweden, to a high of 72% of girls and 77% of boys in Greenland (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001). The next sections outline specific prevalence rates for bully/victimization behaviors in three countries including Scandinavian countries, the United Kingdom, and the United States.

Olweus (1991 & 1994) reported that bully/victimization problems were endorsed “now and then or more frequently” by 15% of a Norwegian sample of students. In this sample, 9% of the students were classified as victims, 7% as bullies, and 1.6% as BVs. Five percent of the students were involved in serious bully/victimization problems, defined by bullying problems occurring “about once a week” or more frequently. Additionally, other prevalence rates from Olweus’ data are presented later in a section describing the effect of



developmental period and bully/victimization behaviors. Kaltiala-Heino, Rimpela, Rantanen, and Rimpela's study (2000) of 14 to 16 year olds in Finland found that 9% of females and 17% of males were involved in bullying on a weekly basis.

While Woods and Wolke (2004) indicated that the prevalence of victimization in the United Kingdom's primary schools ranges from 8% to 46%, and Glover, Gough, Johnson, and Cartwright (2000) report that in any year, 75% of students are bullied. Further, the authors indicated that of the students who report being bullied, 7% are bullied continuously and severely, which is consistent with reports in the United States. Whitney and Smith's (1993) study of more than 6000 pupils in Sheffield found that 27% of junior and middle school pupils, and 10% of secondary school students self-reported being bullied "sometimes or more than often that term," and 10% of junior and 4% secondary school students were being bullied "at least once a week." Boulton and Smith (1994) relied on peer nominations in their study of students in the UK. The results showed that in this sample of 8 to 9 year olds, 13% were defined as bullies, and 17% of were defined as victims. Overall, 35% of the sample was involved as bullies, victims, or both. Moreover, status as a bully or victim was stable over 3 assessment periods during the school year, and initially during the following school year.

In the United States, 75% of adolescents reported experiencing some form of victimization during their school years (Espelage, Bosworth, & Simon, 2000), and 10% of students in U.S. are extreme victims of peer abuse (Perry, Kusel, & Perry, 1988). This is consistent with the data from the United States 1993 Household Education Survey that reported 71% students in grades 6 through 12 were "fully aware of threatening conditions

around the school,” with 56% actually witnessing bullying, physical attack, and theft (Nolin, Davies, & Chandler, 1996). Colvin, Tobin, Beard, Hagan, and Sprague (1998) also indicated that 80% of high school students, and 90% of elementary and middle school students report that they have been bullied at school. In a study assessing bully/victimization behaviors in a sample of middle school students, only 19.5% reported exhibiting no bullying behavior in the past 30 days (Espelage, Bosworth, & Simon, 2000).

While there were no data from the U.S. in the 1996 WHO study, Haynie, Nansel, Eitel, Crump, Saylor, Yu, and Simons-Morton, (2001) reported that analysis from 1997-1998 data in U.S. indicated that 19.5% of students reported bullying others three or more times over past year, and 8.8% reported bullying once a week or more. Further, 16.9% of the students were identified as being victimized three or more times over the past year, and 8.4% reported being victimized once a week or more. The National Institute of Child Health and Human Development study conducted in grades 6 through 10 in spring of 1998 found overall 10.6% of students reported bullying others “sometimes,” and 8.8% admitted bullying once per week or more. The percent of students experiencing bullying was 8.5% for “sometimes,” and 8.4% “once week or more.” In this sample utilizing self-report questionnaires, 29.9% of students reported some type of involvement in moderate or frequent bullying, including 13% as a bully, 10.6% as a target of bullying, or both (6.3%) (Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001).

In general, estimates from data taken in the U.S. suggest that between 75% to 90% of students are involved in bully/victimization behaviors at some point during their school

years. Further, these data also suggest that at any point in time during the school year, 8% to 20% of the students are involved as bullies, and 8% to 17% are involved as victims.

Results from prevalence studies on bully/victimization behaviors seemed to uncover a trend of a developmental progression in these behaviors over time. Nolin, Davies, and Chandler (1996) indicated that bullying occurs more in middle and junior high than high school. Olweus (1991 & 1994) found that the percentages of student being bullied decreased with higher grades, shown by the younger and weaker students reporting being bullied the most. Additionally, the average number of students involved in bullying in grades 2 through 6 (11.6%) was twice that of grades 7 through 9 (5.4%), with a clear trend towards less use of physical means in the higher grades.

Kochenderfer and Ladd's (1996) study of bully/victimization behaviors, which focused solely on kindergarten children, showed that a substantial proportion of children in kindergarten (i.e., 20.5%) were exposed to moderate to high levels of peer victimization; however, only 9% of this sample of children emerged as stable victims. The authors further indicated that victimization becomes stable around 8 to 9 years old, and that kindergarten perhaps is the time when bully/victimization patterns become established.

Woods and Wolke (2004) hypothesized these results utilizing a developmental explanation of bullying behavior. Given that younger children have not developed fundamental verbal skills, bullying takes on the form of more physically aggressive behavior. Once more complex verbal and social skills develop, children will exhibit more sophisticated styles of aggression such as relational bullying, usually in middle school (Woods & Wolke, 2004).

### Gender Differences in Bully/Victimization Behaviors

Gender appears to be a variable that differentiates bully/victimization behaviors. Overall, boys are more likely to be bullies (Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001; Olweus, 1991) with a clear overrepresentation of boys by approximately 3:1 (Olweus, 2001). Boys are also nominated by their peers as bullies more often (Boulton & Smith, 1994). Girls seemed to be exposed more often to the more indirect forms of bullying such as social isolation, slandering, spreading rumors, and manipulation of friendships (Olweus, 1991; Olweus, 1994; Salmon, James, Cassidy, & Javaloyes, 2000). Although these differences have also been shown to be less pronounced when looking at indirect or relational bullying (Craig, 1998; Olweus, 1994; Underwood, Galen, & Paquette, 2001), which is approximately equal among boys and girls. Research has also shown that girls are subjected to bullying behaviors more often by boys (Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001; Salmon, James, Cassidy, & Javaloyes, 2000). Olweus (1991 & 1994) reported that of the girls in his sample surveyed in grades 5 through 7, 60% of the girls reported being bullied mainly by boys, while 15% to 20% reported being bullied by both girls and boys. More than 80% of the boys reported being bullied by other boys (Olweus, 1991).

A few consistencies have been reported in the literature describing characteristics among bullies, victims, and BVs based on gender. Male bullies are seen as dominating, disruptive in class, and unable to concentrate (Kumpulainen, Rasanen, Henttonen, Almqvist, Krevanov, Linna, et al., 1998), and often report more physical aggression (Craig, 1998). Craig (1998) also found that male BVs in lower grades report more physical and verbal

aggression, and male bullies and victims in higher grades reported more verbal aggression. In the higher grades, female bullies reported more physical and verbal aggression than comparison groups. Kumpulainen, Rasanen, Henttonen, Almqvist, Krevanov, Linna, et al. (1998) study demonstrated that among girls, BV scored highest on a measure of negative moods, while female bullies were seen as unbalanced, talkative, rude, dominating, and often used bad language.

This next section details information related to studies uncovering incidence rates of comorbid psychiatric diagnoses among children involved in bully/victimization behaviors.

#### Psychiatric Comorbidity and Bully/Victimization Behaviors

Involvement in bully/victimization behaviors appears to occur mutually with severe negative ramifications in the child or adolescent's emotional, social, psychological, and academic experience. However, few studies have attempted to determine rates of comorbid psychiatric diagnoses among children involved in bully/victimization behaviors (Coolidge, Den Boer, & Segal, 2004; Kumpulainen, Rasanen, & Puura, 2001; Salmon, James, Cassidy, & Javaloyes, 2000). This next section comprehensively details these three studies, since they are most relevant to the current study in terms of research methodology and characteristics of the study's sample. A brief overview will be presented of the prevalence rates for comorbid diagnoses with bully/victimization including Conduct Disorder/Oppositional Defiant Disorder, Depression, Anxiety, and one study specifically examining Learning Disabilities among children (Mishna, 2003). Next, a more comprehensive introduction to the prevalence, and possible explanation for the high incidence rates of ADHD among children and adolescent identified as victims, bullies, and BVs will be presented.

Salmon, James, Cassidy, and Javaloyes' (2000) study conducted in the United Kingdom utilized two groups, one from an outpatient adolescent mental health services clinic, and the other from a school for emotionally and behaviorally disturbed children (EBD school). For this population of outpatient adolescents presenting for mental health services, the International Classification of Diseases-10<sup>th</sup> Edition (ICD-10) was used to determine psychiatric diagnoses. Results from the outpatient group indicated that being bullied was a common factor in adolescents presenting for psychiatric services. Additionally, a high number of outpatient adolescents reported a history suggestive of recent involvement in bullying. In the group of adolescents attending the EBD school, DSM-IV criteria were utilized; students reporting involvement in bully/victimization behaviors appeared more psychologically disturbed, and more likely to be referred to mental health services than their peers.

Kumpulainen, Rasanen, and Puura (2001) interviewed 423 Finnish parents and 420 children (mean age = 8.4), and found that children involved in bully/victimization behaviors were more likely to have psychiatric disorders than noninvolved children. Further, children involved in bully/victimization behaviors were more likely to have used mental health services at some point in their lives, and also during the previous three months, and were more likely to be referred for psychiatric consultation.

Coolidge, Den Boer, and Segal (2004) identified a group of middle school students and matched controls in the United States, ages 11 to 15, and measured psychological and neuropsychological correlates of bullying behavior. Students were identified as bullies by teachers, school administrators, and by self-report, and parents completed the Coolidge

Personality and Neuropsychological Inventory (CPNI) based on DSM-IV-TR diagnostic criteria. Overall the results demonstrated that children identified as bullies were more likely to present with several DSM-IV-TR diagnostic categories in comparison to the matched control children. Additional results from each study based on specific diagnostic categories frequently found among children involved in bully/victimization behaviors are presented in the subsequent sections.

#### Conduct Disorder/Oppositional Defiant Disorder and Bully/Victimization Behaviors

Salmon, James, Cassidy, and Javaloyes (2000) found that the most common diagnosis for both bullies and BVs in the outpatient services were CD, and this was also frequently comorbid with ADHD. For the students attending the school for EBD, CD was the most frequent diagnosis whether the student was identified as a bully, victim, or BV. Again this was usually comorbid with ADHD, but with additional comorbid diagnoses of Generalized Anxiety Disorder (GAD) and Major Depressive Disorder (MDD). Kumpulainen, Rasanen, and Puura (2001) found that one of the most common diagnoses among children involved in bully/victimization behaviors were ODD and CD. Among children identified as bullies, 12.5% had a comorbid diagnosis of ODD/CD. For children identified as BVs, ODD/CD also was the most common diagnosis occurring in 21.5% of these children. Additionally the results suggest that CD is more related to children who bully others than to victims, which is supported by the Coolidge, Den Boer, and Segal (2004) study that established that bullying was associated more with diagnoses of CD and ODD.

#### Depression, Anxiety, and Bully/Victimization Behaviors

Salmon, James, Cassidy, and Javaloyes (2000) found that being bullied was a common factor among the adolescent sample presenting for psychiatric services, with depression being diagnosed in 70% of the cases. Depression was the most common diagnosis in the bullied group, which often presented with self harm and school refusal. Students from the EBD school identified as bullies were also frequently diagnosed with MDD and GAD. Identified victims had diagnoses of MDD, while the identified BVs had dysthymia, GAD, and MDD. Furthermore, over 70% of adolescents who were bullied prior to presentation in the outpatient services had a diagnosis of depression, compared with only 25% of the psychiatric control group.

In Kumpulainen, Rasanen, and Puura's (2001) study, depression was one of the most common diagnoses among children involved in bully/victimization behaviors. Depression was common among bullies (12.5%), victims (9.7%), and in particular BVs (17.7%). Suicidal ideation was higher among female victims and bullies, and among male bullies. Anxiety was more common among the children identified as victims (e.g., 8.7%). These results are consistent with Coolidge, Den Boer, and Segal (2004), who found that bullying was associated more with diagnoses of depressive disorder, but not anxiety, compared with noninvolved children. This study additionally indicated that certain items on the Depressive Disorders Scale of the CPNI differentiated bullies from non-bullies. These items included information related to sadness, low self esteem, feelings of worthlessness, and depression.

#### Learning Disabilities (LD) and Bully/Victimization Behaviors

While Coolidge, Den Boer, and Segal's study (2004) did not specifically assess for LD, the results demonstrated that over 61% of the identified bullies in this study had



clinically elevated T scores on the CPNI scales related to academic problems. Parents of these children who were identified as bullies, reported their children having significant reading problems (34%), math problems (37%), learning problems (27%), and trouble concentrating (56%), as defined on the CPNI. Mishna (2003) indicated that children diagnosed with LD are at increased risk for peer victimization, but are no more likely to bully other peers. Mishna reasons children diagnosed with LD are less socially competent than their peers, given the difficulties this population faces in terms of problems with language, attention, and information processing. Furthermore, the author indicates that children diagnosed with LD seem to have more limitations in everyday social interaction and communication since they have additional difficulties interpreting social information, such as facial expressions. It is estimated that 25% to 30% of children with LD are socially rejected in comparison to 8% to 16% of peers without LD. This frequent social rejection and isolation makes children with LD susceptible to further victimization from lack of social support and protection (Mishna, 2003).

#### ADHD and Bully/Victimization Behaviors

Several parallels have been made among the social, psychological, and behavioral attributes children diagnosed with ADHD display that appear to put these children at increased risk for involvement in bully/victimization behaviors. As reported in the section on Social Deficits and Behaviors of ADHD Associated with Bully/Victimization, Shea and Wiener (2003) described some of these attributes including the social incompetence, emotional volatility, lack of insight, and immaturity seen in some children diagnosed with ADHD. Those attributes appear to exacerbate the accompanying social isolation and

exclusion children with ADHD experience, and reinforce them as being seen as ‘different’ from their peers (Shea & Wiener, 2003).

Additionally, analogous comparisons have been made between certain characteristics seen in children with ADHD, and characteristics of BVs. Schwartz, Proctor, and Chien (2001) described BVs as emotionally dysregulated, and the authors presented evidence that dysregulation or impulsive forms of externalizing behaviors are more closely associated with victimization than organized, goal-oriented behaviors. The authors elaborated that children identified as BVs appear as though their behavior is driven by intense underlying states of anger and emotional distress, poorly regulated internal impulses, or short-term reinforcers in the environment, similarly as children diagnosed with ADHD. Typical behaviors include retaliatory forms of aggression, hyperactivity, and off-task behaviors (Schwartz, Proctor, & Chien, 2001). The authors further commented that aggressive children who are rejected within the social context may be at high risk for harassment.

A few studies in the literature have associated aggressive behaviors with a subset of children diagnosed with ADHD. These aggressive behaviors have also been associated with the deficits in EF, and social difficulties commonly seen children diagnosed with ADHD. Hinshaw and Melnick (1995) reported that aggression and noncompliance were cited as reasons for peer rejection of children with ADHD. Further, the boys with ADHD classified as highly aggressive self-reported social goals of a sensation-seeking nature, and were observed to be more emotionally reactive. These highly aggressive boys with ADHD were rated significantly worse on peer sociometric status than were non-aggressive boys also diagnosed with ADHD.

Identifying and understanding the relationship between bullying/victimization behaviors and ADHD has been promoted by a few different studies that identified the prevalence of DSM and ICD diagnostic classifications among children and adolescents described as bullies, victims, and BVs (Coolidge, Den Boer, & Segal, 2004; Salmon, James, Cassidy, & Javaloyes, 2000; Kumpulainen, Rasanen, & Puura, 2001; Unnever & Cornell, 2003). The results suggest that the diagnosis of ADHD is highly prevalent among children and adolescents involved in bully/victimization behaviors.

Kumpulainen, Rasanen, and Puura (2001) found almost one third of the bullies in their sample were also diagnosed with ADHD (29.2%), 17.7% of the BVs were diagnosed with ADHD, and 14.4% of victims were diagnosed with ADHD. Salmon, James, Cassidy, and Javaloyes (2000) reported that adolescents presenting in an outpatient setting identified as bullies were frequently diagnosed with ADHD (75%). For the students attending the EBD school, a comorbid diagnosis of ADHD was also common among bullies (44.4%), BVs (12.5%), and victims (60%). Kumpulainen, Rasanen, and Puura (2001) cited Olweus' (1994) rationale for the high incidence of ADHD among bullies and BVs. Olweus claimed that impulsivity and a strong need to dominate others characterize bullies, and that hyperactivity is more common among bullies. Furthermore, Olweus cited evidence that BVs have more problems with concentration and hyperactivity, and behave in ways that cause irritation and tension around them.

Deficits in self control appear to play a significant role in the association between bullying behaviors and ADHD. Unnever and Cornell (2003) found among a sample of 1315 middle school students, that students reporting taking medications for ADHD were at

increased risk for bullying and victimization. Furthermore, students taking medications for ADHD were more likely to report lower self control. In the sample, 12% of students reporting taking medications for ADHD also reported bullying at least 2 to 3 times per month, and 34% reported being bullied 2 to 3 times per month in comparison to students not taking medications who reported bullying (8%) and being victimized (22%) in that same time period. The relationship between ADHD and bullying could be explained by low self control, although the relationship between ADHD and victimization was independent of self control.

Unnever and Cornell (2003) hypothesized that children diagnosed with ADHD have negative interpersonal characteristics that increase the risk of involvement in bully/victimization behaviors, including poor social status and social skills resulting in peer rejection and isolation, and general difficulties in academic and discipline problems. Additionally, other symptoms and behavioral problems were identified that increased the likelihood of victimization for children diagnosed with ADHD such as inappropriate behavior, anxiety, depression, and low self-esteem. For bullies, the authors indicated that impulsivity is an important psychological correlate of both ADHD and bullying. Overall, ADHD was the variable most strongly related to being a victim even among other possible determinants including self-control, age, and gender. These results suggested that students taking medication for ADHD have a higher probability of being bullied because they have symptoms related to their ADHD that are independent of low self control (Unnever & Cornell, 2003).

ADHD, EF, and Bully/Victimization Behaviors

Past literature indicates that the relationship between ADHD and impairments in EF is a manifestation of dysfunction in the prefrontal striatal circuits of the frontal lobes. As previously suggested, research has also shown that bully/victimization behaviors are common among pediatric populations diagnosed with ADHD. There is some evidence in the literature that deficits in EF, both cognitive and emotional, which are sometimes displayed by children diagnosed with ADHD, contribute to the manifestation of bullying/victimization behaviors in these populations.

Halperin, Newcorn, Matier, Bedi, Hall, and Sharma (1995) found that in a group of children ages 7 to 13 years old, those who initiated physical fights were rated as significantly more impulsive than those children who did not initiate fights. Impulsivity was defined by the number of impulsive errors (e.g., commission errors that occurred under rapid reaction times) on the Continuous Performance Test (CPT). Children identified with a previous history of instigating fights on a routine basis were found to be more impulsive on the CPT. This was irrespective of the presence or absence of ADHD; however, children diagnosed with ADHD performed more impulsively on the CPT. Impulsivity, as defined by impulsivity errors on the CPT, was not associated with diagnoses of CD and ODD. Children diagnosed with ADHD who did not initiate fights had significantly more CPT inattentive errors (e.g., omission errors and correct responses with significant longer reaction times) overall. The authors noted that children in the sample who were hyperactive, but not inattentive, were more likely to initiate fights, suggesting that only certain ADHD subtypes may be associated with physical aggression.

Coolidge, Den Boer, and Segal (2004) specifically assessed the relationship among ADHD, bullying behaviors, and EF deficits, which approximates the aim of the current study. As previously discussed, this study examined middle school students ages 11 to 15 identified as bullies by self, teacher, and school administrators reports. The students were compared with matched controls utilizing psychological and neuropsychological correlates of bullying behavior, including the parent reported responses on the Coolidge Personality and Neuropsychological Inventory (CPNI). The students identified as exhibiting bullying behaviors, as defined by self and informants reports, had significantly higher T scores on the CPNI's ADHD scale compared the noninvolved control group. Further, students identified as bullies had higher T scores in comparison to the matched control group on the CNPI's scale of General Neuropsychological Dysfunction and Executive Function Deficit scale. Students identified as bullies also significantly elevated the three CPNI Executive Function Deficit subscales, including the subscale measuring decision making, planning and organization, the metacognitions subscale (e.g., problems with learning, reading, memory, concentration, and integrating information), and the social judgments subscale (e.g., social misjudgments including poor interpersonal decision-making and choices). In the group identified as bullies, 32% were clinically elevated on the Executive Function Deficit scale, while 61% of this group had significant elevations on the General Neuropsychological Dysfunction scale.

Coolidge, Den Boer, and Segal (2004) suggested that the study's findings imply EF deficits accompany bullying behaviors, since the results demonstrated that as a group, students identified as bullies were significantly elevated on the Executive Function Deficit

scales compared with children in the control group. The authors also suggested that there may be different subtypes of bullies, including some of which have more wide-ranging neuropsychological dysfunction, as opposed to EF deficits specifically. Coolidge, Den Boer, and Segal (2004) did comment that future research should be conducted utilizing performance measures of EF since the CPNI is only an informant-reported measure, and also assessing victimization in addition to bullying behaviors.

As an explanation for the study's results, Coolidge, Den Boer, and Segal (2004) presented Grisby and Stevens' (2000) theory that proper functioning in the brain's frontal system provides a foundation for the understanding and displaying of appropriate social behaviors. Additionally, optimal frontal system functioning creates a basis for the inhibition of irrelevant and inappropriate behaviors. The Coolidge, Den Boer, and Segal (2004) study indicated that children who display bullying behaviors may be deficient in frontal system functioning, and this is demonstrated by deficiencies in their ability to inhibit aggressive and inappropriate verbal and physical actions. This was observed by the other scale elevations in the group of students identified as bullies including the CPNI's Dangerousness, Aggression, Emotional Liability, and Disinhibition scales. According to the authors, this finding is consistent with other literature indicating that children identified as bullies have significant problems with impulse control, anger, and emotional control.

#### Summary and Rationale for the Present Study

Previous literature describes the numerous difficulties children with ADHD face within the social realm, and the unsatisfactory interpersonal relationships these children have, characterized by dysfunctional and disappointing interactions (Barkley, 2002; Cantwell,

1996; NIH, 2000; Teeter & Semud-Clikeman, 1995; Wheeler & Carlson, 1994). In addition to the difficulties in interpersonal and social relations, observations suggest that children with ADHD have deficiencies in the ability to regulate their affective experiences (American Academy of Pediatrics, 2000; Barkley, 1997a, 1997b; Barkley, Grodzinsky, & DuPaul, 1992; Brown, 2000; Cantwell, 1996; Cole, Zahn-Waxler, & Smith, 1994; Hinshaw & Melnick, 1995; Maedgen & Carlson, 2000; Mash & Wolfe, 2000). Deficits in EF have also been well-documented in children diagnosed with ADHD, based on both performance-based neuropsychological tests (e.g., Barkley, Grodzinsky, & DuPaul, 1992; Pennington & Ozonoff, 1996; Sergeant, Geurts, & Oosterlann, 2002), and EF rating scales (Gioia, Isquith, Guy, & Kenworthy, 2000; Gioia & Isquith, 2004; Molho & Silver, 1997). Furthermore, emotional regulation has also recently been recognized as a component of EF (Barkley, 1997a, 1997b, Brown, 2000; Gioia, Isquith, Guy, & Kenworthy, 2000; Gioia & Isquith, 2004), and equally one that has shown to be deficient in some children diagnosed with ADHD (Barkley, 1997a, 1997b; Brown, 2000; Maedgen & Carlson, 2000).

A few studies have described the constructs related to the social/interpersonal problems of children diagnosed with ADHD in a manner that seems to reflect similar constructs that are measured by EF tests (Hoza, Waschbusch, Pelham, Molina, & Milich, 2000; Maedgen & Carlson, 2000; Shea & Wiener, 2003; Whalen & Henker, 1992). It is likely that the deficits in EF, including emotional regulation, may contribute to the substantial impediments children diagnosed with ADHD face within their interpersonal and social worlds. The diagnosis of ADHD also appears frequently in groups of children and adolescents identified as victims, bullies, and BVs (Coolidge, Den Boer, & Segal, 2004;



Kumpulainen, Rasanen, & Puura, 2001; Salmon, James, Cassidy, & Javaloyes, 2000).

Further, the literature indicates that some of the specific interpersonal problems children with ADHD experience, also put them at increased risk for peer victimization (Maedgen & Carlson, 2000; Olweus, 1994; Schwatz, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1998; Shea & Wiener, 2003; Whalen & Henker, 1985; Wheeler & Carlson, 1994), and aggressive/bullying behaviors (Barkley, 1997b; Halperin, Newcorn, Matier, Bedi, Hall, & Sharma, 1995; Hinshaw, 1987; Hoza, Waschbusch, Pelham, Molina, & Milich, 2000; Wheeler & Carlson, 1994). One study (Coolidge, DenBoer, & Segal, 2004) that assessed the relationship among ADHD, EF, and bullying, indicated that children identified as bullies had more symptoms consistent with the diagnosis of ADHD. Moreover, the children identified as bullies demonstrated more deficits in EF compared to matched control children, suggesting an apparent relationship among these variables.

#### Aims for Present Study

The goal of the present study is to enhance the understanding of the relationship among ADHD, EF, and bully/victimization behaviors by multiple means. This study will improve upon the preceding literature by utilizing both standardized performance-based and informant measures of EF. The specific components of EF and the measures selected for this study are based on several meta-analytical studies that documented the utility of these tasks in defining executive dysfunction in children diagnosed with ADHD. This study will add to the sparse literature examining ADHD, EF, and bully/victimization behaviors by examining levels of involvement in bullying and victimization, and both direct and relational bullying and victimization, areas which have not been previously explored.

### Hypotheses and Statistical Analyses

Analyses of the data were conducted utilizing correlational procedures. Based on the results of the correlations, multiple regression analyses were conducted to determine which performance-based, and informant ratings of EF best predict level of involvement in both the teacher-and self-reported bullying and victimization behaviors.

Hypothesis 1: There will be a significant negative correlation between the Wechsler Intelligence Scale for Children- 4<sup>th</sup> Edition (WISC-IV) Integrated Digit Span Backward (DSB) scaled score, and both the self-report and teacher-report scores on the bullying and victimization measures.

Hypothesis 2: There will be a significant negative correlation between the Wisconsin Card Sorting Test (WCST) Perseverative Responses standard score, and both the self-report and teacher-report scores on the bullying and victimization measures.

Hypothesis 3: There will be a significant positive correlation between the Category Test (CT) Total Error score, and both the self-report and teacher-report scores on the bullying and victimization measures.

Hypothesis 4: There will be a significant negative correlation between the Tower of London (TOL) T Score, and both the self-report and teacher-report scores on the bullying and victimization measures.

Hypothesis 5: There will be a significant negative correlation between the Delis-Kaplan Executive Function System (D-KEFS) Letter Fluency scaled score, and both the self-report and teacher-report scores on the bullying and victimization measures.

Hypothesis 6: There will be a significant negative correlation between the Delis-Kaplan Executive Function System (D-KEFS) Interference scaled score, and both the self-report and teacher-report scores on the bullying and victimization measures.

Hypothesis 7: There will be a significant positive correlation between the teacher-reported Children's Executive Function Scale (CEFS) Total score and subscales, and both the self-report and teacher-report scores on the bullying and victimization measures.

Hypothesis 8: There will be a significant positive correlation between the Brief Rating Inventory of Executive Function (BRIEF) Emotional Control T score, and both the self-report and teacher-report scores on the bullying and victimization measures.

## CHAPTER 3

### METHODS

#### Participants

Students from The Shelton School, who were initially enrolled in an ongoing study with the University of Texas Southwestern Medical Center at Dallas on executive functioning, were recruited for this study. The Shelton School is a private school for children diagnosed with language-learning differences. A total of 24 students agreed to participate in the ongoing EF study.

The inclusion criteria for this study included children with a previous diagnosis of ADHD, who were between the ages of 8 years, 0 months and 12 years, 11 months at the time of the initial neuropsychological testing. The exclusion criteria included children who had been diagnosed with any major neurological condition, either congenital or acquired.

Table 1 presents the descriptive statistics for the demographic variables. The participants' ages ranged from 8 to 12.5 years, and 54% of the participants were females. The majority of the students who participated in the study were in the 4<sup>th</sup> through 6<sup>th</sup> grades, and all participants were Caucasian. Table 1 also presents data on the reported comorbid diagnoses in the sample. Diagnoses for this sample were based on parent report, and inspection of the child's school records from The Shelton School. Overall, 62% of the sample were diagnosed with Attention-Deficit/Hyperactivity Disorder-Combined Type, while 38% were diagnosed with Attention-Deficit/Hyperactivity Disorder-Inattentive Type. Consistent with the literature on comorbid diagnoses and ADHD, all of the children in this sample, except one child, had at least one additional diagnosis. In this sample 88% of the

children had 2 in addition to the diagnosis of ADHD. The most common comorbid diagnosis in this sample was dyslexia (75%).

### Procedures

Parents who consented for their children to participate in the initial EF study completed the Executive Function Study Information Sheet, CEFS, BRIEF, and Connors' Parent Rating Scale-Revised (see Materials). The children were tested at The Shelton School with a short-form test of intelligence and measures of EF. Attempts were made to present the series of tests in the same order for all participating children; however, mechanical error during the Category Test prevented this. Some of the children were administered the Category Test several days subsequent to administration of the initial battery of EF measures, and some children completed the Intermediate Booklet Category Test (IBCT). Two children, who were both age 8, did not receive the Category Test since the IBCT has an age range from 9 to 14.

Following testing, parents were given a written report of the test results, and this letter additionally included information about the present study. After IRB approval was granted, the author of the current study re-contacted these parents to ask for their continued participation in this study. All parents and children again consented to participate in the current study. The children completed the self report measures of bullying and victimization behaviors, and the children's current homeroom teacher, or another available teacher who could comment on the child's behavior at The Shelton School, completed the teacher report measures of bullying and victimization behaviors, as well as the CEFS.

Both the child and the teacher were presented with instructions for completing the bully/victimization questionnaires. Written instructions were provided initially to both the children and teachers on the questionnaires that assess the child's experience with commonly defined bully/victimization behaviors (See 1<sup>st</sup> paragraph on Appendices C–G). This researcher read out loud these instructions to the children, and asked the child to respond to the items on the bully/victimization questionnaires based on these criteria outlined in the instructions. This procedure was implemented to ensure the data reported by the participants is consistent with bully/victimization behaviors, as opposed to more general occurrences of peer aggression and victimization, and to provide the informants with as much privacy as possible while responding to the questionnaires.

## Materials

### Estimated IQ

#### Wechsler Intelligence Scale for Children-3<sup>rd</sup> Edition (WISC-III): Vocabulary & Block Design Subtests

The WISC-III (1991) is an individually-administered test of intelligence for children ages 6:0 through 16:11. The WISC-III assesses both verbal and nonverbal aspects of intelligence and consists of 13 subtests and includes 2 scales, the Verbal Scale (VIQ) and Performance Scale (PIQ). Ten of the thirteen subtests additionally comprise a measure of general intellectual abilities, the Full Scale IQ (FSIQ). For this two tests utilized to estimate Full Scale IQ (FSIQ) are Vocabulary and Block Design. The Vocabulary subtest requires the child to define the meanings of words of increasing difficulty. The Vocabulary subtest is part of the VIQ, and it is considered a measure of word knowledge. The Block Design subtest

requires the child to replicate designs of increasing difficulty using three-dimensional blocks. The Block Design subtest is part of the PIQ, and it is considered a measure of visual-spatial abilities, nonverbal concept formation, and abstract conceptualization (Sattler, 2001). These subtests have been shown to have excellent reliability and validity, and to correlate highly with FSIQ. The correlations between the subtest scores and FSIQ across all ages are 0.79 for Vocabulary, and 0.74 for Block Design. The average internal consistencies for the two subtests determined by split-half reliability are 0.87 for Vocabulary, and 0.87 for Block Design. The average test-retest reliability coefficients are 0.89 for Vocabulary and, 0.77 for Block Design (Wechsler, 1991). The Vocabulary and Block Design subtests from the WISC-III were used to estimate full scale IQ by calculating the WISC-III Deviation Quotients as listed in Sattler (2001; p. 774). The composite has shown to have satisfactory reliability and validity (e.g.,  $r_{xx} = 0.91$  and  $r = 0.86$ ).

#### EF Performance Battery

##### Digit Span-Wechsler Intelligence Scale for Children- 4<sup>th</sup> Edition (WISC-IV) Integrated

The WISC-IV is an individually-administered broad clinical measure for assessing intelligence and cognitive processes of children aged 6:0 through 16:11 (Wechsler, Kaplan, Fein, Kramer, Morris, Delis, & Maerlender; 2004). The WISC-IV includes four index scores including Verbal Comprehension (VCI), Perceptual Reasoning (PRI), Working Memory (WMI), and Processing Speed (PSI), and a composite score that represents general intellectual ability (FSIQ). Additional process subtest modifications are incorporated into the WISC-IV Integrated to provide more measures of cognitive abilities that may be utilized to test specific hypotheses regarding underlying cognitive processes and test taking

behaviors. As reported in the manual, the WISC-IV Integrated was developed to enhance clinical utility, increase developmental appropriateness, improve psychometric properties, and to increase user friendliness.

Digit Span (DS) is a WMI subtest composed of two parts: Digit Span Forward (DSF) and Digit Span Backward (DSB). Digit Span Forward involves the child repeating increasing spans of numbers read by the examiner. This part of the DS subtest involves rote memory, learning, and attention. Digit Span Backward requires the child to repeat a series of numbers in reverse order of what is verbally presented by the examiner, and this part reportedly requires WM, transformation of information, mental manipulation, and visuospatial imaging (Wechsler, Kaplan, Fein, Kramer, Morris, Delis, & Maerlender, 2004). The WISC-IV Integrated provides separate process scores for DSB and DSF since research has demonstrated greater demands on WM for DSB than DSF.

The DS subtest has good internal consistency reliability coefficients, obtained by the split-half method (e.g., correlation between the total scores of the two half-tests corrected by the Spearman-Brown formula for the full subtest). For DSB in children ages 8 through 12, these reliability coefficient are respectively 0.68, 0.77, 0.77, 0.80, and 0.82. For a sample of children diagnosed with ADHD, the reliability coefficient was 0.81. The standard error of measurements for DSB for children 8 through 12 respectively are 1.70, 1.44, 1.44, 1.34, and 1.27. Estimates of the test-retest stability for DS overall are good (0.80s). Validity of DS is demonstrated by the intercorrelations of DS being higher with the WMI than to other Index or IQ scores. Moreover, verification of DS as a subtest of the WMI has been demonstrated



by both exploratory and confirmatory factor analysis (Wechsler, Kaplan, Fein, Kramer, Morris, Delis, & Maerlender, 2004).

#### Delis-Kaplan Executive Function System (D-KEFS)

The D-KEFS (Delis, Kaplan, & Kramer, 2001) is a compilation of modifications on established experimental and/or clinical tests designed to assess the higher-order cognitive functions of executive functioning. The D-KEFS is standardized for both children and adults ages 8 to 89 years, and represents one of the first nationally-normed tests solely designed to assess EF. While the D-KEFS includes nine tests that measure both verbal and nonverbal aspects of EF, the following two subtests were utilized in the present research based on the literature demonstrating their effectiveness discriminating between children diagnosed with ADHD, and other normal and clinical populations.

#### D-KEFS Color-Word Interference Test

This task was first developed by Stroop (1935) as a means to study verbal interferences effects. The primary executive function measured in this task is inhibition of a more habitual verbal response (e.g., reading) in order to generate a conflicting response of naming the dissonant ink colors. While numerous version of the Stroop exists in the experimental literature, at least two versions of the Stroop have been published in the literature for clinical use (Golden, 1978; Trenerry, Crosson, DeBoe, & Leber, 1989).

The D-KEFS Color-Word Interference Test is comprised of two baseline conditions (Color Naming and Word Reading), and two higher level conditions (Inhibition and Inhibition/Switching). Condition 1, the Color Naming, includes asking the examinee to name color patches. Condition 2, Word Reading, involves the examinee reading color names

printed in black ink. In Condition 3, Inhibition, the examinee is given a page of color names that are printed in a different colored ink, and asked to name the color of the ink the letters are printed in, and not the word. For the purposes of this study, the Inhibition Condition score will be the variable analyzed in the data.

The D-KEFS Color-Word Interference Test included Condition 4, Inhibition/Switching, which is a newer component based on the work of Bohnen, Twijnstra, and Jolles (1992), who demonstrated that assigning a switching procedure to the interference condition enhanced the sensitivity of the task to mild brain damage. In this condition, again the examinee is given a page of color names that are printed in a different colored ink, and asked to name the color of the ink the letters are printed in, not the word; however, occasionally within the list of words, some words are inside a box. The examinee is asked to name the word, not the color of the letters the word is printed in, when this occurs. Delis, Kaplan, and Kramer (2001) rationalize that this condition not only measures inhibition, but additionally cognitive flexibility. For each condition, normative data is provided for completion time, errors, and contrast score to parcel out the effects of the baseline scores from the higher level tasks.

Reliability for the D-KEFS Color-Word Interference Test has been demonstrated by internal consistency values for the Combined Color Naming + Word Reading Composite Scores, which range from 0.72 to 0.79 for ages 8 to 12. Further, the test-retest reliability coefficients for ages 8 to 19 range from 0.77 to 0.90, and estimates of the standard error of measurement for ages 8 through 12 range from 1.38 to 1.59. The validity of the D-KEFS Color-Word Interference Test has been shown by the time-completion measures for the four

conditions having moderate positive intercorrelations. Additionally, higher correlations occur between the Color Naming and Word Reading conditions, and between the Inhibition and Inhibition/Switching conditions (Delis, Kaplan, & Kramer, 2001).

#### D-KEFS Verbal Fluency Test

Thurson originally developed the first written word fluency test in 1938 as part of his Primary Abilities Tests, and variants of this test have been widely utilized in the clinical neuropsychological evaluations. Most frequently utilized verbal fluency, the COWAT (Controlled Oral Word Association Test), was developed by Benton and colleagues (Benton & Hamsher, 1976; Spreen & Benton, 1969) and it measures verbal fluency in an oral format. Additionally, Newcombe (1969) devised category fluency procedure with simultaneous switching between semantic categories.

The D-KEFS Verbal Fluency Test is devised of three conditions including Letter Fluency, Category Fluency, and Category Switching Condition. In the Letter Fluency Condition, the examinee is asked to name as many words they can think of that start with a particular letter (F, A, and S) within a 60 second time span. The examinee is additionally told that none of the words can be names of people, places, or numbers. This portion of the Verbal Fluency Test reportedly taps phonemic fluency while the examinee has to simultaneously observe several rules and restrictions. For the Category Condition, the examinee is asked to name as many words within a given semantic category, also within a 60 second time span. For this study the two trials included the semantic categories of animals and boy's names. This condition is believed to assess the examinees ability to rapidly generate semantic information described as overlearned concepts. In the last condition, the

Category Switching, the examinee is told to say as many words, switching back and forth between two semantic categories, over a 60 second time span. For this study fruits and pieces of furniture was used as the two categories. Not only does this task require simultaneously shifting between the overlearned semantic concepts, but it additionally requires cognitive flexibility. For each condition, process measure included are the number of correct responses, contrast measures among the various conditions, error types including repetition and set-loss errors, and time interval analyses (Delis, Kaplan, & Kramer, 2001).

During each condition, performance is assessed within 4 time intervals (15 seconds each). Internal consistencies were computed by comparing the specific split-half tests by interval. The internal consistency values ranged from moderate to high for children ages 8 through 12. For the Letter Fluency condition these values ranged from 0.68 to 0.80, for the Category Fluency Condition 0.58 to 0.75, Category Switching Total Correct 0.62 to 0.37, and Category Switching Total Switching 0.53 to 0.76. The test-retest reliability coefficients for children ages 8 to 19 ranged from 0.53 to 0.70. The standard error of measurement for children ages 8 through 12 in Letter Fluency ranged from 1.33 to 1.69, Category Fluency 1.50 to 1.94, Category Switching Total Correct 1.85 to 2.37, and Category Switching Total Switching 1.48 to 2.06 (Delis, Kaplan, & Kramer, 2001).

The validity of the Verbal Fluency Test for normal functioning individuals is demonstrated by the moderate associations that are present between Letter Fluency, Category Fluency, and Switching Conditions. The time interval measures had a moderate to high correlation with overall achievement scores (Delis, Kaplan, & Kramer, 2001).

Wisconsin Card Sorting Test (WCST)

The WCST was originally developed by Berg (1948) to assess cognitive flexibility and set shifting. The WCST has gained support in the literature as a measure sensitive to frontal lobe deficits (Milner, 1963; Robinson, Heaton, Lehman, & Stilson, 1980), and it has been regarded as the most widely utilized neuropsychological measure of EF (Butler, Retzlaff, & Vanderploeg, 1991). The WCST was standardized and formally published by Heaton (1981) and the manual was revised in 1993 by Heaton, Chelune, Tally, Kay, and Curtiss. The WCST has also gained support as a measure of EF in children by Chelune and Baer (1986), who published the first normative data for children, demonstrating that the WCST can be used as an appropriate tool to assess set-shifting and problem solving behavior in younger populations.

During this task, the examinee is instructed to match a deck of response cards to 1 of 4 stimulus cards using three different sorting rules. The 4 stimulus cards and 128 response cards depict various forms (e.g., triangle, stars, crosses, and circles), of differing colors (red, yellow, blue, and green), and number of figures (e.g., one, two, three, and four). The examinee must match the cards by one of the three rules (e.g., color, form, or number). The sorting rules are not given to the examinee, but must be inferred from the examiner's verbal feedback about whether the response was correct or incorrect. The matching principles change without the knowledge of the examinee after he/she correctly matches ten cards in a row. The test continues until the examinee has correctly matched 10 consecutive cards on 6 separate trials, has attempted greater than 64 cards in one category, or has used all 128 cards. Derived scores include Total Number of Correct Responses, Total Number of Errors, Number of Categories Completed, Number of Trials to Complete First Category,

Perseverative Responses, Perseverative Errors, Percent Perseverative Errors, and Failure to Maintain Set (Heaton, Chelune, Tally, Kay, & Curtiss, 1993).

The interrater reliability of the WCST has been reported by Axelrod, Goldman, and Woodard (1992) to be excellent range with correlations ranging from 0.88 to 0.93. Demonstration of test-retest reliability is problematic for the WCST, given that once the rules are understood by an examinee, these rules are also likely to be retained (Denckla, 1994; Gioia, Isquith, & Guy, 2001). The validity of the WCST has been demonstrated by the ability of the measure to discriminate among a number of clinical groups (Heaton, Chelune, Tally, Kay, & Curtiss, 1993), including in adults, adolescent, and child populations. Further, several studies (Chelune & Baer, 1986; Levin, Culhane, Hartmann, Evankovich, Mattson, Harward, et al., 1985; Welsh, Pennington, & Groisser, 1991) have shown developmental improvements in performance on the WCST throughout childhood.

#### Category Test (CT) for Older Children

The CT was developed by Halstead (1947) as part of the Halstead Reitan-Neuropsychological Battery as a measure of abstraction and concept formation. The CT reportedly is one of the most sensitive measures in the Halstead-Reitan Batteries to cerebral damage, and it is a globally sensitive measure of brain integrity, with reports of 95% hit rates in discriminating brain damaged from intact subjects (Byrd, 1987; Reitan & Wolfson, 1992). The Older Children's version is appropriate for children ages 9 to 14, and consists of 168 visually presented items, organized into 5 item sets based on different principles, with the 6<sup>th</sup> made up of previously seen items. The examinee is required to examine a set of visual

stimuli and deduce a common organization principle, and the test also requires the ability to learn from feedback (Tanel, Anderson, & Benton, 1994).

The items for the machine version of the CT are presented on an 8" X 10" projector screen, with an answer panel that contains four levers numbered 1 through 4, which is attached to the test apparatus below the screen. The child is told to examine each stimulus figure on the screen, and press down on the lever corresponding to the correct answer, which alters the child's performance based on auditory positive and negative feedback. When the child depresses the lever, this either causes a bell or buzzer to sound. If the examinee is correct, the bell will sound (positive feedback), and if the response is incorrect, the buzzer will sound (negative feedback). The child is told there is only one choice per stimulus. The child is additionally told that the CT is divided into 6 subtests with one idea or principle within each subtest, and that it is possible that the idea can be the same or different from the last subtest.

The 1<sup>st</sup> subtest is fairly easy with Roman numerals presented on the screen, and the child is asked to match this stimuli with the Arabic numerals presented on panel. The 2<sup>nd</sup> subtest's correct answer corresponds to the number of items appearing on the screen. The 3<sup>rd</sup> subtest is based on concept of uniqueness, which is indicated by the figure (1 of 4 figures presented on the screen) that is most different from other figures. Both the 4<sup>th</sup> and 5<sup>th</sup> subtests are organized according to the principle of proportion of the figure that is composed of solid versus dotted lines. The 6<sup>th</sup> and final subtest is made of previous presented items, and the child is asked to remember the correct answer, and give that same answer again (Reitan & Wolfson, 1992).

The test produces a single score based on the number of incorrect responses, which ranges from 0 to 168. The raw scores for incorrect responses are then transformed into T scores based on the child's chronological age. The CT has been able to discriminate between children with and without brain impairment (Baron, 2004), and Gioia, Isquith, and Guy (2001) report that the split-half reliability is good, while the test-retest reliability is variable.

#### The Intermediate Booklet Category Test (IBCT)

The IBCT (DeFilippis & McCampbell, 1979; DeFilippis, McCampbell, & Rogers, 1979; McCampbell & DeFilippis, 1979) was developed to improve upon some of the impracticalities involved with the original CT including being more mobile (Byrd, 1987). The IBCT is a booklet version of the Category Test for older children, ages 9 through 14. It is composed of 168 stimulus items, which are replicates of the original slide version of the CT. As with the CT, the IBCT is divided into six subtests, although the items in the IBCT are contained in two binders. The stimulus items are presented as white designs on a black background, while the responses (e.g., the numbers 1, 2, 3, and 4) are provided on a cardboard response strip. The examinee is asked to point to the response on the cardboard strip.

Concurrent validity of the IBCT has been established with the CT utilizing normal control children, and children diagnosed with learning disabilities and behavioral disorders. Correlation coefficients between the IBCT and CT with groups of children ages 9 to 12 identified as normal and learning disabled are respectively, 0.94, 0.82, 0.86, and 0.80 (Bryd & Warner, 1986). In another study comparing children in regular education (RE) classes, and children in special education classes diagnosed with behavior disorders (BD), the



correlations coefficient was 0.95 overall for all children, 0.94 for the students in RE, and 0.91 for the students diagnosed with BD (Bryd & Ingram, 1987).

### Tower of London (TOL)

The TOL was developed by Shallice (1982) as a measure of planning ability and problem solving. Krikorian, Bartok, and Gay (1994) published standardized instructions, scoring rules, and normative data for pediatric populations, and this method was utilized in the current study. The TOL is a transfer task which consists of 3 wooden pegs of increasing heights mounted on a wood base. Three colored balls (red, blue, and yellow) are moved from peg to peg in order to achieve a displayed configuration, which is presented standard 8 X 11.5 inch card. There are 12 configurations of graded difficulty, with 3 trials allowed for each problem. Item scores range from 0 to 3 depending on if the child was able to match the configuration, and if so, in what trial. An item is scored correct if the configuration is achieved within the number of allowed moves, which ranges from 2 to 5. The TOL yields a total score ranging from 0 to 36, which is the sum of the points earned over the 12 items (e.g., 36 possible trials). Raw scores can be transferred to T scores based on the grade of the child (Krikorian, Bartok, & Gay, 1994). Rule violations and perseverations can also be scored. Rules provided to the child by the examiner prior to starting the task includes not moving two balls at once, not holding a ball in one hand while moving another ball, and not stacking more balls on a peg than is allowed. Any violations of these rules results in termination of that trial.

The TOL and other similar disc transfer tasks have shown to be developmentally sensitive and to be valid measures of planning (Anderson, Anderson, & Lajoie, 1996;

Denckla, 1994; Levin, Culhane, Hartmann, Evankovich, Mattson, Harward, et al., 1991).

Anderson, Anderson, and Gay (1994) confirmed the validity of the TOL as a measure of EF by demonstrating performance on the TOL is related to several other EF measures such as the Trail Making Task, COWAT, and Rey-Osterreith Complex Figure. Krikorian, Bartok, and Gay (1994) additionally demonstrated concurrent validity by correlating the TOL with the Porteus Maze Test (a measure of visuospatial planning) yielding a correlation coefficient of 0.55.

### Informant Rating Scales and Questionnaires

#### Children's Executive Function Scale (CEFS)

The CEFS (Silver, Kolitz-Russell, Bordini, & Fairbanks, 1993) is a 99-item informant-reported measure of executive functioning believed appropriate for children ages 6 to 12. Currently, only the parent form has been developed and tested for reliability; however, with the modification of one item, the CEFS is believed appropriate for use by teachers. The CEFS items are rated on a 3-point Likert scale, which indicates presence or absence of symptoms or behaviors (e.g., 0 = never, 1 = sometimes, 2 = very much); thus, the CEFS yields a possible score ranging from 0 to 198 (e.g., the CEFS Total Score). The CEFS subscales include Social Appropriateness (0-30 possible points), Inhibition (0-50), Problem Solving (0-68), Initiative (0-30), and Motor Planning (0-20).

Analysis of CEFS data (Silver, 1996) found the following test-retest reliability coefficients: Total Score (0.92), Social Appropriateness (0.85), Problem Solving (0.85), Initiative (0.81), and Motor Planning (0.81), in a sample of 44 children ages 6 to 13. The validity of the CEFS was demonstrated by a discriminant analysis of scores from an ADHD

group and control group, producing correct classification of 89% of the children with ADHD, and 92% of the controls (Molho, 1996). Additionally, low to moderate correlations between the CEFS Total Score and the Wisconsin Card Sorting Test (WCST) also were found. Similarly, using a heterogeneous group of children with neurological impairment, Goulden (1998) found significant correlations between subscales of the CEFS and the several neuropsychological measures and other parent rating scales. In particular, the CEFS Total Score was found to show significant correlations with results of the Conners' Parent Rating Scale and the Child Behavior Checklist.

#### Brief Rating Inventory of Executive Function (BRIEF)

The BRIEF was developed by Gioia, Isquith, Guy, and Kenworthy (2000) as a tool to assess the behavioral manifestations of EF in children aged 5 to 18 years with developmental disorders, neurological, psychiatric, and medical conditions. The BRIEF contains two index scores formed from eight subscales representing commonly discussed EF domains in the literature (Gioia & Isquith, 2004). The BRIEF also provides a Metacognitive Index and a Behavioral Regulation Index comprised of various subscales, and each of the 8 subscales then contributes to the composition score, the Global Executive Composite. These include the Metacognitive Index and associated subscales (e.g., Initiative, Working Memory, Plan/Organize, Organization of Materials, and Monitor) which purport to measure more cognitive aspects of EF, and the Behavioral Regulation Index (e.g., Inhibit, Shift, and Emotional Control) thought to measure more behavioral aspects of EF. Each of the 8 subscales then contributes to the composition score, the Global Executive Composite (Anderson, Anderson, Northam, Jacobs, & Mikiewicz, 2002; Gioia, Isquith, Guy, &

Kenworthy, 2000). The subscales, index scores, and domain score are calculated with T scores, with a mean of 50, and scores of 65 or over being considered abnormally elevated.

#### BRIEF Emotional Control Scale

The Emotional Control Scale, which includes 10 items, was designated as a means to assess the emotional aspects of EF, and the child's ability to modulate his/her emotional response in a developmentally-appropriate manner. Gioia, Isquith, Guy, and Kenworthy (2000) report that the experience of unmodulated emotional responses in children can manifest in either emotional liability or explosiveness. Further, the authors indicate that children with clinical elevations on this scale are likely to have exacerbated emotional reactions to minor events, have temper tantrums and cry easily, and recurrent and severe emotional episodes that are not age-appropriate.

The reliability of the Emotional Control Scale has been demonstrated as excellent by internal consistency coefficients for the Parent Form (clinical sample = 0.92, normative sample = 0.89) and Teacher Form (clinical sample = 0.94, normative sample = 0.93). The test-retest reliability for both the parent normative and clinical subsample has a mean test-retest correlation of 0.79 over an average interval of 2 weeks. The construct validity of the BRIEF is demonstrated with other established measures behavior rating scales including the ADHD-Rating Scale-IV (positive and significant  $r$ 's with both Inattention and Hyperactivity-Impulsivity Scales), Conners' Parent Rating Scale (positive and significant  $r$ 's with both Restless/Disorganization and Conduct Disorder Scales), CBCL Parent Form (positive and significant  $r$ 's with both Attention and Aggressive Behavior Scales), and BASC Parent Form (positive and significant  $r$  with Aggression Scale) (Gioia, Isquith, Guy, & Kenworthy, 2000).

### Connors' Parent Rating Scale-Revised: Short Form (CPRS-R: S)

The CPRS-R: S (Connors, 1997) is used to assess ADHD symptomatology consistent with DSM-IV (APA, 2001) criteria, and other related problem behaviors in children and adolescents ages 3 to 17. The CPRS-R: S consist of 27 items, and is approximately one-third the length of the long form (Connors' Parent Rating Scale-Revised: Long Form-CPRS-R: L), although the items included in the CPRS-R: S are the most important and significant items from the CPRS-R: L. The four scales in the CPRS-R:S are Oppositional (6 items), Cognitive Problems (6 items), Hyperactivity (6 items), and the ADHD Index (12 items). Each scale is calculated in T scores, and Connors (1997) indicates that T scores above 60 are suggestive of possible problems. The ADHD Index encompasses the best set of items to distinguish children with ADHD for non-affected children. Parents were asked to respond to questions based on child's behavior over the past month, and questions are rated on a 4-point Likert scale ranging from "Not true at all" to "Very much true."

The reliability of the CPRS-R: S is satisfactory demonstrated by the internal reliability coefficients (Cronbach's alpha), which range from 0.86 to 0.94, and the test-retest coefficients, which ranged from 0.62 to 0.85 over a 6 to 8 week period. The validity is demonstrated by the items from CPRS-R: L, which were utilizing selected items with the highest loading from an exploratory factor analysis of the factor subscale items.

### Executive Function Study Information Sheet

This is a 2 page questionnaire that was designed specifically for this study, and was completed by a parent or guardian to obtain various demographic and clinical information. The form was revised from the Parent Questionnaire utilized in Goulden's (1998)

dissertation. The form is comprised of several demographic questions about the child and family including age, grade, address, socioeconomic information, etc. Additionally, questions regarding diagnoses, both psychiatric and medical, and treatment including medications were requested (see Appendix B).

### Self-and Teacher-Report Bully/Victimization Measures

#### Self Report Measure: The Peer Experiences Questionnaire (PEQ)

The PEQ was developed by Vernberg, Jacobs, and Hershberger (1999) as a self-reported measure of aggression and victimization (see Appendices C & D). The PEQ items were adapted from previous studies (Caires, Caires, Neckerman, Ferguson, & Garipey, 1989; Olweus, 1991, Vernberg, Abwender, Ewell, & Beery, 1990; Whitney & Smith, 1993), and encompass the significant forms of aggression noted in the literature including confrontive verbal aggression and physical aggression, and relational aggression. This measure consists of two 10-item versions, including one for self-reported victimization (Victimization of Self; VS), and the other for self-reported aggression (Victimization of Others; VO). Each version includes 5 items measuring overt or direct aggression, including 2 items related to verbal aggression and 3 items related to physical aggression. The other 5 items measure behaviors related to relational aggression. Items are reported on a 5-point Likert scale based on the frequency of the occurrence for each behavior ranging from 1 for “never” to 5 for “a few times a week.” For the purposes of the study, the methodology outlined by Nichols (2004) for categorizing the different types of bully/victimization behaviors (e.g., direct and relational) on the PEQ will be utilized, and these categories are listed on the questionnaires included in Appendices D through E.

Vernberg, Jacobs, and Hershberger (1999) administered the PEQ to 1088 7<sup>th</sup> through 9<sup>th</sup> graders and found high internal consistency for the total score on both the VO and VS scales (Cronbach's alpha = 0.78 and 0.85, respectively). The authors suggested that the total scores on each scale provided an index of overall peer victimization even though each scale's items concern different types of bullying/aggression. Champion (1997) found that the correlation between self-and parent-reports on the VS was 0.36, which is consistent with levels of parent-child agreement on other behavioral measures (Vernberg, Jacobs, & Hershberger, 1999). Self-report of both victimization and aggression on the PEQ has been shown to correlate significantly with peer-report on the same construct (*rs* ranging from 0.34 to 0.40), and the test-retest reliability of the self-report PEQ over a 6-month period is adequate (*rs* ranging from 0.48 to 0.52) (Prinstein, Boergers, & Vernberg, 2001).

#### Teacher-Report Measure: Modification of The Peer Experiences Questionnaire (PEQ)

Given that the utilization of multi-informant approaches for the measurement of bully/victimization behaviors increases the validity and consistency of the findings (Pellgrini & Bartini, 2000; Schwartz, Proctor, & Chien, 2001), this study intended to measure both self- and teacher-reported bully/victimization behaviors. However, comparable self- and teacher-reported questionnaires that assess both direct and relational bully/victimization behaviors are relatively absent in the literature. Some studies have reworded previously existing self-report measures of bullying (Coolidge, Den Boer, & Segal, 2004) and victimization (Cullerton-Sen & Crick, 2005) for teacher reports. This study proposed to reword the PEQ so that each participant's teacher can respond to the questions. These responses were based on the teacher's own observation of the child's behavior (see Appendices E & F).

Additionally, the teachers were provided with the same instructions for answering the questions related bully/victimization behaviors as the child prior to completing the questionnaire. Because there are no psychometric properties available for a teacher-reported version of the PEQ, estimates of internal consistency reliabilities were calculated for the proposed sample. Additionally, each of the teachers will be administered The Social Experience Questionnaire-Teacher Report (Cullerton-Sen & Crick, 2005; SEQ-T), which is a validated teacher-reported measure of peer victimization (see below). Correlational analyses between the two scales were conducted to establish the validity of the teacher-reported version of the PEQ.

Teacher-Report Victimization Scale: The Social Experience Questionnaire-Teacher Report (SEQ-T)

The SEQ-T (Cullerton-Sen & Crick, 2005; see Appendix G) is a six-item teacher reported scale assessing both the physical and relational aspects of peer victimization. Both the Physical Aggression and Relational Aggression subscales include three items asking the teacher to assess the extent to which a student is a victim of the aggressive acts. The scale is also based on a 5-point Likert scale ranging from 1 (“Never”) to 5 (“Almost Always”). Cullerton-Sen and Crick (2005) reported both subscales have high levels of internal consistency with alpha coefficients of 0.82 for the Relational Victimization subscale, and 0.93 for the Physical Victimization subscale.

Further, in Cullerton-Sen and Crick’s (2005) study utilizing the SEQ-T in a sample of 119 4<sup>th</sup> graders, modest but significant correlations were found between the teacher, self, and peer reports of both physical and relational aggression as assessed by the SEQ-T and the



comparable versions for self and peer reports, the Social Experience Questionnaire-Peer and Self Report (SEQ-S and SEQ-P; Crick & Bigbee, 1996), indicating similar levels of informant agreement across the three groups. The teacher reports of victimization also were uniquely related to the children's adjustment problems including difficulties with peer rejection, and internalized and externalized behavioral problems as measured by the Child Behavioral Checklist (CBCL; Achenbach, 1991).

## CHAPTER IV

### Data Analyses and Results

#### Overview of the Statistical Analyses

Descriptive statistics were calculated for both the performance and informant EF measures, and both the teacher- and self-reported bully/victimization measures. Given the absence of equivalent forms for self- and teacher-report bully/victimization in the literature, and additionally forms that survey both overt and relational bully/victimization behaviors, this study modified an established self-report measure of bully/victimization for teacher response. The Peer Experiences Questionnaire (PEQ; Vernberg, Jacobs, & Hershberger, 1999) was utilized as the self-reported measure of both overt and relational bully/victimization behaviors, and was modified for teacher report. To establish the validity of this modified version, correlational analyses were computed between the Social Experience Questionnaire-Teacher Report (SEQ-T; Cullerton-Sen & Crick, 2005) and the teacher-reported PEQ. Internal consistency reliabilities were also calculated for the modified PEQ for teacher report to determine whether this measure has adequate levels of reliability.

Since inconsistencies have been reported in the literature when comparing self and teacher reports of bully/victimization behaviors, additional correlational analyses were computed between the self-reported bully/victimization measures and the teacher-reported bully/victimization measures. This was done in an attempt to examine any differences between the two informant reports.

To test the hypotheses, correlational analyses were conducted to examine the relationships between the performance- and informant-reported EF measures with the self-

and teacher-reported bully/victimization measures. Given the small sample size utilized in this study, power analyses were performed to suggest adequate sample sizes for future research. Additional exploratory data analyses utilizing stepwise multiple regression procedures were performed to determine which EF variables best predicted the scores on the bully/victimization measures. The alpha level for all analyses was set at 0.05. Given the great number of statistical analyses conducted for this research, the probability of committing a Type 1 error was increased with this less stringent alpha level. However, because of the exploratory nature of this study the alpha level was set at a more liberal level to ensure all possible relationships could be uncovered for future investigation.

### Descriptive Statistics

Descriptive statistics, including means, standard deviations, and ranges, for both the performance and informant EF measures are presented in Table 2. Overall, for the standardized neuropsychological measures, including estimated intellectual functioning, mean performance was in the average range. There was also consistency in the variability of scores for the measures where scores ranged from well below average to well above average in this sample. However, for the Tower of London, the mean average score across the sample approached the low average range, while the mean average score across the sample approached the high average range for the BRIEF Emotional Control Scale. Descriptive statistics for both the teacher-and self-reported bully/victimization measures appear in Table 3. Given that neither the CEFS nor the PEQ are standardized measures, no performance descriptions can be made for this sample.

### Initial Analyses

### Reliability of the Modified Teacher-Report PEQ

Two internal consistency estimates of reliability were computed for the modified PEQ for teacher report, and for both the bullying and victimization forms. For the bullying form the value for the coefficient alpha was 0.88, indicating satisfactory reliability. For the split-half coefficient, the scale was split into two halves in an attempt to create equivalent forms; however, given that there are 5 questions related to relational bullying and 5 questions on overt bully, the split halves were not equally balanced in regards to type of bullying. Although, the value for the split-half coefficient was 0.89, indicating satisfactory reliability.

For the victimization form, the value for the coefficient alpha was 0.90, indicating satisfactory reliability. For the split-half coefficient, the scale was split into two halves in an attempt to create equivalent forms; however, item an related to verbal threats was removed from the analysis since all children were given scores of “0” indicating no teacher-reported verbal threats observed for any participants. The value for the split-half coefficient for unequal length was utilized, and the value was 0.93, indicating satisfactory reliability.

### Modified Teacher-Report PEQ and SEQ-T

Correlational analyses were computed between the Social Experience Questionnaire-Teacher Report (SEQ-T) and the Teacher-Reported Peer Experiences Questionnaire (PEQ) to establish the validity of the modified PEQ for teacher report. As presented in Table 4, the overall teacher-reported victimization score on the SEQ-T and the overall teacher-reported victimization score on the PEQ were positively and significantly related ( $r = 0.66, p < 0.001$ ). There was also a positive, significant correlation between the SEQ-T and teacher-reported PEQ relational victimization scores ( $r = 0.78, p < 0.001$ ). The correlation between the SEQ-

T overt victimization subscale and the teacher-reported overt victimization score on the PEQ was not significant ( $r = 0.32, p = 0.13$ ).

#### Self-and Teacher-Reported Bully/Victimization Measures

Figure 1 displays a pictorial description of the various components for the bully/victimization measures (e.g., total score, total overt score, overt physical score, overt verbal score, and relational score). For both the bullying and victimization measures, correlational analyses were computed between the self-reported bully/victimization measures and the teacher-reported bully/victimization measures (see Table 5).

For the bullying measures, all correlational analyses were non-significant except for the analysis between the teacher- and self-reported total overt bullying subscale ( $r = 0.44, p = 0.03$ ). For the victimization measures, two correlational analyses were significant, including the overall victimization scale ( $r = 0.48, p = 0.02$ ), and the relational victimization subscale ( $r = 0.65, p = 0.001$ ).

Table 6 outlines the agreement between self-report and teacher-report bullying/victimization for each child. Children were classified as bullies or victims if they reported, or received based on teacher report, responses of “about once a week” for two or more of the bullying/victimization questions. To be classified as a bully/victim (BV), the child had to meet this criterion on both questionnaires. As shown in Table 6, for the self-report data, there were no “pure” bullies, 7 “pure” victims, and 2 BVs. For the teacher reported data, there were 4 “pure” bullies, no “pure” victims, and 2 BVs. In only one occurrence was the self-report and teacher-report data consistent, and this was for a child classified as a BV.

While findings from the data enabled classification of some of the participants as bullies, victims, BVs, and noninvolved children, no further statistical analyses were conducted on the classification groups because of the extreme discrepancies in number of participants between each of the groups, as well as the low number of participants in some groups.

#### Hypotheses: Executive Function (EF) and Bully/Victimization Measures

The 8 hypotheses stated that impaired functioning and ratings on the performance and informant EF measures would be related to more involvement in both self-reported and teacher-reported bully/victimization behaviors. Bivariate correlational analyses were conducted between each of the EF measures and the bully/victimization scales and subscales. The results from these analyses will first be presented based on the hypotheses of this study, then for the teacher-reported bully/victimization measures and the EF measures, and lastly for the self-reported bully/victimization measures and the EF measures.

Tables 7 through 10 list the correlation coefficients for each of the EF measures based on the informant (e.g., teacher-or self-report), and then based on type of bully/victimization behavior. Table 7 shows the results for the teacher-reported bullying, and Table 8 presents teacher-reported victimization. For the self-reported bullying, the correlational results are in Table 9, while the self-reported victimization results are displayed in Table 10.

Hypothesis 1 predicted that there would be a significant negative correlation between the Wechsler Intelligence Scale for Children-4<sup>th</sup> Edition (WISC-IV) Integrated Digit Span Backward (DSB) scaled score, and both the self-report and teacher-report scores on the bullying and victimization measures. The WISC-IV Integrated DSB scaled score was chosen

as a measure of working memory in this study. As seen in the first row of Tables 7 through 10 for DSB, this prediction was not supported for the teacher- and self-reported responses on the bully/victimization measures.

Hypothesis 2 predicted that there would be a significant negative correlation between the Wisconsin Card Sorting Test (WCST) Perseverative Responses standard score, and both the self-report and teacher-report scores on the bullying and victimization measures. The WCST Perseverative Responses standard score was chosen as a measure of set-shifting in this study. This prediction was supported for the teacher's responses for the total victimization, overt verbal victimization, and relational victimization scores.

Hypothesis 3 predicted that there would be a significant positive correlation between the Category Test (CT) Total Error T Score, and both the self-report and teacher-report scores on the bullying and victimization measures. The CT Total Error T Score was chosen as a measure of abstraction in this study. This prediction was not supported for either informant's responses for the bully/victimization measures.

Hypothesis 4 predicted that there would be a significant negative correlation between the Tower of London (TOL) T Score, and both the self-report and teacher-report scores on the bullying and victimization measures. The TOL T Score was chosen as a measure of planning in this study. This prediction was not supported for either informant's responses for the bully/victimization measures.

Hypothesis 5 predicted that there would be a significant negative correlation between the Delis-Kaplan Executive Function System (D-KEFS) Letter Fluency scaled score, and both the self-report and teacher-report scores on the bullying and victimization measures.

The D-KEFS Letter Fluency scaled score was chosen as a measure of verbal fluency in this study. This prediction was not supported for either informant's responses for the bully/victimization measures.

Hypothesis 6 predicted that there would be a significant negative correlation between the Delis-Kaplan Executive Function System (D-KEFS) Interference scaled score, and both the self-report and teacher-report scores on the bullying and victimization measures. The D-KEFS Interference scaled score was chosen as a measure of inhibition in this study. This prediction was not supported for either informant's responses for the bully/victimization measures.

Hypothesis 7 predicted that there would be a significant positive correlation between the teacher-reported Children's Executive Function Scale (CEFS) Total score and subscales, and both the self-report and teacher-report scores on the bullying and victimization measures. The CEFS was utilized as an informant-reported measure of EF to increase the ecological validity of the study's measures. The CEFS Total Score, and the Social Appropriateness, Inhibition, and Problem Solving subscales consistently demonstrated significant positive correlations with all of the teacher-reported bullying scales. The Initiative subscale demonstrated significant correlations with the teacher-reported total bullying scale, and both the overt verbal bullying and relational bullying subscales. The Motor Planning subscale demonstrated significant correlations with the teacher-reported total overt bullying scale, and both the overt physical and relational bullying subscales.

The CEFS Total Score, and the Social Appropriateness, Problem Solving, and Initiative subscales again consistently demonstrated significant positive correlations with all



of the teacher-reported victimization scales. The Inhibition subscale demonstrated significant correlations with all of the teacher-reported victimization scales, with the exception of the overt physical victimization subscale. The Motor Planning subscale demonstrated no significant correlations.

Hypothesis 8 predicted that there would be a significant positive correlation between the Brief Rating Inventory of Executive Function (BRIEF) Emotional Control T score, and both the self-report and teacher-report scores on the bullying and victimization measures. The BRIEF Emotional Control T score was chosen as a measure of emotional regulation in this study. This prediction was not supported for either informant's responses for the bully/victimization measures.

#### Results of the Bivariate Correlational Analyses across Informant

Given that the bivariate correlation analyses appeared to be related more to the type of informant rather than specific EF measures, a summary of the results is presented again based on whether the informant was the teacher or child.

##### Teacher-Reported Bullying with the Performance and Informant EF Measures

As shown in Table 7, there were no significant relationships between any teacher-reported scales and any of the performance EF measures. For the informant-reported EF measures the teacher-reported CEFS Total scale, and several CEFS subscales were significantly related to the teacher-reported responses for the bullying scales. There were no significant correlations between the BRIEF parent-reported Emotional Control Scale and the teacher-reported bullying scales.

##### Teacher-Reported Victimization with the Performance and Informant EF Measures

As shown in Table 8, there were a few significant relationships between the teacher-reported victimization scales and one performance EF measure, the WCST Perseveration Responses score. A significant negative correlation was found for the WCST and the total victimization score, and some of the victimization subscales. No other significant relationships were found for the performance EF measures. For the informant-reported EF measures the teacher-reported CEFS Total scale, and several CEFS subscales were significantly related to the teacher-reported responses for the victimization scales. There were also no significant correlations between the BRIEF parent-reported Emotional Control Scale and the teacher-reported victimization scales.

#### Self-Reported Bullying with the Performance and Informant EF Measures

As shown in Table 9, there were no significant relationships between any self-reported bullying scales and any of the performance or informant EF measures.

#### Self-Reported Victimization with Performance and Informant EF Measures

As shown in Table 10, there were no significant relationships between any self-reported victimization scales and any of the performance EF measures. Only one informant EF measure, the CEFS Motor Planning subscale, was found to demonstrate a significant negative correlation, and this was with the overt verbal victimization subscale.

#### Power Analyses

Given that the sample utilized in the current study was small, and additionally the exploratory nature of this research, power analyses were conducted to determine the sample sizes needed for future studies. The power analyses were performed for a power of 0.80 at an alpha level of  $p = 0.05$ , and analyses were conducted for variables with non-significant

correlations only. Given the numerous variables utilized in this study, these analyses were based on the overall correlational results of performance-based EF measures, and the overall results for the CEFS and BRIEF Emotional Control scale for both the teacher- and self-reported bully/victimization measures. The following results relate to the minimum sample size needed. One EF variable was chosen for the power analyses, and this was based on which EF measure's correlation with the bully/victimization measures was closest to significance.

For the teacher-reported bullying measures with the performance-based EF measures, the correlation between the D-KEFS Letter Fluency and Overt Verbal Bullying score approached significance more so than any other performance-based EF measure. Based on this data, a minimum sample size of 102 is needed for a power of 0.80, which would potentially yield significant outcomes. Additionally, a sample size of 131 would be required on the BRIEF Emotional Control Scale to achieve a power of 0.80. No power analysis was conducted for the CEFS given that significant correlations were routinely found between the CEFS and the teacher-reported bullying measures.

For the teacher-reported victimization measures with the performance-based EF measures, the correlation between the WISC DS-B and the Overt Verbal Victimization score approached significance more so than any other performance-based EF measure. Based on this data, a minimum sample size of 95 is needed for a power of 0.80, which would potentially yield significant outcomes. Additionally, a sample size of 395 would be required on the BRIEF Emotional Control Scale to achieve a power of 0.80. No power analysis was

conducted for the CEFS given that significant correlations were routinely found between the CEFS and the teacher-reported victimization measures.

For the self-reported bullying measures with the performance-based EF measures, the correlation between the WISC-IV DS-B and Relational Bullying score approached significance more so than any other performance-based EF measure. Based on this data, a minimum sample size of 76 is needed for a power of 0.80, which would potentially yield significant outcomes. For the self-reported bullying measures with the informant-rating EF measures, the correlation between the CEFS Social Appropriateness subscale and Overt Physical Bullying score approached significance more so than any other informant-rating EF measure. Based on this data, a minimum sample size of 71 is needed for a power of 0.80, which would potentially yield significant outcomes.

For the self-reported victimization measures with the performance-based EF measures, the correlation between the WISC-IV DS-B and the Relational Victimization score approached significance more so than any other performance-based EF measure. Based on this data, a minimum sample size of 76 is needed for a power of 0.80, which would potentially yield significant outcomes. For the self-reported victimization measures with the informant-rating EF measures, the correlation between the CEFS Motor Planning subscale and Total Overt Victimization score approached significance more so than any other performance-based EF measure. Based on this data, a minimum sample size of 63 is needed for a power of .80, which would potentially yield significant outcomes.

#### Multiple Regression Analyses

Stepwise multiple regression procedures were utilized to determine which EF measures best predicted the bully/victimization scores for each of the bully/victimization subscales, and for each informant (teacher- and self-report). The results of the best model of the regression analyses for accounting for the variance in the bullying/victimization scores will be reported (see Table 11). For each analysis, all of the EF measures, both performance and informant, were entered into the regression analysis with the exception of the Category Test Error score. This was due to missing data for this variable, which would have reduced the study's sample size.

#### Prediction of Teacher-Reported Bullying by the EF Measures

A stepwise multiple regression analysis was conducted to predict the overall teacher-reported bullying score. The predictors included all EF measures, while the criterion was the teacher-reported PEQ total bullying score. The best predictors of the total bullying score were the teacher-reported CEFS Social Appropriateness subscale, and the parent-reported BRIEF Emotional Control subscale,  $F(2, 21) = 27.52, p < 0.001$ . The sample multiple correlation coefficient was 0.85, indicating that approximately 72% of the variance of the teacher-reported PEQ total bullying score is accounted for by these two informant-reported EF measures.

A stepwise multiple regression analysis was conducted to predict the overall teacher-reported overt bullying score. The best and only predictor of the total overt bullying score was the teacher-reported CEFS Social Appropriateness subscale,  $F(1, 22) = 39.12, p < 0.001$ . The sample multiple correlation coefficient was 0.80, indicating that approximately 64% of

the variance of the teacher-reported PEQ total overt bullying score is accounted for by the CEFS Social Appropriateness subscale.

A stepwise multiple regression analysis was conducted to predict the teacher-reported overt physical bullying score. The best and only predictor of the overt physical bullying score was the teacher-reported CEFS Social Appropriateness subscale,  $F(1, 22) = 9.72, p = 0.005$ . The sample multiple correlation coefficient was 0.55, indicating that approximately 31% of the variance of the teacher-reported PEQ overt physical bullying score is accounted for by the CEFS Social Appropriateness subscale.

A stepwise multiple regression analysis was conducted to predict the teacher-reported overt verbal bullying score. The best and only predictor of the overt verbal bullying score was the teacher-reported CEFS Social Appropriateness subscale,  $F(1, 22) = 45.37, p < 0.001$ . The sample multiple correlation coefficient was 0.82, indicating that approximately 67% of the variance of the teacher-reported PEQ overt verbal bullying score is accounted for by the CEFS Social Appropriateness subscale.

A stepwise multiple regression analysis was conducted to predict the teacher-reported relational bullying score. The best predictors of the relational bullying score were the teacher-reported CEFS Social Appropriateness subscale, and the parent-reported BRIEF Emotional Control subscale,  $F(2, 21) = 21.45, p < 0.001$ . The sample multiple correlation coefficient was 0.82, indicating that approximately 67% of the variance of the teacher-reported PEQ relational bullying score is accounted for by these two informant-reported EF measures.

#### Prediction of the Teacher-Reported Victimization with the EF Measures

A stepwise multiple regression analysis was conducted to predict the overall teacher-reported victimization score. The predictors included all EF measures, while the criterion was the teacher-reported PEQ total victimization score. The best and only predictor of the total victimization score was the teacher-reported CEFS Social Appropriateness subscale,  $F(1, 22) = 15.03, p = 0.001$ . The sample multiple correlation coefficient was 0.64, indicating that approximately 41% of the variance of the teacher-reported PEQ total victimization score is accounted for by the CEFS Social Appropriateness subscale.

A stepwise multiple regression analysis was conducted to predict the overall teacher-reported total overt victimization score. The best and only predictor of the total overt victimization score was the teacher-reported CEFS Social Appropriateness subscale,  $F(1, 22) = 14.86, p = 0.001$ . The sample multiple correlation coefficient was 0.64, indicating that approximately 40% of the variance of the teacher-reported PEQ total overt victimization score is accounted for by the CEFS Social Appropriateness subscale.

A stepwise multiple regression analysis was conducted to predict the teacher-reported overt physical victimization score. The best predictors of the overt physical victimization score were the teacher-reported CEFS Social Appropriateness subscale and the WISC-IV Integrated Digit Span-Backwards scaled score,  $F(2, 21) = 6.44, p = 0.007$ . The sample multiple correlation coefficient was 0.62, indicating that approximately 38% of the variance of the teacher-reported PEQ overt physical victimization score is accounted for by these two EF measures.

A stepwise multiple regression analysis was conducted to predict the teacher-reported overt verbal victimization score. The best predictors of the overt verbal victimization score

were the teacher-reported CEFS Problem Solving and Motor Planning subscales,  $F(2, 21) = 21.41, p < 0.001$ . The sample multiple correlation coefficient was 0.82, indicating that approximately 67% of the variance of the teacher-reported PEQ overt verbal victimization score is accounted for by these two informant-reported EF measures.

A stepwise multiple regression analysis was conducted to predict the teacher-reported relational victimization score. The best predictors of the relational victimization score were the teacher-reported CEFS Social Appropriateness, Initiative, and Motor Planning subscales,  $F(3, 20) = 10.46, p < 0.001$ . The sample multiple correlation coefficient was 0.78, indicating that approximately 61% of the variance of the teacher-reported PEQ relational victimization score is accounted for by these three informant-reported EF measures.

#### Prediction of the Self-Reported Bullying with the EF Measures

None of the stepwise multiple regression analyses produced significant results for prediction of the self-reported bullying by the EF measures.

#### Prediction of the Self-Reported Victimization with the EF Measures

Only one stepwise multiple regression analysis produced significant results for prediction of self-reported victimization by the EF measures. The best and only predictor of the total overt verbal victimization score was the self-reported CEFS Motor Planning subscale,  $F(1, 22) = 6.55, p = 0.02$ . The sample multiple correlation coefficient was 0.48, indicating that approximately 23% of the variance of the self-reported PEQ overt verbal victimization score is accounted for by the CEFS Motor Planning subscale.



## CHAPTER V

### Discussion

This chapter will discuss the results of this study in more detail and present conclusions based on the results of the initial analyses, hypotheses testing, and the additional exploratory analyses conducted. This chapter will also discuss limitations of this study and implications for future research.

#### Initial Analyses

##### Reliability of the Modified Teacher-Report PEQ

Two internal consistency estimates of reliability, including the coefficient alpha and split-half coefficient, were computed for the modified PEQ for teacher report. For both the bullying and victimization forms the value of the coefficients indicated satisfactory reliability. This suggests that the modified PEQ for teacher report was both a valid, and reliable measure to compare the child's self reports with teacher reports on one measure.

##### Modified Teacher-Report PEQ and SEQ-T

Correlations were computed between the Social Experience Questionnaire-Teacher Report (SEQ-T) and the Teacher-Reported Peer Experiences Questionnaire (PEQ) to establish the validity of the modified PEQ for teacher report. Significant positive relationships were found for the total victimization scores and the relational victimization scores. However, the correlation between the overt victimization score was non-significant.

The non-significant correlation suggests that the difference between the two overt victimization scales may be tied to differences in the item content. The teacher-reported PEQ, as the SEQ-T, contains one overt verbal victimization item concerning physical threats;

however, the teacher-reported PEQ also contains an overt verbal victimization item on name calling. There are no items on the SEQ-T about the teacher's observations of the child being called names by other children, which is unusual given that name calling has been reported as a frequent form of bullying (Espelage, Bosworth, & Simon, 2000; Olweus, 1991; Salmon, James, Cassidy, & Javaloyes, 2000). It would seem while the SEQ-T is a previously validated measure of teacher-reported victimization (Cullerton-Sen & Crick, 2005), the teacher-reported PEQ may be a more comprehensive, and therefore more reliable measure of overt victimization.

#### Comparison of Self- and Teacher-Reported Bully/Victimization Measures

Correlations were also computed between the self-reported bully/victimization measures and the teacher-reported bully/victimization measures to examine concordance between the two respondents.

For the bullying measures, all correlations were non-significant except for the analysis between the teacher- and self-reported total overt bullying subscale. In the literature, teacher- and self-report agreement on bullying behaviors has been reported as low (Kochenderfer & Ladd, 1996; Whitney & Smith, 1993), which overall is consistent with the results from this study.

For the victimization measures, two significant relationships were found, including the overall victimization scale and the relational victimization subscale. Teacher nominations of victimization have been shown to correlate with self-report questionnaire responses (Kochenderfer & Ladd, 1996; Whitney & Smith, 1993), and this is consistent with the results of this study. However, given that the correlations for the teacher- and self-

reported overt victimization subscales averaged at about chance levels, it is likely that the significant positive correlation between the overall victimization scales was primarily due to the high correlation for the relational victimization subscales. This finding may be explained by the child's and teacher's unwillingness, to report overt instances of victimization.

There was little agreement between self-report and teacher-report bullying/victimization for any of the children based on classification of the children as bullies, victims, or BVs. In only one case were the self-report and teacher-report data consistent, and this was for a child classified as a BV. Based on these results it appears that children are more willing to self-report occurrences of victimization, while teachers are more willing to identify children they perceive as bullies. According to the literature on bully/victimization behaviors, reasons for these observations are numerous, including social desirability, opportunity to witness such bully/victimization behaviors, or willingness to acknowledge and/or disclose instances of these behaviors (Austin & Joseph, 1996; Cornell & Brockenbrough, 2004; Craig, 1998; Ladd & Kochenderfer, 2002).

Overall for the present study, the results demonstrated that teacher- and self-reports of certain types of bully/victimization are not consistent with the exception of overt bullying and relational victimization. Given the contradictions between the informants' reports on bully/victimization behaviors, expectedly the results on the relationships between the self- and teacher-reported bully/victimization measures with the EF measures diverged. This finding will be discussed throughout the subsequent sections.

Hypotheses: Executive Function (EF) and Bully/Victimization Measures

For the 8 hypotheses, bivariate correlations were presented predicting that worse performance on the EF measures and ratings on the EF rating scales would be related to more involvement in both self-reported and teacher-reported bully/victimization behaviors as measured by The Peer Experiences Questionnaire (PEQ). Two of the hypotheses were supported when teacher report was used as the criterion variable, and one of the correlations were significant for the self report data.

Overall, for the performance-based EF measures, only one measure demonstrated a significant relationship with the bully/victimization measures. A higher number of perseveration responses on the WCST were associated with higher victimization scores. Higher scores on the victimization measures mean more involvement in the child being victimized, and this was found for overall victimization, and specifically verbal and relational victimization. This relationship was found for the teacher reports only. These results are consistent with certain social skills deficits that have been noted in some children diagnosed with ADHD. Previous literature has highlighted interpersonal difficulties that would be consistent with perseverative responses on the WCST, including difficulty switching roles during peer interactions and failing to adjust behavior in accordance with shifts in situational demands (Shea & Wiener, 2003). Further, set-shifting difficulties in the interpersonal realm suggest that the child's behavior does not change despite being given feedback from others, or based on changes in the situation or environmental conditions (Hoza, Waschbusch, Pelham, Molina, & Milich, 2000; Maedgen & Carlson, 2000; Whalen & Henker, 1992; Wheeler & Carlson, 1994). This unresponsiveness to cues and feedback is additionally the primary contributor for perseverative responses on the WCST. As supported by the results in

this study, these problems in set-shifting among children diagnosed with ADHD appear to be related to being victimized by peers.

No other significant bivariate correlations were found between the performance-based EF measures and the bully/victimization measures; however, further exploratory analyses with multiple regression techniques did uncover a predictive relationship with one other performance-based EF measure. These results will be discussed later, subsequent to a discussion on the relationship between the informant-reported EF measures and the bully/victimization measures.

Bivariate correlational analyses were conducted between the bully/victimization measures and the teacher-reported CEFS Total score, and for each of the CEFS subscales. The CEFS Total score consistently demonstrated significant positive relationships with the teacher-reported bully/victimization measures, including all total score scales and subscales. This suggests that overall teacher-observed difficulties with EF, as measured by the CEFS, are associated with the teacher's observations that the child has more involvement in bully/victimization behaviors. There were no significant correlations between the teacher-reported CEFS Total score and any of the self-reported bully/victimization measures, and this non-significant finding was consistent for all but one CEFS subscale.

Bivariate correlational analyses were conducted between each of the CEFS subscales and the bully/victimization measures. As with the CEFS Total score, the Social Appropriateness subscale consistently demonstrated significant positive relationships with the teacher-reported bully/victimization measures, including all of the total score scales and subscales. This suggests that overall teacher-observed difficulties in the CEFS domain of

Social Appropriateness are associated with the teacher's observations of more involvement in bully/victimization behaviors.

This finding supports similar results found by Coolidge, Den Boer, and Segal's (2004) study that revealed students identified by informant reports as exhibiting bullying behaviors had significantly higher T scores on the Coolidge Personality and Neuropsychological Inventory's (CPNI) ADHD scale and Executive Function Deficit scale compared the noninvolved control group. Students identified as bullies specifically had a significantly elevated score on the CPNI Executive Function Deficit subscale, the social judgments subscale. This subscale, which appears analogous to the CEFS Social Appropriateness subscale, measures social misjudgments including poor interpersonal decision-making and choices.

This finding also is consistent with observations that the difficulties in social relationships experienced by some children diagnosed with ADHD may contribute to the involvement in bully/victimization behaviors. Additionally, several items on the CEFS Social Appropriateness subscale are related to interpersonal deficits some children diagnosed with ADHD are noted to have, including poor social skills, emotional maturity, lack of insight, and being bothersome to others (Maedgen & Carlson, 2000; Schwatz, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1998; Shea & Wiener, 2003; Wheeler & Carlson, 1994). This would suggest that these specific interpersonal difficulties put them at increased risk for involvement in bully/victimization behaviors.

However, another explanation for the significant correlation between the CEFS Social Appropriateness subscale and the bullying measures may be attributed to the overlap in item

content between these scales. The Social Appropriateness scale contains a few items about fighting and making fun of other children, as does the teacher-reported Peer Experience Questionnaire (PEQ). This overlap in item content may have augmented the significant positive relationship among the scales. Again, there were no significant correlations with the teacher-reported CEFS Social Appropriateness subscale and any of the self-reported bully/victimization measures.

Bivariate correlational analyses were conducted on the teacher-reported CEFS Inhibition subscale, and this subscale consistently demonstrated significant positive relationships with the teacher-reported bully/victimization measures, with the exception of the teacher-reported overt physical victimization subscale. Again, there were no significant correlations with the teacher-reported CEFS Inhibition subscale and any of the self-reported bully/victimization measures.

Interestingly, several items of the Inhibition subscale parallel the DSM-IV-TR ADHD diagnostic criteria for the inattentive, hyperactive, and impulsive symptoms. This suggests that the observation of children displaying the specific symptoms of ADHD may contribute to their increased involvement in bully/victimization behaviors based on teacher report. This indirectly supports data from several studies suggesting that ADHD is a common diagnostic category among children and adolescents identified as involved in bully/victimization behaviors (Coolidge, Den Boer, & Segal, 2004; Salmon, James, Cassidy, & Javaloyes, 2000; Kumpulainen, Rasanen, & Puura, 2001; Unnever & Cornell, 2003).

This significant finding is also consistent with the results of Unnever and Cornell's (2003) study, suggesting that the relationship between ADHD and bullying in their sample of

adolescents could be explained by low self control. While Unnever and Cornell (2003) did not utilize a neuropsychological definition or test to operationalize self control, it would seem that problems with self control are equivalent to problems with inhibition. This is also consistent with Barkley's (1997a, 1997b) influential theory on ADHD. This theory views ADHD as a developmental disorder mainly involving deficits in an executive functions, and with the primary deficit in behavioral inhibition, which leads to deficiencies in self control (Barkley, 1997a, 1997b).

Further, there is no overlap between the items of the Inhibition subscale and the items that comprise the PEQ, so unlike the Social Appropriateness subscale, overlap of item content is an unlikely contributor to the significant association.

Bivariate correlational analyses were conducted on the teacher-reported CEFS Problem Solving subscale, and this subscale consistently demonstrated significant positive relationships with the teacher-reported bully/victimization measures. This finding is consistent with reports in the literature that children identified as bullies and victims demonstrate deficiencies in their problem-solving skills (Batsche & Knoff, 1994; Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Kumpulainen & Rasanen, 2000).

Again, there were no significant correlations between the teacher-reported CEFS Problem Solving subscale and any of the self-reported bully/victimization measures. Like the Inhibition subscale, there is no overlap between the items of the Problem Solving subscale and the items that comprise the PEQ. The CEFS Problem Solving subscale does incorporate items related to logical reasoning, processing of information, organization, and conceptual thinking, all of which are necessary skills for successful interpersonal



relationships. Results from the current study suggest that these abilities are specifically tied to how others, namely teachers, view children maneuvering through their social worlds. It may be that deficiencies in any of these areas of problem solving likely make it more difficult for a child to understand how to go about preventing or attempting to cease their role as a victim of bullying behaviors. Further, deficits in these areas may also predispose a child to display certain types of behaviors, namely bullying behaviors that affect the child's ability to successfully communicate, resolve conflict, express emotions, and negotiate needs or wants as a member of a peer group.

Bivariate correlational analyses were conducted on the teacher-reported CEFS Initiative subscale, and this subscale demonstrated significant positive relationships with the teacher-reported bullying total scale, overt verbal bullying subscale, and relational bullying subscale. For the teacher-reported victimization scale, significant positive correlations were found for the total victimization scale and all of the subscales. Again, there were no significant correlations with the teacher-reported CEFS Initiative subscale and any of the self-reported bully/victimization measures. Additionally, there is no overlap between the items of the Initiative subscale and the items that comprise the PEQ.

One common theme among the CEFS Initiative subscale items is passivity. Passivity has also been noted in descriptions of victims, such as victims having a more insecure and cautious disposition and being inhibited or fearful of new situations (Craig, 1998; Haynie, Nansel, Eitel, Crump, Saylor, Yu, & Simons-Morton, 2001; Kochenderfer & Ladd, 1996; Olweus, 1993; Salmon, James, Cassidy, & Javaloyes, 2000). Victims also often have problems asserting themselves within the peer group (Olweus, 1994). Additionally, the

victim's passive reaction to the bullying appears to be a factor encouraging the bullying to continue (Batsche & Knoff, 1994; Nansel, Overpeck, Pilla, Ruan, Simon-Morton, & Scheidt, 2001; Olweus, 1978 & 1994).

Additionally, passivity may also explain the positive relationship between the CEFS Initiative subscale and the overt verbal and relational bullying subscales. Relational bullying is a more manipulative and indirect manner of bullying. This more indirect, or passive, form of bullying again is likely related to passivity theme highlighted in the Initiative subscale. Further, this also would explain the non-significant relationship between the CEFS Initiative subscale and the overt physical bullying subscale, given that physical bullying would be considered the most blatant and direct manner of bullying others. This does not, however, explain the positive correlation between the CEFS Initiative subscale and the overt verbal bullying subscale. It could be that while the verbal bullying subscale is classified as an overt measure of bullying, items on this scale actually reflect more passive bullying behaviors, at least in comparison to physical bullying behaviors.

Bivariate correlational analyses were conducted on the teacher-reported CEFS Motor Planning subscale. This subscale demonstrated significant positive relationships with the teacher-reported bullying total overt and overt physical bullying subscales. For the teacher-reported victimization scale, no significant correlations were found. One significant negative correlation was demonstrated with the teacher-reported CEFS Motor Planning subscale and the self-reported overt verbal victimization subscale. This was the only significant correlation found with any of the EF measures and the self-reported bully/victimization measures.

This was an unusual finding, given that participants who reported more involvement as a victim of verbal bullying were observed to have fewer visual-motor problems based on the teacher-reported CEFS. Shea and Wiener (2003) accounted for the increased peer victimization among children diagnosed with ADHD by these children being perceived as different from their peers. This perception further was hypothesized to lead to social isolation. The isolation from a peer network was seen as a mechanism to exacerbate the bullying due to the absence of the protective factor of having friends. It would seem that awkwardness, specifically motor problems as captured by the items contained in the CEFS Motor Planning subscale, would manifest as behaviors identifying the child as different from his or her peers; however, this assumption was not supported by the results.

Bivariate correlational analyses were conducted on the parent-reported BRIEF Emotional Control Scale. No significant correlations were found between the BRIEF Emotional Control Scale and the teacher- or self-reported bully/victimization measures. This was an unexpected finding given the literature supporting emotional dysregulation as a common problem for children diagnosed with ADHD (Barkley, 1997a, 1997b; Berlin, Bohlin, Nyberg, & Janols, 2004; Brown, 2000; Cantwell, 1996; Gioia & Isquith, 2004; Hinshaw & Melnick, 1995; Maedgen & Carlson, 2000; Shea & Wiener, 2003) and children involved in bully/victimization behaviors (Batsche & Knoff, 1994; Hodges, Malone, & Perry, 1997; Losel & Bliesener, 1999; Olweus, 1994; Pellegrini & Bartini, 2000). However, further statistical analyses utilizing multiple regression techniques did uncover a predictive relationship with the parent-reported BRIEF Emotional Control Scale and some of the bully/victimization measures, which is discussed in the next section.

### Power Analyses

Power analyses were performed to determine the minimum number of participants that would be needed to detect significant relationships between the EF and bully/victimization measures. Overall the analyses revealed that a sample size of 63 to 131, at a minimum, would be needed to uncover an effect for most EF variables.

### Multiple Regression Analyses between the EF and Bully/Victimization Measures

Stepwise multiple regression analyses were conducted to determine what EF measures predicted involvement in bully/victimization behaviors.

#### Predictors for Teacher-Reported Bullying Behaviors

The teacher-reported CEFS Social Appropriateness subscale consistently was a predictor for all the teacher-reported bullying scale and subscales. For the multiple regression analyses in which the CEFS Social Appropriateness subscale was the only predictor (i.e., the total overt and physical and verbal subscales), this subscale accounted for a range of 31% to 67% of the variance in these bullying measures. The CEFS Social Appropriateness subscale only accounted for 31% of the variance for the physical bullying subscale. It is possible that other variables such as physical size would be a stronger predictor for this variable as opposed to neuropsychological variables.

For both teacher-reported total bullying and relational bullying, the teacher-reported CEFS Social Appropriateness subscale and parent-reported BRIEF Emotional Control Scale were significant predictors. Interestingly, the partial correlation of the BRIEF Emotional Control Scale in both multiple regression analyses was in the negative direction, implying that little or no difficulties with emotional regulation, as reported by the parents, predicts

greater involvement in bullying behaviors when the child has difficulties displaying appropriate social behavior. This was unexpected, given that the research supports that emotional dysregulation is associated with bully/victimization behaviors. It may be that since the Emotional Control Scale was a predictor for relational bullying with the Social Appropriateness subscale, while it did not predict more overt types of bullying, that low emotionality is related to the more subtle and socially-sophisticated types of bullying.

No other informant-reported subscales predicted teacher-reported bullying, and none of the performance EF measures were predictors. This finding, which was consistent overall for the multiple regression analyses, with the exception of one EF measure, will be discussed later in a section on the ecological validity of EF measures.

#### Predictors for Teacher-Reported Victimization Behaviors

The teacher-reported CEFS Social Appropriateness subscale was a predictor of all the teacher-reported victimization scales and subscales with the exception of one, the overt verbal victimization scale. This is noteworthy in that deficiencies in social skills, which are common in children with ADHD, predict both involvement as a bully and a victim of bullying behaviors. This finding is significant for treatment implications for children in general, and in particular for children diagnosed with ADHD, which will be discussed shortly.

For the multiple regression analyses of overt physical victimization, the CEFS Social Appropriateness subscale in combination with the WISC-IV Integrated Digit Span-Backwards were significant predictors and accounted for 38% of the variance in this measure. This was the only performance EF measure that was a predictor in any of the

multiple regression analyses. It may be that working memory deficits as they relate to social behaviors somehow put the child at increased risk for certain types of victimization. Why this would be true for physical victimization specifically is unclear.

For the multiple regression analyses of overt verbal victimization, the CEFS Problem Solving and Motor Planning subscales were significant predictors, accounting for 67% of the variance in this measure. The partial correlation of the Motor Planning subscale was in the negative direction, implying that little or no difficulties with visual/motor skills, but with deficits in problem solving as reported by the teacher, predicts greater involvement as a victim of verbal bullying. Again why these variables in combination would specifically predict verbal victimization is unknown.

For the multiple regression analyses of relational victimization, the CEFS Social Appropriateness, Motor Planning, and Initiative subscales were significant predictors and accounted for 61% the variance in this measure. The partial correlation of the Motor Planning subscale again was in the negative direction, implying that little or no difficulties with visual/motor skills as reported by the teacher, predicts greater involvement as a victim of relational bullying, when the child additionally has problems in displaying appropriate social behaviors and initiative. Compared to the other bully/victimization regression analyses, it appears that several factors relate to being the recipient of relational bullying. Based on the PEQ items on relational bully/victimization behaviors, this type of bully/victimization appears more complex and sophisticated than the more overt forms of bully/victimization. It seems logical, therefore, that the factors predicting these behaviors

would be numerous, and have a complicated and complex relationship. This was supported by the results of the regression for teacher-reported relational victimization

#### Predictors for Self-Reported Bully Behaviors

None of the EF measures predicted self-reported bullying in the multiple regression analyses. This finding will be discussed later in a section on the validity of self-reported bully/victimization behaviors.

#### Predictors for Self-Reported Victimization Behaviors

Only one multiple regression analysis demonstrated a significant predictor among the EF measures, and this was for self-reported overt verbal victimization. The CEFS Motor Planning subscale accounted for 23% of the variance for the self-reported overt verbal victimization subscale. Again this was in the negative direction, implying that little or no difficulties with visual/motor skills as reported by the teacher, predicts greater self-reported involvement as a victim of verbal bullying. This is consistent with the teacher-reported overt verbal victimization regression analysis. As stated previously, this finding seems to be contrary to what might be predicted based on reports in the literature on the behavior of children with ADHD and peer victimization. While this finding seems contrary, the significant negative relationship was strong enough to predict the score for overt verbal victimization, and further this was true for both the teacher-and self-reported verbal victimization, adding to the significance of the findings.

#### Explanation for the Results between the EF and Bully/Victimization Measures

This next section attempts to clarify the results of the study based on a more generalized understanding of the problematic measurement issues inherent in executive

functioning and bully/victimization behaviors. Given the majority of the performance-based EF measures did not demonstrate significant correlations or predictive values for the bully/victimization measures, while the converse was true for the informant-rated EF measures, an explanation based on the ecological validity of performance-based EF measure will be presented. Further, given the contradictory findings of the self-reported bully/victimization measures in comparison to the teacher-reported data, a subsequent section will be presented on the validity of self-reports of bully/victimization behaviors. This ties the results of the current study to previous literature that was covered in the section on problems with the measurement of bully/victimization behaviors.

#### The Ecological Validity of EF Measures

In the literature review of this paper, an introduction was presented on the concept of ecological validity (EV), and how this concept relates to the definition and assessment of EF. Given the inherent difficulties measuring EF, and issues related to the EV of traditional performance-based EF measures, the current study utilized two informant-rating scales of EF, the CEFS and BRIEF. These two scales were added in an attempt to enhance the EV of the EF measures utilized in this study.

As stated previously, the performance EF measures demonstrated few significant findings for both the bivariate correlational and multiple regression analyses with the bully/victimization behavior measures. In contrast, significant results for both types of analyses were frequently found for the teacher-reported CEFS, and the parent-reported BRIEF; however, the significant results for the teacher-reported CEFS were more consistent and stronger.



If there is some support for the main hypotheses of this study, that the EF deficits observed in some children with ADHD are related to their involvement in bully/victimization behaviors, then the results of the current study are consistent with reports questioning the EV of the more traditional, performance-based EF measures. This was demonstrated by the fact that in general, the informant-rating EF scales were better predictors of bully/victimization behaviors. As implied in the main hypotheses, bully/victimization behaviors would be seen as one of the everyday behavioral manifestations of deficits in EF, which were better predicted by informant-reports of EF, as opposed to the performance-based EF measures.

#### The Validity of Self-Reported Bully/Victimization Behaviors

Another methodological issue that most likely influenced the results of this study was presented in the literature review on measurement of bully/victimization behaviors. Self-report is a commonly-utilized means to measure involvement in bully/victimization behaviors, and one that has been supported as adequate (Austin & Joseph, 1996; Colvin, Tobin, Beard, Hagan, & Sprague, 1998; Kochenderfer & Ladd, 1996; Ladd & Kochenderfer, 2002; Nansel, Overpeck, Pilla, Ruan, Simins-Morton, & Scheidt, 2001). However, other literature has questioned the validity of this method, and in particular for the use of self-reported bullying incidences given the effect of social desirability, and the child's willingness to disclose and accurately report involvement in bullying behaviors (Austin & Joseph, 1996; Cornell & Brockenbrough, 2004; Craig, 1998; Ladd & Kochenderfer, 2002).

The results of the current study demonstrated that none of the EF measures showed any significant relationship or predictive value with self-reported bullying. This was not true for teacher-reports of bullying, where some of the strongest relationships were found among

the EF measures, and in particular the informant-reported EF measures. For the self-reported victimization measures, only one EF measure was found to have a significant predictive power, and this relationship was consistent with the teacher-reported data on the same variable. Since significant results were uncovered for the teacher-reported bully/victimization behaviors, this finding supports the assertion that self-reported bully/victimization behaviors, and specifically self-reported bullying, may have questionable validity.

### Conclusions

This study was designed to examine whether the deficits in EF that some children with ADHD experience are related to the presence of bully/victimization behaviors. Children diagnosed with ADHD were assessed with several performance-based EF measures thought to measure specific components of EF found problematic in children with ADHD. Additionally, informant rating scales of EF were completed to both the child's teacher and parent to include more ecologically-valid measures of EF. Both the children and their teachers were administered equivalent questionnaires on bully/victimization behaviors.

Overall, the statistical analyses determined that the informant ratings of EF were better predictors of the teacher-reported bully/victimization behaviors. Specifically, the EF measures of appropriate social behavior and emotional regulation often predicted the teacher-reported bullying behaviors. For the teacher-reported victimization, informant-rated EF measures of appropriate social behavior often was a significant predictor of the scales and subscales, as well. Teacher ratings of motor planning also had surprising predictive value for certain types of both teacher- and self-reported victimization, given the predictive

relationship was opposite of the expected direction. Overall, the performance-based EF measures and self-reported bully/victimization measures contributed modestly to the results. These findings were elaborated from a perspective questioning the ecological validity of performance-based EF measures, and the validity of self-reported bully/victimization measures.

In summary, both teacher- and parent reports on certain EF components appear to predict teachers' reports in involvement in bully/victimization behaviors for children who have been diagnosed with ADHD. The specific symptoms of ADHD and inherent EF difficulties these children experience appeared to be related to involvement in bully/victimization behaviors. Additional explanations for the results will be elaborated in the following sections on this study's limitations, followed by implications of this research and future directions to better understand the complex relationship among ADHD, EF, and bully/victimization behaviors.

#### Limitations of the Current Study

The children and teachers involved in this study were recruited from a rather unique environment. This environment was a private school that specializes in educating children with learning differences, including ADHD. Further, as part of the specialized curriculum at this school, these children have specific classes in social skills. Given these children attend a school where learning differences such as ADHD are common, and additionally receive consistent instruction on social skills as part of the academic routine, it is likely this may have some effect on involvement with bully/victimization behaviors. The effect of this distinct environment would seem to be especially apparent in comparing this study's results

on bully/victimization behaviors if it had been conducted in most public independent school districts. While environment was controlled for in the current study given that all the participants were in the same environment, conducting this study in a public school setting would serve to remove the effect of “evening the playing field;” meaning that the behaviors associated with the diagnosis of ADHD, and those likely to increase involvement in bully/victimization behaviors, are not as frequent and widespread in the school environment. Additionally, given the usual school environment, this further limits generalization of these results to other populations and environments.

Along the similar lines, this sample of children was homogeneous in that all children had a diagnosis of ADHD, and no comparison group was utilized. Further, every child, with the exception of one, was reported to have at least one additional diagnosis. It was usually the case that the child had at least three diagnoses. While multiple diagnoses are routinely observed, given ADHD’s high comorbidity, this fact makes it difficult to determine whether it is the symptoms related to the ADHD, and not the comorbid diagnoses that are contributing to the deficits in EF, or if the comorbid diagnoses are amplifying the display of bully/victimization behavior. Likewise, one could argue this sample of children diagnosed with ADHD and numerous comorbid conditions actually increases the EV of the study’s design, since this is representative of the literature on ADHD and comorbidity.

Another limitation of this study relates to the measures utilized. Both the CEFS and PEQ are not standardized measures, and therefore have not been normed and psychometric properties on both measures are limited. Further the teacher-reported version of the PEQ was a reformatted version of the PEQ created by this investigator. While statistical comparisons

were conducted with another established teacher-reported measure of victimization, the teacher-reported version of the PEQ has never been utilized in any other research study. Additionally as elaborated previously, there was some overlap in the item content between the PEQ and CEFS, and this may have affected the results of the statistical analyses.

One explanation for the significant results found between the teacher-reported CEFS and the teacher-reported bully/victimization measures may have been related to the consistency across these measures with one informant. Only one teacher responded to questions about the child's involvement in bully/victimization behaviors, and this same teacher additionally completed the CEFS.

Lastly, with a small sample size in the study and large number of variables, it is likely that the probability of a Type I error was increased. The bivariate correlation analyses were reported significant at an alpha level of 0.05. Numerous correlations were performed for the statistical analyses of this research; therefore, a stricter alpha level might have been chosen. However, given the exploratory nature of this research study and the sparse research on the relationship among ADHD, EF, and bully/victimization behaviors, analyses were performed at a more liberal alpha level to ensure that any possible significant relationships were revealed. These significant findings will have to be interpreted cautiously.

#### Implications for Future Research and Treatment

In general, given the limited available research targeting ADHD, EF, and bully/victimization behaviors simultaneously, additional research is needed this area. The limitations presented for the current research identified several areas for further exploration. The environment in which this study was conducted is a rather remarkable one. Replications

of this research in another environment, in particular a public school setting, would suggest how ADHD, EF, and bully/victimization behaviors relate in a more typical school setting.

Another direction for future research would be to utilize a control group and/or other clinical comparison groups in an attempt to determine both the effects of ADHD and other psychiatric diagnoses on both EF and bully/victimization behaviors. Additional research in this area should also broaden the age range of the children participating. Both EF and bully/victimization behaviors have been noted in the literature to progress and change developmentally; therefore, it may be that these changes in EF are tied to the changes in the presentation of bully/victimization behaviors.

Potential studies should also concentrate on improving the methodological issues related specifically to this study, and to the broader areas of measurement of both EF and bully/victimization behaviors. For the bully/victimization measures, additional informants should be utilized including parent reports, reports from more than one teacher, and peer reports. Other bully/victimization measures should be sought, and in particular, measures that survey a broader range of bully/victimization behavior. Given this use of electronic communication devices in pediatric populations, bullying via internet, emailing, text messaging, and cellular telephones would be an important addition to the assessment of bully/victimization behaviors. For the neuropsychological variables, additional measures could be added not only for the various components of EF, but also for different types of neuropsychological processes. With regards to measures, further exploration is needed on the validity of performance-based versus informant-ratings of EF, and self-reported and teacher-reported bully/victimization behaviors.

Lastly, the present research provides notable implications for treatment of ADHD and areas on which to concentrate. Cantwell's (1996) portrayal of the interpersonal difficulties children with ADHD encounter, a "lack of social savoir-faire" (p. 981), seems descriptive of the overall results of the current study. The focus of adequate intervention and treatment of the social difficulties children with ADHD face, which should include improving upon skills related to EF, equally will likely address bully/victimization behaviors.

Interventions for children with ADHD in the school setting must not only target academic performance; equal attention needs to be directed at increasing appropriate and productive classroom behavior in both the academic and social realms. Interventions directed at increasing the child's ability to maneuver within the social arena to improve upon peer relationships would likely improve the quality of social relationships. Psychotropic medications such as stimulants, while a primary and essential component in effective treatment for ADHD, do not normalize the entire range of behavioral problems presented in pediatric populations diagnosed with ADHD. Even children taking stimulant medications continue to manifest a higher level of behavioral problems than children without the diagnosis (NIH, 2000), and these behaviors may be manifested in bully/victimization behaviors.

With regards to specific interventions for bully/victimization behaviors, Colvin, Tobin, Beard, Hagan, and Sprague (1998) advocate that victims may benefit from social skills training in areas including conflict resolution and interpersonal problem solving, in order to improve their relationships with their peers. The authors suggest that teaching social problem-solving and anger management skills may alleviate bullying behaviors, since

learning interpersonal problem-solving skills has been shown to decrease disciplinary actions for fighting.

Continued research assessing the relationship among these three factors, including deficits in EF, ADHD, and bully/victimization behaviors which appear to be interrelated, is paramount to understanding the adaptive struggles children diagnosed with ADHD face in several crucial areas in life. Not only will understanding the complex relationships among these risk factors aid in identifying causal factors contributing to possible deterioration in the child's quality of life, but also may suggest more precisely targeted interventions to prevent and rectify established problematic interpersonal patterns, and also to increase the child's everyday social and adaptive functioning.



## Appendix A

DSM-IV-TR Criteria for Attention-Deficit/Hyperactivity Disorder

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## A. Either (1) or (2):

(1) six (or more) of the following symptoms of **inattention** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

**Inattention**

- (a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
- (b) often has difficulty sustaining attention in tasks or play activities
- (c) often does not seem to listen when spoken to directly
- (d) often does not follow through on instruction and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
- (e) often has difficulty organizing tasks and activities
- (f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
- (g) often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)
- (h) is often easily distracted by extraneous stimuli
- (i) is often forgetful in daily activities

(2) six (or more) of the following symptoms of **hyperactivity/impulsivity** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

**Hyperactivity**

- (a) often fidgets with hands or feet and squirms in seat
- (b) often leaves seat in classroom or in other situations in which remaining seated is expected
- (c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
- (d) often has difficulty playing or engaging in leisure activities quietly
- (f) often talks excessively

**Impulsivity**

- (g) often blurts out answers before questions have been completed
- (h) often has difficulty awaiting turn
- (i) often interrupts or intrudes on others (e.g., butts into conversations or games)

## Appendix A Continued

DSM-IV-TR Criteria for Attention-Deficit/Hyperactivity Disorder

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B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occurring exclusively during the course of a Pervasive Development Disorder, Schizophrenia, or other Psychotic Disorder, and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or Personality Disorder).

Code based on type:

**314.01 Attention-Deficit/Hyperactivity Disorder, Combined Type:** if both Criteria A1 and A2 are met in the last 6 months

**314.00 Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type:** if Criteria A1 is met but Criteria A2 is not met in the last 6 months

**314.01 Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type:** if Criteria A2 is met but Criteria A1 is not met in the last 6 months

**314.9 Attention-Deficit/Hyperactivity Disorder Not Otherwise Specified**

Appendix B

Executive Functioning Study Information Sheet

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## EXECUTIVE FUNCTIONING STUDY

### Information Sheet

The following information will be utilized as part of your child participating in this study of children's problem solving skills through The University of Southwestern Medical Center and The Shelton School. This information will remain strictly confidential, and will be coded and entered into a database with all identifying information removed.

Name of Child: \_\_\_\_\_

Date of Birth: \_\_\_\_\_ Age: \_\_\_\_\_ Last Grade completed: \_\_\_\_\_

Name of parent/guardian completing this form: \_\_\_\_\_

Parent(s) mailing address:  
\_\_\_\_\_

Parent(s) Home number: \_\_\_\_\_ Cell: \_\_\_\_\_ Work: \_\_\_\_\_

**The following questions are necessary in order to verify your child's diagnoses:**

Has your child been diagnosed with a Learning Disability? Y            N

If so, what kind (e.g., nonverbal, mathematics, reading, etc.) \_\_\_\_\_

Has your child been diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD/ADD)?

Y            N

If so, what kind (e.g., Inattentive, Hyperactive/Impulsive, or Combined subtype)? \_\_\_\_\_

Has your child been diagnosed with developmental or neurological condition?  
(for example, Tourette's, autism, seizure disorder) Y            N

Has your child ever suffered a hit to the head (from a car accident, fall, or fight) that  
resulted in a loss of consciousness or "blacking out?" Y            N

If you answered "yes" to the previous question, how long was your child unconscious, and  
what was the nature of their injury?

\_\_\_\_\_

Is your child being treated for any medical disorder? Y N

If "yes," what is the nature of their illness? \_\_\_\_\_

Has your child been diagnosed/treated for a mental disorder(s)?  
(for example, depression, anxiety, etc.) Y N

If "yes," what is the nature of their illness? \_\_\_\_\_

Is your child taking any prescription medications? Y N

If so, please list:  
\_\_\_\_\_

Is your child taking any over-the-counter (non-prescription) medications? Y N

If so, please list:  
\_\_\_\_\_

**The following questions are necessary in order to determine demographic information:**

Who is currently living in the home:  
\_\_\_\_\_

Years of schooling/degree mother has completed:  
\_\_\_\_\_

Mother's occupation:  
\_\_\_\_\_

Years of schooling/degree father has completed:  
\_\_\_\_\_

Father's occupation:  
\_\_\_\_\_

***Thank you for your time and cooperation in completing this form!***

## Appendix C

## The Peer Experiences Questionnaire (PEQ)-Self Report Bullying Items

Sometimes students do hurtful things to one another and it is difficult for one of the students to stick up for him or herself for several reasons. These may include because the other student is older, in a higher grade, is physically stronger or bigger, has more friends, or is more popular. Please answer the following questions based on whether you did the actions in school (in the school building or on schools grounds) to another student over the past 3 months. Do not include occurrences when these actions were done in a friendly and playful way.

	Never	Once or twice	A few times	About once a week	A few times a week
1. I hit, kicked, or pushed a student in a mean way.	1	2	3	4	5
2. I told put-downs or rumors about another student.	1	2	3	4	5
3. I threatened to hurt or beat up another student.	1	2	3	4	5
4. I left a student out of an activity or conversation she or he wanted to be included in to make her or him feel bad.	1	2	3	4	5
5. I chased a student like I was trying to hurt him or her.	1	2	3	4	5
6. I played a mean trick to try and scare or hurt another student.	1	2	3	4	5
7. I grabbed, held, or touched a student in a way he or she did not like.	1	2	3	4	5
8. I ganged up with other students and we did mean things to another student.	1	2	3	4	5
9. I ignored another student on purpose to hurt his or her feelings.	1	2	3	4	5
10. I teased a student in a mean way, called him or her bad names, or said rude things to him or her.	1	2	3	4	5

Overt Bullying: Physical = 1, 5, 7 and Verbal = 3, 10

Relational Bullying = 2, 4, 6, 8, 9

## Appendix D

## The Peer Experiences Questionnaire (PEQ)-Self Report Victimization Items

Sometimes students do hurtful things to one another and it is difficult for one of the students to stick up for him or herself for several reasons. These may include because the other student is older, in a higher grade, is physically stronger or bigger, has more friends, or is more popular. Please answer the following questions based on whether you had these actions done to you in school (in the school building or on schools grounds) by another student over the past 3 months. Do not include occurrences when these actions were done in a friendly and playful way.

	Never	Once or twice	A few times	About once a week	A few times a week
1. A student hit, kicked, or pushed me in a mean way.	1	2	3	4	5
2. A student told put-downs or rumors about me.	1	2	3	4	5
3. A student threatened to hurt or beat me up.	1	2	3	4	5
4. A student left me out of an activity or conversation I wanted to be included in to make me feel bad.	1	2	3	4	5
5. A student chased me like he or she was trying to hurt me.	1	2	3	4	5
6. A student played a mean trick to try and scare or hurt me.	1	2	3	4	5
7. A student grabbed, held, or touched me in a way I did not like.	1	2	3	4	5
8. Other students ganged up against me and were mean to me as a group.	1	2	3	4	5
9. A student ignored me on purpose to hurt my feelings.	1	2	3	4	5
10. A student teased me in a mean way, called me bad names, or said rude things to me.	1	2	3	4	5

Overt Victimization: Physical = 1, 5, 7 and Verbal = 3, 10

Relational Victimization = 2, 4, 6, 8, 9

## Appendix E

## The Peer Experiences Questionnaire (PEQ)-Teacher Report Bully Items

Sometimes students do hurtful things to one another and it is difficult for one of the students to stick up for him or herself for several reasons. These may include because the other student is older, in a higher grade, is physically stronger or bigger, has more friends, or is more popular.

Please answer the following questions based on whether you have seen \_\_\_\_\_ do these actions in school (in the school building or on schools grounds) to another student over the past 3 months. Do not include occurrences when these actions were done in a friendly and playful way.

	Never	Once or twice	A few times	About once a week	A few times a week
1. This student hit, kicked, or pushed another student in a mean way.	1	2	3	4	5
2. This student told put-downs or rumors about another student.	1	2	3	4	5
3. This student threatened to hurt or beat up another student.	1	2	3	4	5
4. This student left another student out of a activity or conversation he/she wanted to be included in to make him/her feel bad.	1	2	3	4	5
5. This student chased another student like he or she was trying to hurt the other student.	1	2	3	4	5
6. This student played a mean trick to try and scare or hurt another student.	1	2	3	4	5
7. This student grabbed, held, or touched another student in a way he/she did not like.	1	2	3	4	5
8. This student ganged up against another student and was mean to him/her as a group.	1	2	3	4	5
9. This student ignored another student on purpose to hurt his/her feelings.	1	2	3	4	5
10. This student teased another student in a mean way, called him/her bad names, or said rude things to him/her.	1	2	3	4	5

Overt Bullying: Physical = 1, 5, 7 & Verbal = 3, 10

Relational Bullying = 2, 4, 6, 8, 9



## Appendix F

## The Peer Experiences Questionnaire (PEQ)-Teacher Report Victimization Items

Sometimes students do hurtful things to one another and it is difficult for one of the students to stick up for him or herself for several reasons. These may include because the other student is older, in a higher grade, is physically stronger or bigger, has more friends, or is more popular. Please answer the following questions based on whether you have seen \_\_\_\_\_ have these actions done to him or her in school (in the school building or on schools grounds) by another student over the past 3 months. Do not include occurrences when these actions were done in a friendly and playful way.

	Never	Once or twice	A few times	About once a week	A few times a week
1. This student was hit, kicked, or pushed by another student in a mean way.	1	2	3	4	5
2. This student had put-downs or rumors told about him/her by another student.	1	2	3	4	5
3. This student has been threatened to be hurt or beaten up by another student.	1	2	3	4	5
4. This student was left out of an activity or conversation he/she wanted to be included by another student in to make him/her feel bad.	1	2	3	4	5
5. This student was chased like the other student was trying to hurt him/her.	1	2	3	4	5
6. This student had another student play a trick to try and scare or hurt him/her.	1	2	3	4	5
7. This student had another student grab, hold, or touch him/her in a way he/she did not like.	1	2	3	4	5
8. This student has been ganged up against by other students who were mean to him/her as a group.	1	2	3	4	5
9. This student was ignored by another student on purpose to hurt his/her feelings.	1	2	3	4	5
10. This student was teased by another in a mean way, called bad names, or had rude things said to him/her.	1	2	3	4	5

## Appendix F Continued

## The Peer Experiences Questionnaire (PEQ)-Teacher Report Victimization Items

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Overt Victimization:

Physical = 1, 5, 7 and Verbal = 3, 10

Relational Victimization = 2, 4, 6, 8, 9

## Appendix G

## The Social Experience Questionnaire-Teacher Report (SEQ-T)

Sometimes students do hurtful things to one another and it is difficult for one of the students to stick up for him or herself for several reasons. These may include because the other student is older, in a higher grade, is physically stronger or bigger, has more friends, or is more popular. Please answer the following questions based on whether you have seen \_\_\_\_\_ have these actions done to him or her in school (in the school building or on schools grounds) by another student over the past 3 months. Do not include occurrences when these actions were done in a friendly and playful way.

	Never	Almost never	Sometimes	Almost all the time	All the time
1. This child gets hit or kicked by peers.	1	2	3	4	5
2. This child gets pushed or shoved by peers.	1	2	3	4	5
3. This child gets physically threatened by peers.	1	2	3	4	5
4. This child gets ignored by peers when a peer is mad at them.	1	2	3	4	5
5. This child gets left out of the group when someone is mad at them or wants to get back at them.	1	2	3	4	5
6. This child is the target of rumors or gossip in the playgroup.	1	2	3	4	5

Overt Victimization: 1, 2, and 3

Relational Victimization: 4, 5, and 6



Table 2

## Descriptive Statistics for the Executive Function (EF) Measures

	Mean	Standard Deviation	Range
<u>Estimated IQ Measures</u>			
Estimated IQ standard score	105.38	18.54	71-152
Vocabulary scaled score	11.92	2.34	9-19
Block Design scaled score	9.92	4.79	1-19
<u>EF Performance Measures</u>			
Digit Span-B scaled score	9.08	2.72	4-14
WCST standard score	102.17	17.00	70-133
Category Test* T score (* n = 22)	53.05	13.78	20-69
Tower of London T score	43.21	13.39	16-66
Letter Fluency scaled score	10.58	2.96	5-19
D-KEFS Inhibition scaled score	9.42	2.95	2-13
<u>EF Informant Measures</u>			
Total CEFS raw score	73.58	43.60	2-137
Social Appropriateness raw score	9.46	6.05	2-21
Inhibition raw score	19.42	12.63	0-44
Problem Solving raw score	26.92	17.39	0-51
Initiative raw score	11.08	7.03	0-24
Motor Planning raw score	6.71	5.97	0-20
BRIEF Emotional Control T score	59.21	13.13	40-85

Table 3

## Descriptive Statistics for the Raw Scores on the Bully/Victimization Measures

	Mean	Standard Deviation	Range
<u>Teacher-Reported Bullying</u>			
Total Bullying	5.63	6.96	0-24
Total Overt Bullying	2.04	2.79	0-11
Overt Physical Bullying	0.79	1.59	0-6
Overt Verbal Bullying	1.25	1.65	0-6
Relational Bullying	3.58	4.53	0-15
<u>Teacher-Reported Victimization</u>			
Total Victimization	3.21	4.59	0-18
Total Overt Victimization	1.25	1.70	0-6
Overt Physical Victimization	0.58	1.14	0-4
Overt Verbal Victimization	0.67	0.82	0-3
Relational Victimization	1.96	3.00	0-12
<u>Self-Reported Bullying</u>			
Total Bullying	2.71	3.79	0-13
Total Overt Bullying	1.13	1.87	0-7
Overt Physical Bullying	0.46	1.06	0-4
Overt Verbal Bullying	0.67	1.01	0-4
Relational Bullying	1.58	2.26	0-8
<u>Self-Reported Victimization</u>			
Total Victimization	7.71	7.82	0-27
Total Overt Victimization	3.21	3.61	0-14
Overt Physical Victimization	1.38	1.72	0-6
Overt Verbal Victimization	1.83	2.16	0-8
Relational Victimization	4.50	5.09	0-19

Table 4

Descriptive Statistics for the SEQ-T and Intercorrelations between the SEQ-T and the Teacher- Reported Peer Experiences Questionnaire (PEQ)

	Mean	Standard Deviation	Range
<u>SEQ-T</u>			
Total Score	2.38	3.10	0-9
Overt	0.54	1.18	0-4
Relational	1.83	2.32	1-6

Intercorrelations between the SEQ-T and Teacher-Reported PEQ

	SEQ-T Total	Overt	Relational
PEQ Total Victimization	0.66***		
PEQ Total Overt Victimization		0.32	
PEQ Relational Victimization			0.78***

p < 0.001 = \*\*\*

Figure 1

Scales and Subscales of the Bully/Victimization Measures

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# Teacher and Self-Report Bully/Victimization B/V

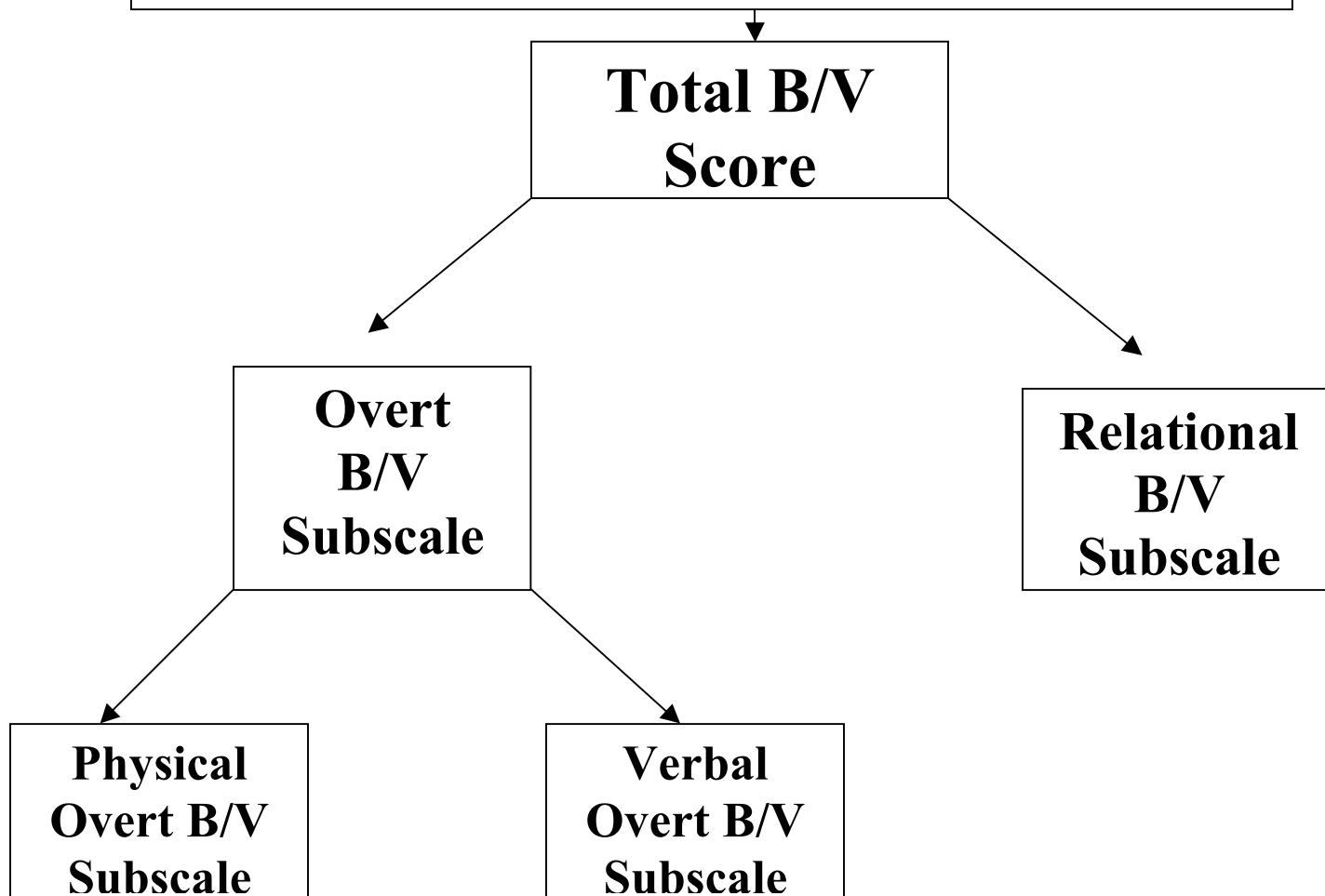


Table 5

Intercorrelations between the Teacher- and Self-Report Bully/Victimization Measures

<u>Teacher-Reported Bullying</u>					
	Total	Total Overt	Physical	Verbal	Relational
<u>Self-Reported Bullying</u>					
Total	0.32				
Total Overt		0.44*			
Physical			0.21		
Verbal				0.28	
Relational					0.21
<u>Teacher-Reported Victimization</u>					
	Total	Total Overt	Physical	Verbal	Relational
<u>Self-Reported Victimization</u>					
Total	0.48*				
Total Overt		0.16			
Physical			0.15		
Verbal				0.14	
Relational					0.65**

p &lt; 0.05 = \*

p &lt; 0.01 = \*\*

Table 6

Self- and Teacher-Reported Classification of Bullies, Victims, and Bully/Victims (BVs)

Participant #	Self-Reported		Teacher-Reported	
	Bully	Victim	Bully	Victim
1			X	
2	X	X		
3			X	
4				
5		X		
6				
7				
8		X		
9				
10				
11	X	X	X	X
12				
13		X		
14				
15				
16		X		
17		X		
18				
19				
20		X		
21			X	
22				
23		X	X	X
24			X	

Table 7

## Intercorrelations between Teacher-Reported Bullying and Executive Functioning Measures

	Total	Total Overt	Physical	Verbal	Relational
<u>EF Performance Measures</u>					
DS-B	-0.21	-0.12	0.004	-0.20	-0.26
WCST	-0.21	-0.16	-0.17	-0.12	-0.22
CT (n = 22)	0.09	0.08	-0.08	0.06	0.10
TOL	-0.22	-0.18	-0.08	-0.22	-0.22
Letter Fluency	-0.21	-0.21	-0.09	-0.27	-0.19
Interference	0.002	-0.04	0.15	-0.09	-0.02
<u>EF Informant Measures</u>					
Total CEFS	0.67***	0.64***	0.41*	0.70***	0.64***
Social Appropriateness	0.82***	0.80***	0.55**	0.82***	0.76***
Inhibition	0.68***	0.65***	0.45**	0.66***	0.65***
Problem Solving	0.66***	0.62**	0.36*	0.70***	0.63**
Initiative	0.38*	0.25	0.02	0.40*	0.42*
Motor Planning	0.29	0.41	0.37*	0.33	0.19
<u>BRIEF</u>					
Emotional Control	-0.17	-0.04	-0.05	-0.02	-0.24

p < 0.05 = \*    p < 0.01 = \*\*    p < 0.001 = \*\*\*

Table 8

## Intercorrelations between Teacher-Reported Victimization and Executive Functioning Measures

	Total	Total Overt	Physical	Verbal	Relational
<u>EF Performance Measures</u>					
DS-B	-0.13	0.03	0.25	-0.28	-0.22
WCST	-0.38*	-0.31	-0.14	-0.44*	-0.40*
CT (n = 22)	-0.11	-0.02	0.09	-0.12	-0.16
TOL	-0.13	-0.16	-0.14	-0.14	-0.11
Letter Fluency	-0.13	-0.19	-0.23	-0.08	-0.10
Interference	0.04	-0.12	0.27	-0.14	-0.008
<u>EF Informant Measures</u>					
Total CEFS	0.57**	0.58**	0.39*	0.70***	0.55**
Social Appropriateness	0.64***	0.64***	0.47**	0.67***	0.61**
Inhibition	0.52**	0.49**	0.27	0.65**	0.51**
Problem Solving	0.58**	0.57**	0.35*	0.70***	0.56**
Initiative	0.52**	0.52**	0.38*	0.56**	0.49**
Motor Planning	0.15	0.28	0.33	0.13	0.07
<u>BRIEF</u>					
Emotional Control	-0.08	-0.03	0.05	-0.01	-0.14

p < 0.05 = \*    p < 0.01 = \*\*    p < 0.001 = \*\*\*

Table 9

## Intercorrelations between Self-Reported Bullying and Executive Functioning Measures

	Total	Total Overt	Physical	Verbal	Relational
<u>EF Performance Measures</u>					
DS-B	-0.23	-0.10	-0.16	-0.005	-0.31
WCST	0.006	-0.03	-0.16	0.11	0.04
CT (n = 22)	-0.10	-0.06	-0.14	0.04	-0.12
TOL	-0.08	0.004	-0.001	0.009	-0.14
Letter Fluency	0.04	0.05	0.008	0.08	0.03
Interference	-0.17	-0.13	-0.06	-0.17	-0.18
<u>EF Informant Measures</u>					
Total CEFS	0.08	0.14	0.20	0.04	0.02
Social Appropriateness	0.16	0.26	0.32	0.15	0.06
Inhibition	0.05	0.10	0.16	0.03	-0.01
Problem Solving	0.16	0.20	0.26	0.10	0.11
Initiative	0.07	0.12	0.14	0.08	0.01
Motor Planning	-0.24	0.21	-0.13	-0.26	-0.22
<u>BRIEF</u>					
Emotional Control	0.06	0.08	0.04	-0.10	0.04

Table 10

## Intercorrelations between Self-Reported Victimization and Executive Functioning Measures

	Total	Total Overt	Physical	Verbal	Relational
<u>EF Performance Measures</u>					
DS-B	-0.17	0.10	0.18	0.03	-0.33
WCST	-0.12	0.17	0.10	0.20	-0.31
CT (n = 22)	0.09	0.16	0.31	0.02	0.008
TOL	-0.08	0.02	-0.05	0.07	-0.14
Letter Fluency	0.05	0.10	-0.09	0.23	0.003
Interference	-0.15	-0.10	-0.02	-0.15	-0.16
<u>EF Informant Measures</u>					
Total CEFS	0.03	-0.14	0.03	-0.26	0.14
Social Appropriateness	0.02	-0.15	0.03	-0.27	0.14
Inhibition	0.04	-0.15	0.009	-0.26	0.17
Problem Solving	0.07	-0.10	0.02	-0.19	0.17
Initiative	0.20	0.07	0.20	-0.04	0.25
Motor Planning	-0.33	-0.34	-0.12	-0.48**	-0.27
<u>BRIEF</u>					
Emotional Control	-0.09	-0.04	-0.04	-0.04	-0.10

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p < 0.01 = \*\*

Table 11

## Summary of Stepwise Multiple Regression for Teacher-Reported Bully/Victimization Measures

<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Total Bullying Score	0.85			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	<u>Partial(p)</u>
Constant	4.106			
1. Social Appropriateness	0.963	0.84	7.27(>0.001)	
2. Emotional Control	-0.128	-0.24	-2.10(0.048)	-0.42(0.05)
<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Total Overt Bullying Score	0.80			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	
Constant	-1.447			
1. Social Appropriateness	0.369	0.80	6.25(>0.001)	
<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Physical Bullying Score	0.55			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	
Constant	-0.582			
1. Social Appropriateness	0.145	0.55	3.12(0.005)	
<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Verbal Bullying Score	0.82			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	
Constant	-0.865			
1. Social Appropriateness	0.224	0.82	6.74(>0.001)	
<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Relational Bullying Score	0.82			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	<u>Partial(p)</u>
Constant	4.241			
1. Social Appropriateness	0.590	0.79	6.27(>0.001)	
2. Emotional Control	-0.105	-0.31	-2.43(0.024)	-0.47(0.02)



Table 11

## Summary of Stepwise Multiple Regression for Teacher-Reported Bully/Victimization Measures

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<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Total Victimization Score	0.64			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	
Constant	-1.361			
1. Social Appropriateness	0.483	0.64	3.88(0.001)	
<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Overt Victimization Score	0.64			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	
Constant	-0.438			
1. Social Appropriateness	0.178	0.64	3.86(0.001)	
<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Physical Victimization Score	0.62			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	<u>Partial(p)</u>
Constant	-2.041			
1. Social Appropriateness	0.110	0.59	3.28(0.004)	
2. Digit Span-Backwards	0.174	0.42	2.32(0.03)	0.45(0.03)
<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Verbal Victimization Score	0.82			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	<u>Partial(p)</u>
Constant	-0.165			
1. Problem Solving	0.050	1.06	6.246(>0.001)	
2. Motor Planning	-0.075	-0.55	-3.37(0.003)	-0.59(0.003)

Table 11

## Summary of Stepwise Multiple Regression for Teacher-Reported Bully/Victimization Measures

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<u>Dependent Variable</u>	<u>Multiple R</u>			
Teacher-Report Relational Victimization Score	0.78			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	<u>Partial(p)</u>
Constant	-0.1563	0.71	4.05(0.001)	
1. Social Appropriateness	0.353	-0.56	-3.10(0.006)	-0.42(0.05)
2. Motor Planning	-0.280	0.44	-2.54(0.02)	0.49(0.02)
3. Initiative	0.186			
<u>Dependent Variable</u>	<u>Multiple R</u>			
Self-Report Verbal Victimization Score	0.48			
<u>Predictors</u>	<u>Coefficient</u>	<u>Beta</u>	<u>t(p)</u>	
Constant	2.995	-0.48	-2.56(0.02)	
1. Motor Planning	-0.173			

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## VITAE

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