How Does Sluggish Cognitive Tempo Relate to ADHD in a Sample of College Students?:

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HOW DOES SLUGGISH COGNITIVE TEMPO RELATE TO ADHD IN A SAMPLE OF COLLEGE STUDENTS?

By

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ABSTRACT

This study sought to investigate the relationship between SCT and ADHD in two groups of college students. One group consisted of 121 participants who were clinically diagnosed with ADHD. The other group was a non-diagnosed control group which consisted of 102 participants who were recruited from general university classrooms. Students diagnosed with ADHD endorsed a significantly higher number of SCT symptoms compared to the control group. Additionally, within the group diagnosed with ADHD, the strongest significant relationship was between symptoms of SCT and symptoms of inattention. The relationship between SCT and symptoms of hyperactivity and impulsivity was non-significant. There were no significant gender differences in SCT symptoms in either group. The number of SCT symptoms needed to be at or above the 95th percentile in the group diagnosed with ADHD was nine and in the control group it was five symptoms. Informant differences were investigated in the group diagnosed with ADHD and the results indicated that the self-reported score for symptoms of SCT was significantly higher than those reported by an informant rater. SCT was significantly related to symptoms of anxiety and depression. The strongest relationship was between SCT and depression. The relationship between SCT and two timed measures of cognitive functioning was investigated. The results indicated that SCT was not significantly related to a measure of reading fluency or visual matching. This is the first known study to date to have explored the relationship between ADHD and SCT in college students. Recommendations for future research are made.
CHAPTER ONE

INTRODUCTION

The objective of the current study is to increase the research regarding adult Attention Deficit Hyperactivity Disorder (ADHD) by investigating Sluggish Cognitive Tempo (SCT) in a sample of college students with and without ADHD. Historically, understanding and diagnosing ADHD has been controversial due, in large part, to the heterogeneous nature of the disorder. Previous studies with children who have been diagnosed with ADHD have indicated that identifying symptoms of SCT may increase the homogeneity within a subset of children with symptoms of inattention. College students with ADHD are an understudied group and symptoms of SCT may provide additional information that can improve diagnosis and treatment within this group.

Social Significance

The current edition of the Diagnostic and Statistical Manual of Mental Health Disorders, Text Revision (4th ed.; American Psychiatric Association, 1994) defines ADHD as a developmentally inappropriate ability to establish or maintain attention, which is frequently diagnosed in childhood. Currently, the core features include inattention, impulsivity, and hyperactivity. The dominant core feature of ADHD has been broadly debated over the years. Originally ADHD was thought to primarily exist only in childhood and remit in adulthood. At that time, the primary core feature was hyperactivity and its diagnostic name reflected this emphasis, “Hyperkinetic Reaction in Childhood” (2nd ed.; American Psychiatric Association, 1968).

Research began to unearth diagnostic inconsistencies believed to be primarily the result of the extreme heterogeneous nature of the disorder. Changes in the multiple versions of
the DSM seemed to at times increase the accuracy of diagnosing and treating ADHD. However, some of the changes in the DSM increased diagnostic confusion. This was arguably most apparent when the criteria for ADHD in the DSM-III changed in the DSM-III-R by eliminating differentiation between the core features. This change sparked a great deal of research, which led to the return of ADHD subtypes in the DSM-IV. A plethora of research that used mostly male children revealed the existence of three subtypes: ADHD-predominately inattentive (ADHD-I), ADHD- predominantly hyperactive/impulsive (ADHD-HI), and ADHD- combined type (ADHD-C) in the DSM-IV (Lahey et al., 1994). Despite the progress of ADHD research, issues regarding heterogeneity of the subtypes are still apparent.

Current research has focused much attention on trying to reduce heterogeneity. This focus led the researchers to explore a set of symptoms used in a much earlier study performed by Lahey et al. (1988). Lahey et al. (1988) investigated a set of symptoms informally associated with ADHD which included: Sluggish, Drowsy, Forgetful, Daydreams, and Disturbs Others. He referred to these symptoms as Sluggish Cognitive Tempo (SCT). The results of a factor analysis he performed indicated the existence of three distinct clusters, specifically, Hyperactive/Impulsive (ADHD-HI), Inattentive (ADHD-I), and Sluggish Cognitive Tempo (ADHD-SCT). However, his results varied based on the number of hyperactive symptoms endorsed. He encouraged additional research to determine the efficacy of including these symptoms in the DSM-IV. However, the research was not fully developed in time for its publication. Research regarding SCT has continued with mixed results.

The research indicates that SCT is highly correlated with inattention and many researchers suggest it is an independent subtype of ADHD, while still others found SCT to be a completely separate type of attention disorder. In some cases, variations in research were a result of
informant differences (parents vs. teachers) or variations in the number of SCT symptoms investigated. It is important to investigate SCT in college students since a majority of the adult population diagnosed with ADHD are diagnosed with ADHD-I or ADHD-C, which is highly correlated with SCT. Approximately 39% of those diagnosed with ADHD also endorse a significant number of SCT symptoms (Barkley, 2012).

It may be possible to create a more homogenous set of diagnostic subtypes by investigating differences between college students with ADHD-I or ADHD-C when combined with SCT. This would provide valuable information about college students with ADHD. While SCT has been investigated in children since 1984, only one study was found to have investigated SCT in adults (Barkley, 2011) and there are no known studies that have investigated SCT in college students.

Although research indicates that ADHD persists in adulthood, early studies were completed primarily with male children. Since the publication of the DSM-IV, research with adult samples has increased. Although recent literature has included adults, studies frequently combine college students diagnosed with ADHD with other adults diagnosed with ADHD who are not college students. There are indications these two groups vary significantly and should be studied separately. College students with ADHD tend to be higher functioning and have greater compensatory strategies when compared to same aged peers who have not attended college (Glutting, Youngstrom, & Watkins, 2005). However, college students diagnosed with ADHD struggle academically compared to their same aged undiagnosed peers who attend college.

Prevalence rates of ADHD in the college population range from 2-8% (DuPaul, Weyandt, O’Dell, & Varejo, 2009; Weyandt & DuPaul, 2008). College students with ADHD make up 25% of the students that receive disability services (Wolfe, 2001; Wolfe et al., 2009).
Symptoms of hyperactivity dissipate as age increases, resulting in more inattentive/impulsive features in college age adults diagnosed with ADHD. This disorder negatively impacts several areas of functioning including social, academic, and career (Barkley, Fischer, Edelbrock, & Smallish, 1990; Barkley, Murphy, & Fischer, 2008; Klein & Mannuzza, 1991; Klein et al., 2013, Shifrin, Proctor, & Prevatt, 2010).

**Statement of the Problem and Purpose of the Study**

The purpose of this study is to further the research regarding diagnostic subtypes of ADHD by investigating the relationship between ADHD and SCT in an understudied population, college students. The symptoms of SCT may comprise a subset of ADHD-I that is more homogenous and improve the ability to make accurate and consistent diagnostic decisions. In addition, identification of a homogenous subset of ADHD-I may also increase a clinician’s ability to provide more tailored treatments which would increase the effectiveness of the treatment that is provided.

The chronicity of ADHD is clearly supported; however, research with ADHD in adults and college students is sparse. Therefore, ADHD subtype research with children may have limited utility with adult groups. Additionally, college students with ADHD are a unique subset of adults with ADHD. A majority of those diagnosed with ADHD do not attend college, but those who pursue a secondary degree are likely to have functional differences (e.g., cognition, coping, and compensatory strategies) in comparison to adults with ADHD who did not attend college.

Current research with groups of children and one adult study have indicated that ADHD and SCT are highly correlated. Other studies have also indicated that there may be a relationship between SCT and internalizing symptoms, such as anxiety and depression, which is more
apparent when it co-exists with ADHD. Informant differences between parent and teacher ratings have produced mixed results. Mixed results have also been found in studies that have investigated gender differences in the prevalence rate of SCT. More research is needed to understand the relationship between SCT and ADHD in college students. Unveiling the relationship between SCT and ADHD in a college group will increase current knowledge regarding the presentation of ADHD.

**Design and Research Questions**

This study is a quasi-experimental design in which college students referred for a psychological evaluation will be assessed for ADHD. Those diagnosed with ADHD will be compared to a control group of college students without ADHD. This study will attempt to answer the following research questions:

1. A.) Do college students with ADHD differ on the total number of SCT symptoms endorsed compared to a non-diagnosed control group of college students? B.) What number of SCT symptoms, (0-9) (endorsed either *more often* or *very often*) meets the symptom cut point of ≥ 95% in the non-diagnosed control group of college students and those college students diagnosed with ADHD?

2. Are there gender differences for the total number of SCT symptoms endorsed? Specifically, do gender differences exist when analyzing (a) the total sample, (b) only the students diagnosed with ADHD or, (c) only the non-diagnosed control group?

3. Within the group of students diagnosed with ADHD, are there differences between self-and other-ratings of SCT at the individual item level?

4. Within the group of students diagnosed with ADHD, is there a relationship between self-reported total number of SCT symptoms, (0-9) and the total number of self-
reported symptoms of ADHD (0-18) Does this relationship differ for the total number of ADHD symptoms of inattention, hyperactivity, or impulsivity?

5. Within the group of students diagnosed with ADHD, is there a relationship between self-reported total SCT symptoms and self-reported total anxiety or total depression?

6. Within the group of students diagnosed with ADHD, is there a relationship between self-reported total symptoms of SCT and cognitive abilities (e.g. Reading Fluency, and Visual Matching)?
CHAPTER TWO

LITERATURE REVIEW

This chapter will begin with a broad literature review of the extant ADHD research including the prevalence and functional areas of impairment, which will highlight the significance of this disorder. Since there are several impending changes expected when the DSM-V is released, this paper includes a historical review of the diagnostic criteria, which begins with the theoretical framework of ADHD, starting with the DSM-II. A review of the DSM will also reveal a burgeoning set of symptoms (SCT) which were believed to describe a subset of inattention within ADHD. The next section will provide a review of current diagnostic considerations, and possible changes that may be included in the DSM-V, scheduled to be released in May 2013.

Next, the chapter briefly reviews methods of multi-modal assessment of ADHD in adults. A majority of the diagnostic controversy in ADHD focuses on the disorders’ subtypes. Therefore, this chapter will provide a literature review of the subtypes, which begins with children, moves on to adolescents, and then highlights adults and college students. It is at this point where a constellation of symptoms named SCT are re-introduced. Current SCT research is reviewed to investigate the utility of SCT as it relates to the subtypes of ADHD. This section will include controversies and gaps in the research. The chapter concludes with a proposed study.

Prevalence and Functional Impairment

Prevalence. Attention-Deficit Hyperactivity Disorder (ADHD) refers to developmentally inappropriate levels of attention most frequently diagnosed in childhood. Its primary symptomatic manifestation consists of inattention, impulsivity, and hyperactivity. It
is one of the most commonly diagnosed mental disorders in children; prevalence rates in childhood are 4 - 8.7% (Fabiano, et al., 2013; Faraone & Biederman, 2005; Froehlich, Lanphear, Epstein, Barbaresi, Katusic, & Kahn, 2007; Polanczyk, Delima, Horta, Biederman, & Rohde, 2007, Willcutt, 2012). ADHD was once thought of as a disorder that abated with age and therefore, a majority of the research has focused on ADHD in children. Current studies indicate that ADHD frequently persists throughout adolescence and into adulthood (Barkley, Fischer, Smallish, & Fletcher, 2002; Biederman, Petty, Clarke, Lomedico, & Faraone, 2011). Specifically, core symptoms persist in 50-80% of adolescents and in 30-50% of adults, resulting in long term social disorders, lower SES, higher academic dropout rates, driving impairment and employment difficulty (Barkley et al., 2008; Bierderman et al., 2011; Klein et al., 2013; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993;).

In addition, ADHD frequently co-occurs with other disorders such as anxiety (27-30%) (Biederman, Newcorn, & Sprinch, 1991) depression (9-32%) (Biederman et al., 1991), and oppositional defiant disorder or conduct disorder (45-84%) (Barkley, DuPaul, & McMurray, 1990). Up to 22% of the children diagnosed with ADHD also have bipolar disorder (Singh, DelBello, Kowatch, & Strakowski, 2006). Overall, comorbid disorders are estimated to range between 60-100% (Gillberg et al., 2004) and they also frequently continue into adulthood (Biederman, 2004; Kessler et al., 2006). Bi-directional complications can occur when diagnosing ADHD if comorbid disorders are present, due to overlap between symptoms of ADHD and other disorders. For example, symptoms of ADHD may be falsely attributed to another disorder resulting in an inaccurate diagnosis of a comorbid disorder. At other times an existing comorbid diagnosis may be overlooked because the symptoms are falsely attributed to ADHD (Newcorn, Weiss, & Stein, 2007).
**Social Implications.** Individuals with ADHD frequently have significant social impairment across their lifespan, and this can negatively impact their interpersonal and family relationships. A meta-analysis revealed that parents of children diagnosed with either Hyperactive/Impulsive or Inattentive subtypes of ADHD have significantly more stress than parents of children without ADHD (Theule, Wiener, Tannock, & Jenkins, 2010). Hyperactive and non-compliant behaviors can significantly increase the demands placed on parents (Gadow & Nolan, 2002), which results in greater family conflict and impaired family relationships (Escobar, et al., 2005). Additionally, parents of children with ADHD tend to be more negative, directive, and less rewarding, perhaps in response to the defiant and demanding requirements a child with ADHD may place on them (Danforth, Barkely, & Stokes, 1991; DuPaul, McGoey, Eckert, & VanBrakle, 2001). These negative interactions can begin in preschool (DuPaul et al., 2001) and may even increase during adolescence (Lifford, Harold, & Thapar, 2009). Significantly greater conflicts are also apparent in sibling relationships, although the research is limited (Mikami & Pfiffner, 2008).

Regarding peer relationships, children and adults with ADHD are also negatively impaired. A study by Pelham and Bender (1982) reported that teachers rated children who had a significant number of hyperactive symptoms also had more social difficulties with their classmates than their peers who were not rated as having symptoms of hyperactivity. Another review suggested that as many as 52% of children with ADHD are rejected by their peers (Hoza, 2007). One study found the most popular peer groups reported that the children with ADHD were not their friends (Hoza, et al., 2005). Also, symptoms of ADHD, such as impulsivity and aggression, have predicted peer rejection (Erhardt & Hinshaw, 1994; Whalen & Henker, 1992; Miller-Johnson, Coie, Maumary-Gremaud, & Bierman, 2001). In addition,
ADHD symptoms can be related to characteristics negatively associated with social functioning, such as poor social skills, aggression, anti-social behaviors, and an inability to understand social cues (Murray-Close et al., 2010).

Regarding social skills in the college population, scant research exists and results have been mixed. One study found that college students with ADHD had impaired social skills and self-esteem compared with their peers (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005). When compared to their peer group, those diagnosed with ADHD in childhood had significantly lower self-esteem (Dooling-Dooling-Litfin & Rosen, 1997). Chew, Jensen, and Rosen (2009) found that college students described their peers who were diagnosed with ADHD more negatively than peers without ADHD.

Dating studies have been mixed. A study by Canu and Carlson (2003) found the ADHD group to be less comfortable, less assertive, and less likely to be in a steady relationship than a group without ADHD. However, Rabiner, Anastopoulos, Costello, Hoyle, and Swartzwelder (2008) found that college students who self-reported symptoms of ADHD were not less satisfied with their social relationships compared to their peers. However, another study with college students who have ADHD found no significant differences on measures of self-concept compared to the control group (Wilmshurst, Peele, & Wilmhurst, 2011). Researchers have suggested that college students with ADHD may overindulge in social activities (McCormick, 1998). Overall, the research indicates that college students with ADHD have significantly more difficulty with peer relationships compared to their non-diagnosed counterparts (Greenwald-Mayes, 2002; Weyandt & DuPaul, 2006; Blasé, Gilbert, Anastopoulos, Costello, Swartzwelder, & Rabiner, 2009) and also more difficulty with social and emotional adjustment (Shaw-Zirt et al., 2005).
After college, social abilities and self-esteem continue to be impaired and affect various relationships including dating, marriage, and parenting ability (Barkley et al., 2008). Previous studies did not indicate that the ADHD group had higher divorce rates than control groups; however, the ADHD group endorsed significantly higher rates of marital dissatisfaction compared to their non-diagnosed peers (Minde, Eakin, Hechtman, Ochs, Bouffard, Greenfield, & Looper, 2003; Murphy, Barkley, & Bush, 2002; Barkley et al., 2008). The adult ADHD group also reported higher rates of parenting stress than the control group (Barkley et al., 2008).

**Academic Difficulty.** Individuals with ADHD frequently struggle with academic underachievement in primary, secondary and post-secondary schools (Merrell & Tymmons, 2001; Murphy et al., 2002). In fact, it is estimated that as many as 30% of children diagnosed with ADHD underachieve given their predicted ability, based on age or IQ (Frick, Lahey, Kamphaus, & Loeber 1991). This is also true for gifted children diagnosed with ADHD (Antshel et al., 2007; Cordeiro et al., 2011). Those with ADHD may contend with a higher incidence of failing grades, lower retention rates, lower scores on standardized assessments and a higher occurrence of learning disabilities (Frazier, Youngstrom, Glutting, & Watkins, 2007; Fergusson, Lynskey, & Horwood, 1997). Additionally, students with ADHD may have higher absenteeism, and drop out of high school more frequently when compared to their non-diagnosed peers (Barbaresi, Katusic, Colligan, Weaver, & Jacobson, 2007). Common academic difficulties include reading, writing, and math underachievement, and these difficulties increase incrementally with an increase in symptoms of ADHD (Barry, Lyman, & Klinger, 2002). After graduating high school, those with ADHD are less likely to attend college compared to their non-diagnosed peers (DuPaul et al., 2009).
Approximately 2-8% of college students endorse ADHD symptoms (DuPaul et al., 2009; Weyandt & DuPaul, 2006). Studies demonstrate that students who exhibit symptoms of ADHD continue to have academic difficulty in the university setting (Weyandt & DuPaul, 2006). Possible contributing factors that lead to academic difficulty in college may include lack of structure, less family support, continually changing schedules, and social distractions. Some of the issues college students with ADHD endorse are: inattention, time management, organization, and planning for the future (Barkley, Knouse, & Murphy, 2011). A study by Reaser, Prevatt, Petscher, and Proctor (2007) revealed that college students diagnosed with ADHD endorsed symptoms that identified areas of impairment on a measure of Learning and Study Strategies (LASSI; Weinstein, & Palmer, 2002). The specific areas of impairment that were endorsed included: time management, concentration, selecting main ideas, and test taking strategies compared to other college students diagnosed with LD and a non-diagnosed group (Reaser, Prevatt, Petscher, & Proctor 2007).

Driving Impairment. Adults diagnosed with ADHD have impaired driving abilities. Driving difficulties include an increased involvement in auto accidents, traffic violations, speeding violations, license suspension and revocations (Barkley et al., 2002; Woodward, Fergusson, & Horwood, 2000). These impairments occur more frequently in the primarily hyperactive group (Barkley et al., 2008). Furthermore, when involved in an automobile accident, the accident tends to be more severe and the individual with ADHD tends to be at fault (Barkley et al., 2008). Additional research suggests that individuals with ADHD experience a significant increase in road rage and overall aggression while driving compared to their non-diagnosed counterparts (Richards, Deffenbacher, Rosen, Barkley, & Rodricks,
Despite these alarming driving impairments adults with ADHD tend to view themselves as being good drivers (Knouse, Bagwell, Barkley, & Murphy, 2005).

**Employment Challenges.** In the workforce individuals with ADHD must overcome several challenges, such as being on-time, meeting deadlines, organizational problems, misplaced items, scheduling difficulties, prioritizing challenges, and poor communication (Barkley et al., 2008; Patton, 2009). Employers also frequently describe their work performance more negatively than non-diagnosed co-workers (Murphy & Barkley, 1996). A study by Barkley et al. (2008) used a sample of 146 adults diagnosed with ADHD and investigated occupational differences between the ADHD group and a group diagnosed with other clinical disorders and a non-diagnosed control group. In this study the authors gained occupational information from two sources; self-report and their employer (who was blind to the diagnosis). The study yielded the following results for the ADHD group: overall lower occupational functioning, difficulties in more jobs, more challenges getting along with others in the work place, behavior issues, fired more frequently, and quit more frequently due to boredom. The supervisors of workers with ADHD rate them as having more symptoms of inattention, more impairment performing assigned work, more difficulty pursuing educational opportunities, difficulty being on-time, poor time management, difficulty managing daily tasks compared to both a clinically referred group and control group (Barkley et al., 2008). Another study by Painter, Prevatt, and Welles (2008) investigated occupational beliefs using a Career Thoughts Inventory (CTI; Sampson, Peterson, Lenz, Reardon, & Saunders, 1996) and the Minnesota Satisfaction Questionnaire MSQ; Weiss, Dawis, England, & Lofquist, 1967). These self–ratings indicated that ADHD symptoms significantly predicted difficulties in several career areas such as, beliefs, decision making confusion, commitment, anxiety, and
external career decision making conflict. An investigation of college students diagnosed with ADHD revealed they had significant occupational impairment compared to non-diagnosed peers (Shifrin, Proctor, & Prevatt, 2010). Overall, ADHD can negatively impact performance in the workplace.

**Historical Overview of the Construct ADHD**

It is clear that ADHD significantly impacts both children and adults. The heterogeneity of the disorder has contributed to difficulty in fully understanding the disorder regarding its presentation. In order to better understand ADHD and the current method of diagnosing, it is important to investigate its origins. Understanding the history of diagnosing ADHD promotes a linear progression of diagnosing through understanding previous failures and successes. Currently, one of the most controversial aspects of diagnosing ADHD centers on subtypes. Although the debate about subtypes began over 45 years ago, a solution has not yet been obtained. Symptoms of SCT were first presented 25 years ago as a possible remedy to the inconsistent nature of subtypes. Although the utility of SCT has been promising, research has been very slow until recently. The impending publication of the new diagnostic manual, the DSM-V, has caused an increase in the research on SCT.

**DSM-II (1968) Theoretical Framework**

The Second Addition of the Diagnostic Statistical Manual of Mental Disorders (DSM-II) was the first manual to contain a category related directly to present day ADHD; however, in the DSM-II it was known as Hyperkinetic Reaction of Childhood (American Psychiatric Association [APA], 1968). Hyperactivity was considered the core feature at this time, although- even at this time the research was mixed. The DSM-II was significantly more substantial than the first manual. However, like the DSM-I, it continued to emphasize
psychoanalysis and it lacked a specific diagnostic criteria and empirical support for reliability and validity (Widiger & Simonsen, 2005). The DSM-II distinguished “Organic Brain Syndromes” from Psychoses that were not related to physical conditions and included psychotic and affective disorders (Pierre, 2010). A section entitled, “Behavioral Disorders of Childhood and Adolescence” included 6 disorders: Withdrawing Reaction, Overanxious Reaction, Runaway Reaction, Unsocialized Aggressive Reaction, Group Delinquent Reaction, and Hyperkinetic Reaction of Childhood (APA, 1968). Studies that investigated possible symptoms of hyperkinetic reaction found that this disorder was extremely heterogeneous, which made it very difficult to study (Langhorne, Loney, Paternite, & Bechtoldt, 1976). Cantewell (1975) suggested that future research should investigate subgroups of hyperactivity in order to find more homogeneous groups. Additionally, in 1972, Douglas suggested that attention and impulse control had more clinical utility than hyperactivity (Douglas, 1972). A study that investigated the inter-rater agreement of the DSM-II found it to range from 20-95% with a mean of 57%. The inter-rater agreement specifically for hyperkinetic reaction was 60% (Mattison, Cantwell, Russell, & Will, 1979). This lack of agreement reveals significant concern with diagnostic consistency.

**DSM-II (1968) Diagnostic Criteria for Hyperkinetic Reaction of Childhood**

Hyperkinetic reaction of childhood is described in two sentences. “This disorder is characterized by over activity, restlessness, distractibility, and short attention span, especially in young children; the behavior usually diminishes in adolescence. “If this behavior is caused by organic brain damage, it should be diagnosed under the appropriate non-psychotic organic brain syndrome” (DSM-II; American Psychiatric Association, 1968; p. 50).

The third revised version of the diagnostic manual was developed during a time when the legitimacy of psychiatry was being challenged for failure to delineate between mentally well and mentally ill (Wilson, 1993). The DSM-III was significantly enhanced from the previous DSM-II in both size and scope and it was considered a “reframing of the biopsychosocial model” (Wilson, 1993: page 399). The DSM-III followed a research-based medical model (Wilson, 1993) and therefore, empirically based research was used to develop thresholds and criteria for diagnosis. Empirical information was ascertained from 800 clinicians who conducted various field trials and also a two-year National Institute of Mental Health (NIMH) project that accumulated information gathered from 400 clinicians from 120 clinics. The DSM-III used more detailed descriptions for the criteria of diagnosing and categorizing such as age of onset, course, impairment, complications, predisposing factors, prevalence, familial pattern and differential diagnosis (Spitzer, Dennis, & Cantwell, 1980). It contained the first multi-axis system which included: Axis I clinical disorders, Axis II developmental and personality disorders, Axis III relevant medical conditions, Axis IV relative psychosocial and environmental factors, Axis V Global Assessment Functioning (GAF) on a scale of 0-100 (APA, 1980). The use of a multi-axis system and empirical research led to a more comprehensive criterion for diagnosing all disorders including ADHD, then referred to as Attention Deficit Disorder (ADD).

The criterion for ADD was also more comprehensive in the DSM-III. It included clearly defined symptoms, specific number of symptoms (see Table 1), age of onset, as well as an exclusion criterion. Hyperkinetic reaction of childhood was renamed, ADD, with and without hyperactivity, emphasizing the attention component of ADHD (Rothenberger &
Neumarker, 2005; Barkley, 2006b). Douglas (1972) concurred that the focus should be on deficits in attention and also impulse control (Douglas, 1984; Barkley, 2006b). This was a clear departure from the consensus of the World Health Organization (WHO), which continued to emphasize hyperactivity. Critics of the DSM-III considered the creation of subtypes to be premature because there was a lack of adequate research to support their existence (Barkley et al., 2008). While a great deal of research was underway, it was not completed in time for the DSM-III-R. Additionally, it became evident that attention deficit disorder persists into adulthood and therefore, a category was created that labeled attention deficit residual type (Spitzer et al., 1980). This became a problem because attention deficit residual type lacked specificity and therefore, diagnosis was left to interpretations, which again led to inconsistent diagnosis.

**DSM-III (1980) Diagnostic Criteria for Attention Deficit Disorder with Hyperactivity**

The child displays, for his or her mental and chronological age, signs of developmentally inappropriate inattention, impulsivity, and hyperactivity. The signs must be reported by adults in the child’s environment, such as parents and teachers. Because the symptoms are typically variable, they may not be observed by the clinician. When the reports of teachers and parents conflict, primary consideration should be given to the teacher reports because of greater familiarity with age-appropriate norms. Symptoms typically worsen in situations that require self-application such as in the classroom. Signs of the disorder may be absent when the child is in a new or one-on-one situation.

The number of symptoms specified is for children between the ages eight and ten the peak age for referral. In younger children, more severe forms of the symptoms
and a greater number of symptoms are usually present. The opposite is true of older children.

Note. The criteria as presented above are for Attention Deficit Hyperactivity Disorder.

From American Psychiatric Association page 43 (1980).

A complete list of ADHD symptoms from the DSM-III are shown in Table 7.

**DSM-III-R (1987)**

The DSM-III was revised in 1987 (DSM-III-R). It was decided that more research was needed in order to understand the utility and validity of subtyping (American Psychiatric Association, 1987). Therefore, the previous three dimensional categories were changed to a single, uni-dimensional category, Attention-Deficit/Hyperactivity Disorder (ADHD). The requirement for diagnosis was the endorsement of 8 of the total 14 symptoms listed (see Table 8). The list of symptoms had a single cut-off score instead of the three separate lists that were in the DSM-III. Additionally, a new category named Undifferentiated ADD was included (APA, 1987) to take the place of the DSM-III ADD without Hyperactivity category.

A field trial was conducted in 1985 to investigate the internal consistency of using the following three items for diagnosis: inattention, impulsivity, and hyperactivity. The field trial also investigated the number of symptoms needed for diagnosis. The symptoms and criteria used for the DSM-III-R were considered to have adequate internal consistency, specificity and high sensitivity (Spitzer, Davies, Barkley, 1990). Research done by Schachar, Rutter, and Smith (1981) investigated pervasiveness of symptoms and found that pervasive hyperactivity was strongly related to behavioral disturbances while situational hyperactivity was not as strongly related. The results of this study influenced an addition in the DSM-III-R criteria for ADHD to include measures of severity (Barkley, 2006a).
Critiques of the DSM-III-R suggested that there was no empirical support to justify using the same cut-off scores for all ages nor was there empirical support for the age of onset and duration. There was also little research that supported sufficient inter-rater reliability (Pendergrast et al., 1988). No diagnostic criteria were included for undifferentiated ADD, which led to confusion and potential inconsistencies regarding how to classify children who lacked symptoms of hyperactivity (Lahey et al., 1990). When the symptoms were collapsed, a major criticism was that the identification of 8 symptoms that could lead to heterogeneity among cases diagnosed with the same disorder (e.g., two children diagnosed with the same disorder may only have two symptoms in common) (Hooper, Hynd, & Mattison, 1992).

**DSM-IV (1994) Current Diagnostic Criteria for ADHD**

The DSM-IV had some minor text revisions, and then was renamed the DSM-IV-TR. Since the DSM-IV and DSM-IV-TR are basically identical, in this paper they will be referred to as the DSM-IV. This version of the DSM took 5 years and over 1,000 people to create (American Psychiatric Association, 1994). The number of disorders listed in the first DSM was 106. The DSM-IV contains descriptions of 357 disorders. Multiple task forces were enlisted as experts in specific psychopathologies (APA, 1994). Three processes were used to ensure the quality of the DSM-IV which included conducting literature reviews, field trials, and the analysis of data sets (APA, 1994). The DSM-IV continued to use the multi-axial system (APA, 1994).

The DSM-IV criteria developed to diagnose ADHD (see Table 9) was considered empirically superior to the criteria in previous diagnostic manuals. While the ADHD criteria in the DSM-III was three dimensional, in the DSM-III-R it was changed to one-dimensional. A field trial conducted for the creation of the DSM-IV identified two dimensions (Inattention
and Hyperactive/Impulsive) and three subtypes that differed in impairment: ADHD-I, ADHD-HI and a combined type (Lahey et al., 1994). The results of the study were considered more reliable than the DSM-III. The DSM-IV reduced heterogeneity and operationally defined inattentiveness, which lowered the inconsistency that developed due to the undifferentiated ADD category listed in the DSM-III-R (Lahey et al., 1994). However, a new category in the DSM-IV called “ADHD not otherwise specified” was developed for clients who did not meet the criteria for diagnosis or when the age of onset is not met. Additionally, research has found that females are more apt to have ADHD-I and because symptoms are internalized, it was frequently overlooked. The identification of ADHD-I led to an increase in noticing this disorder in females (Lahey et al., 1994). However, in this same field trial report Lahey et al. (1994) identified some shortcomings of the DSM-IV field trials.

“It is important to interpret all findings presented in this report with the understanding that neither the age of onset criterion that is part of the diagnostic definitions of DSM-III, DSM-III-R and DSM-IV attention deficit hyperactivity disorder criteria, nor the requirement for pervasiveness across situations that is part of the DSM-IV criteria has been used in any analysis” (Lahey et al.1994, p. 1683).

Another article published by Applegate et al. (1997) investigated a sample of 380 children aged 4-17 and found that several children diagnosed with combined or inattentive type did not have impairment by age seven, which further raised questions about the validity of the DSM-IV age of onset for ADHD. Despite not having statistical support for the age of onset or pervasiveness across situations, the criteria implemented in the DSM-IV are currently used today.
In sum, great strides have been made since the initial ADHD diagnostic criterion, called Hyperkinetic Reaction of Childhood. Information gleaned from research has increased our knowledge of ADHD, which has led to an increase in both breadth and the depth of the ADHD diagnostic criteria. Despite these gains, the current diagnostic criterion for ADHD has been under constant investigation and calls for revisions. These are reviewed in the following section.

**Diagnostic Considerations**

**Threshold Considerations.** One controversy involves the number of symptoms required for a diagnosis, and whether this number changes over time. Murphy and Barkley (1996) suggest, “Perhaps it is the DSM criteria that they grow out of and not the ADHD”. Murphy and Barkley (1996) studied ADHD symptoms in adults and discovered that 6 symptoms were 2-4 standard deviations above the mean for non-diagnosed adults. Another study by Barkley et al. (2002) found the current threshold of 6 symptoms was 3.5 standard deviations above the mean for non-diagnosed adults. A recent study conducted by Solanto, Marks, Wasserstein, and Mitchell (2011) investigated the appropriateness of the current symptom threshold specifically for the hyperactivity-impulsivity symptoms. They used an ADHD rating scale that included adult normative data, which indicated that a T-score of 65 or higher was 1.5 standard deviations above the population mean. Of the participants who met the T-score of 65 or higher, only half endorsed six or more symptoms of ADHD, which left the other half undiagnosed, despite endorsing more symptoms than 93% of the adult population mean.

Several studies have indicated that lowering the number of symptoms needed to meet a diagnosis of ADHD to four, identifies a percentile within the 93rd to 95th range. Therefore,
four symptoms may be a more appropriate threshold required to meet the diagnostic criteria for ADHD in adults (Barkley et al., 2011; Barkley et al., 2008; Kooij et al., 2005).

**Gender Considerations.** Normative data suggests females are overall more inattentive and less hyperactive than their male counterparts (Goyette, Connors, & Ulrich, 1978). Therefore, the inattentive and hyperactive mean symptom scores for females may be different than it is for males. Since the current criterion is based on a sample of males, generalizability to females is questionable (Naduea & Quinn, 2002; Staller & Faraone, 2006). Females that experience significantly more impairment than their non-ADHD female counterparts may go undiagnosed due to the lack of female normative data. In order to better serve this population, it is essential that gender specific thresholds are determined based on female norms. However, the National Institutes for Health (NIH) Conference held in 1994 concluded that separate criteria for females would lead to over diagnosis (NIH, 1994) and suggested that gender differences continued to be studied (Arnold, 1996). A recent study by Nussbaum (2011) suggests that females are more likely to be diagnosed with inattentiveness and frequently receive a diagnosis much later than men, resulting in a delay of treatment which could lead to serious negative consequences in academic and psychosocial functioning. Nussbaum (2011) also suggests an exploration into hormonal influences and differences in neurological development.

**Current Criteria is Developmentally Inappropriate.** One point of controversy is that the current criteria are developmentally inappropriate (Barkley et al., 2008), and therefore symptoms lack temporal consistency. Some of the current symptoms lack face validity for assessment of ADHD in adults. For instance, items such as leaving seat in a classroom, running about, or climbing excessively (Barkley et al., 2008) are not appropriate for adults. In
addition, some of the impairments that adults with ADHD may possess are not currently represented, such as concerns in the area of marital/couple relationships, child rearing, and financial management (Barkley et al., 2006b). Some additional criteria suggested for adult diagnosis are that they are easily distracted, make impulsive decisions, fail to follow directions when performing tasks, do not adhere to promises or commitments, have difficulty following a set procedural order when performing tasks, drive faster than others, have difficulty sustaining attention, and have difficulty organizing (Barkley et al., 2008).

**Informant Concerns.** Other current ADHD diagnostic controversy includes inconsistent informant data, and the validity of subtype criteria. Current guidelines state that there must be impairment in multiple settings and information must be obtained from parents and teachers (NICE, 2009). However, there is no specificity regarding how to combine the information obtained from multiple sources. This is a concern because research has frequently revealed variance between informants (Barkley et al., 2002; Kooij et al., 2008; Zucker, et al., 2002). Some suggest that these differences are a result of differences of opinion while others suggest the variance reflects true differences in home and school settings (Gomez, 2008; Severa et al., 2010). In an effort to resolve the issue of informant variance, some researchers have opted to rely on only one source. However, deciding on a primary informant has led to controversy regarding credence. Some suggest that the parent has the most credence because the teacher is only with the child a few months while others suggest the teacher’s ratings trumps the parents since they are experts on normal behavior for a given age group (Barkley, 2006; NICE, 2009).

Research demonstrates that parent reports used to measure symptoms in a school setting are not predictive of teacher’s behavioral report of school functioning and information
provided by the parent should be limited to the home setting. Therefore, it is prudent to utilize both sources for subtype differentiation and diagnosis. A study by Valo and Tannock (2010) found a significant influence on overall diagnosis and subtype classification based on how informant information was combined. An earlier study by Rowland et al. (2008) investigated a sample of children in grades 1-5 (\(n = 7847\)) to see if subtype diagnosis was influenced by variations in how the informant data was combined. The results indicated significant differences in subtype classification based on how parent and teacher data were combined (Rowland et al., 2008). Given that ADHD diagnosis and classification is significantly affected by how informant data is combined it has been suggested that a standard procedure be implemented (Rowland et al., 2008; Valo & Tannock, 2010). Controversy regarding informants is also evident in adult diagnosis.

Adult ADHD assessments require the client and the informant to retrospectively describe the client’s childhood behavior. The ability of both informant and client to accurately recall childhood information has been concerning (Barkley et al., 2002; Mannuzza, Klein, Klein, Bessler, & Shrout, 2002; Murphy & Adler, 2004). Additionally, when parents are the informant for a client that no longer lives at home the information they provide about the clients’ current functioning is often inaccurate (Barkley et al., 2008). In this case it is often suggested that the informant should be a person with current knowledge of the clients functioning. Therefore, some suggest the informants used in adult evaluations could include a parent, sibling, spouse, or a cohabiting partner (Barkley & Edwards, 2006). The rate of agreement between the adult self-report and the informant has been mixed. A longitudinal study of hyperactive children in adulthood found low agreement on symptoms reports at age 21, \(r = .21\) (Barkley et al., 2002); however, the same children at the age of 27 increased in
agreement to ($r = .43$) (Barkley et al., 2008). A more current study by Barkley et al., (2011) investigated agreement between self and others (including parent, friends and siblings) and found moderate to high relationship (.59-.80) on ratings of current symptoms and childhood symptoms.

However, in this same study Barkley et al. (2011) found self-referred women had significantly lower informant agreement in current and childhood ratings, compared to self-referred men. Barkley et al. (2011) also found other factors contributed to lower agreement such as higher education, high anxiety, and older age.

Research that compared self and informant ratings in college students revealed mixed results. A study by Klorman, Gift, and Gorman (2009) found that female college students reported fewer symptoms than their parents. Another study by Katz, Petscher, and Welles (2009) found that college students reported more current symptoms and childhood symptoms than their informants. There are several possible explanations for these discrepancies, such as differences in perception, parent attitude, informants lack of current information about the client, failure of an accurate retrospective account of behavior, malingering, self-referred verses other referred, gender, anxiety, and age (Zucker et al., 2002; Barkley et al., 2011).

Since there is no standard method for dealing with informant discrepancies there is a concern regarding accuracy of diagnosis.

**DSM-V**

(Published May, 2013)

In 2007 a task force was assembled; it consisted of 13 groups comprised of experts in the field. These 13 groups had members from diverse backgrounds and included psychiatrists, psychologists, pediatric neurologists, statisticians and epidemiologists along with people from
the field of social work, pediatric nursing, and speech/hearing specialists (APA, 2010). They also sought out 300 expert advisors and were open to information received from other people that may be affected by the revisions made to the DSM-V (APA, 2010).

Changes proposed specifically for the ADHD diagnostic criteria addressed the following issues: the general ADHD diagnostic structure, subtypes, number content and distribution of criteria, age of onset, adult diagnostic differences, informant guidelines, inclusion and exclusion criteria and detailed descriptions of criteria for Inattention, and Hyperactivity/Impulsivity (APA, 2010).

**Proposals for the DSM-V Diagnostic Criteria for ADHD**

In the DSM-V, a change was proposed regarding the description of ADHD symptoms. The symptoms for inattention and hyperactive/impulsive behaviors should include examples appropriate for a variety of age groups, including adults. In addition, a change was proposed for the number of symptoms listed in the DSM-V and also the number of symptoms required for a diagnosis. While it was not proposed that the current number of symptoms listed for inattention change, it was proposed that the descriptions of each Inattentive symptom include examples relevant for adults (i.e. misses details, work is inaccurate) (APA, 2010). It was suggested that the symptoms of hyperactivity/impulsivity still be combined; however, the number of symptoms listed in the DSM-V should be increased. In the DSM-IV, there are nine possible symptoms: hyperactivity (6) and impulsivity (3). The suggested revision was to combine hyperactive /impulsive symptoms and add four more symptoms: act without thinking, impatient, uncomfortable doing things slowly/systematically, and difficult to resist temptations/opportunities. Additionally, it was suggested that each description included an example appropriate for various ages, and also adults.
The ADHD committee for the DSM-V proposed the number of symptoms for diagnosis should remain the same for children under the age of 17 (six or more symptoms); however, the number of symptoms required for a diagnosis in adults 17 and older should be reduced to four symptoms (APA, 2010). There is an additional criteria added that suggested the symptoms should not be due to oppositional defiance, hostility, or inability to understand directions (APA, 2010).

Additional changes proposed for the DSM-V included a revision regarding subtype diagnosis. In order to meet the criteria for a combined diagnosis, it was proposed that the criteria for inattention and hyperactivity/impulsivity must have been met for 6 months. In order to meet the diagnosis for predominately inattentive, the criterion for inattention must have been met; however, if the symptoms for hyperactivity were also met it was proposed that they would not receive a diagnosis of predominately inattentive (APA, 2010). To meet the diagnostic criteria for predominantly hyperactive/impulsive, the criterion for hyperactivity but not inattentive should have been met. Additionally, it was proposed that a new subtype should be added: inattentive presentation (restrictive) (APA, 2010). It was proposed that in order to meet the diagnostic criterion for inattention presentation (restrictive), the client should have no more than 2 symptoms of hyperactivity/impulsivity. Another important proposed change was an increase in age of onset from the age of 6 to age 12 (APA, 2010). Finally, there were no changes proposed for the diagnosis ADHD-NOS.

Informant guidelines in the DSM-V state the information for diagnosis should be obtained from the “parent and teacher.” The word “and” is bolded for emphasis in the proposed guidelines (APA, 2010). It is further suggested, in the event that teacher information is not available, the teacher feedback given to the parents will be used instead
(APA, 2010). When assessing an adolescent or adult, confirmation should be obtained from a third party (APA, 2010). It is important to note these informant guidelines do not entirely address issues found in previous studies. In sum, the changes proposed for the DSM-V address some of the existing concerns regarding the current diagnostic criteria for ADHD.

**Multi-Method Assessment of Adults**

Given the heterogeneous nature of ADHD assessment of both children and adults can be challenging. There is no one assessment that can provide all the information needed to make an accurate diagnosis of ADHD. The examiner will need to consider the uniqueness of each client and use multiple sources to obtain information (Schulenberg, Melton, & Foote, 2006; Wasserstein, 2005). In order to ensure consistent and reliable diagnostic results, it is essential that only evidence based assessments are used (Sowerby & Tripp, 2009). It is also vital to only use assessments that include normative data that match the client being assessed in regards to age, gender, and ethnicity (Sowerby & Tripp, 2009). Assessments used to diagnose ADHD should also include normative data for special populations such as college students because normative data for non-college working adults of the same age is not interchangeable. In other words, behavior or lifestyle considered typical for a college student may not be typical for a non-college working adult despite being the same age.

The data obtained from assessments will help the clinician accurately match the appropriate intervention (Barkley, 2006). The accuracy of the assessments depends on obtaining a thorough historical account, differential and comorbid diagnosis, along with investigating information from multiple sources by using multiple assessments (Barkley, 2006). The components of the assessments typically used to evaluate for ADHD in both
Clinical Interviews

Clinical interviews are considered an essential component of the diagnostic process for ADHD assessment. Their function is to gain information about the client’s presenting problems including chronicity, pervasiveness, and the overall impact ADHD symptoms have on daily functioning. The specific guidelines set forth are: to follow the DSM-IV guidelines, obtain information from multiple informants, assess for comorbid conditions, and use assessments that are based on the DSM-IV (APA, 2000). The criteria set forth in the DSM-IV require impairment in multiple settings, multiple sources, and an age of onset by age seven. To establish these criteria, interviews are typically conducted with the client and at least one other source. When evaluating a child the teachers and parents are typically interviewed. When evaluating an adult for ADHD, information is obtained from the client, significant other, and/or parent. Adult evaluations require the informants give a retrospective account of the client’s childhood symptoms, which could lead to inaccuracies because recall can be affected by the passage of time. There are three basic types of clinical interviews: structured, semi-structured, and unstructured.

The structured interview format is very specific and does not provide much flexibility. The questions, as well as the sequences and methods of recording information, are very specific (Sattler & Mash, 1998). This type of interview tends to be much longer than other interviews, because the clinician is unable to skip any questions. However, this method reduces variability, which increases the reliability of the assessment (McClellan & Werry, 2000). In some cases this method may be inappropriate, time consuming, and costly.
The semi-structured interview is the most common type of interview used for diagnosing ADHD. This type of interview typically requires more training than the highly structured clinical interview (Sattler & Mash, 1998). The clinician may still use the structured assessments; however, they will be able to explore other questions and ask for clarification based on the responses given by the client. This can provide the clinician with a better understanding of the client’s concerns and reveal possible co-morbid diagnoses.

The unstructured interview allows the clinician the opportunity to be flexible regarding how the interview is conducted. However, this may affect the reliability and validity of the interview. The clinician may fail to conduct a thorough assessment and miss critical questions; additionally, their biases may influence the interview and interpretation of the information obtained (Sattler & Mash, 1998). Unstructured interviews are sometimes used to augment the information gleaned from a structured or semi-structured interview. This information includes potential barriers to intervention, family dynamics, and associated difficulties.

The information gained from the client interview will be needed for treatment planning. However, since clinical interviews can require a great deal of time and expense, Pelham, Fabiano, and Massetti (2005) suggest that a psychometrically sound rating scale is sufficient and much less costly. However, Sowerby and Tripp (2009) point out a lack of studies comparing interviews to rating scales or questionnaires.

**Rating Scales and Questionnaires**

Unlike the clinical interview, rating scales and questionnaires are completed by the client and frequently a parent, teacher, friend, or spouse. The clinician will then score the measures based on the normative data provided, which should match the client being
assessed. These assessments can also be used to monitor the effectiveness of a treatment by comparing pre and post measures. There are two categories of questionnaires: broadband and narrowband (Sowerby & Tripp, 2009).

Broadband scales are used for a wide range of psychopathologies such as hyperactivity/impulsivity aggression, conduct problems, depression, anxiety, inattention, somatic difficulties, and at times adaptive functioning (Sowerby & Tripp, 2009). Broadband scales should not be used as the sole method of diagnosing ADHD (APA, 2000). When the clinician combines information from rating scales or questionnaires from multiple sources, she/he will need to assess them for inter-rater reliability. A complete list of the various scales and measures and their reliability and validity is beyond the scope of this paper. However, a review of some of the rating scales and questionnaires can be found in a study by Pelham et al. (2005).

**Intellectual Assessment**

A measure of intellectual functioning and cognitive abilities may be given in order to rule out general cognitive delay or a possible learning difficulty. Assessment for intellectual functioning is an important component of an evaluation of children, adolescents, or college students. It may also be important to assess a non-college adult’s intellectual functioning if it is believed that their symptoms may be better or further explained by impaired intellectual functioning (Barkley et al., 2008). Understanding discrepancies between measures of IQ compared to academic performance can help identify a specific area of concern so it can be addressed in treatment, because learning disorders are common in children diagnosed with ADHD (Barkley et al., 2008)
Medical History

It is crucial to obtain medical information from the client in order to know what medical complications could exist or what medical diagnosis could interfere with the relevancy of the diagnosis and treatment. For example, some possible rule outs would be a diagnosis of head injury, fetal alcohol syndrome, thyroid disorders, epilepsy, heart problems, and possibly perimenopause, since these may influence the client’s symptoms (Barkley, 2006; Sowerby & Tripp, 2009). It is also important to know what current medication the client is taking, since this may also affect the client’s presentation.

Subtypes of ADHD

In the diagnostic and statistical manual (DSM-IV) ADHD is depicted as having two dimensions, consisting of ADHD-HI and ADHD-I and a combined type ADHD-C. Researchers anticipated that separating ADHD into subtypes would reduce heterogeneity and in turn improve the diagnosis and treatment of the disorder. Some distinct functional differences between ADHD-I and ADHD-HI have been identified. Internalized impairments have been most frequently associated with ADHD-I while more externalized impairments have been more evident in ADHD-HI (Carlson & Mann, 2002; Milich et al., 2001). Children who have been diagnosed with ADHD-I have more difficulty with sustaining attention and adapting to changes to functional demands. Their parents rated them as having significant elevations in anxiety, withdrawal, and depression (Carlson & Mann, 2002; Milich et al., 2001). Other studies have indicated that those diagnosed with ADHD-I were more impaired in processing speed (Chhabildas, Pennington, & Willcutt, 2001; Rucklidge & Tannock, 2002). ADHD-I has also been correlated with more symptoms of depression, academic deficits, and a
lack of relationships with peers (Lahey et al., 1994; Lahey, 2001; Lee & Hinshaw, 2006; Lahey & Willcutt, 2002; Whelstedt, Thorell & Bohlin, 2009).

Parents and teachers rated children with ADHD-HI as being rejected by their peers, more prone to accidents, higher rates of conduct problems and overall more strained relationships with both parents and teachers. Nikolas & Nigg (2012) investigated differences between subtypes using a large sample of 498 children and adolescents aged 6-17 years. The group diagnosed with ADHD-C was more impaired than the other subtypes in all the areas they assessed including: inhibition, arousal, response variability, processing speed, temporal processing, and working memory. Results of a meta-analysis did support “concurrent, predictive, and discriminant validity” of the distinction between the symptoms of ADHD-I and ADHD-HI (page 16. Willcutt et al., 2012).

**Subtypes and Adults**

Since a vast majority of the research has focused on children, adult ADHD research is lagging behind. Since approximately half of those who were diagnosed with ADHD in childhood continue to meet the criteria for ADHD in adulthood, understanding the developmental path of the disorder is important. Some of these diagnostic barriers that are exclusive to diagnosing adults are: the cut off scores were normed using samples of children (which are in some cases, not appropriate for adults), and the wording of the ADHD symptoms in the DSM-IV are frequently developmentally inappropriate for adults, (e.g. runs about and climbs, has difficulty playing). Studies that made diagnoses using the DSM-IV criteria found 93% of the adults diagnosed with ADHD are diagnosed with either ADHD-I or ADHD-C (Millstein et al., 1997; Wilens et al., 2010). Since the most prevalent subtype in
adults is ADHD-I (Kessler et al., 2010) increasing our current understanding of this subtype in particular, will provide the most benefits for adults diagnosed with ADHD.

**College Students**

The most prevalent subtype in college students is also ADHD-I. Given the high demands placed on college students, those who experience impaired functioning will be impacted significantly. Inattention has a higher correlation with academic performance (Spinella & Miley, 2003). Scant studies have investigated ADHD in college students and others have grouped college students together with non-college adults. It is important to study college students separately from non-college adults for a variety of reasons. College students with ADHD are more likely to have, prior academic success, and better compensatory skills than non-college adults with ADHD (Glutting et al., 2005). A separate normative sample for college students may be warranted (Kooij et al., 2004). A study by Prevatt, Walker, Baker, and Taylor (2010) investigated 299 college students diagnosed with primarily inattentive and combined ADHD comparing differences in their current symptoms and their retrospective account of childhood symptoms. The results indicated the most commonly endorsed symptoms were related to inattention and the least endorsed symptoms were related to impulsivity (Prevatt et al., 2010) with the exception of one symptom of hyperactivity.

A recent study by Ladner, Schelenberg, Smith, and Dunaway (2011) evaluated 643 college students aged 17-29 with a new measure, the Barkley Current Symptoms Scale (BCSS: Barkley & Murphy, 2006a). On this adult ADHD measure, Barkley and Murphy (2006a) modified the wording of the ADHD symptoms on the checklist to be more relevant for adults. In this study, two methods of diagnosing are discussed; in one method, the number of symptoms are counted to make a diagnosis, and in the other, a summary method is used to
score the symptoms, which involves totaling the number of symptoms endorsed (Ladner et al., 2011). The results were compared to normative data Barkley and Murphy (2006a) obtained from 720 adults aged 17-85 who were renewing or applying for a driver’s license (Ladner et al., 2011). The number of symptoms endorsed for inattentiveness was significantly higher than Barkley and Murphy’s (1996) normative data (Ladner et al., 2011). However, the number of symptoms endorsed for hyperactivity/impulsivity was significantly lower than the normative data (Ladner et al., 2011). This data suggests that the college student population may have different norms than the general adult population, which further supports the need for separate normative data for college students.

**Temporal Instability of a Subtype**

A great deal of controversy has centered on the stability and validity of the ADHD subtypes. In an effort to gain clarity, Willcutt (2012) performed a meta-analysis of 546 studies to investigate the validity and reliability of the current ADHD subtypes: ADHD-HI, ADHD-I and ADHD-C. The stability of ADHD using the DSM-IV was supported in five longitudinal studies which revealed that 59% of those originally diagnosed with ADHD, five to nine years earlier continued to meet the criteria for ADHD; however, only 35% continued to meet the criteria for their original subtype diagnosis (Willcutt, 2012).

A longitudinal meta-analysis of ADHD demonstrated that ADHD-HI is the least stable subtype and is the most likely to dissipate as age increases. Some posit that ADHD-H may actually be a precursor of ADHD-HI (Barkley, 2006b; Lahey, Pelham, Loney, Lee, & Willcutt, 2005). ADHD-I is longitudinally more stable (Lahey et al., 2004; Lahey & Willcutt, 2010). Lahey and Willcutt (2010) found consistent developmental shifting from ADHD-C to ADHD-I, where there was an equal likelihood through time that someone who was originally
diagnosed with ADHD-C would continue to meet the criteria or “shift” and meet the criteria for a new subtype, ADHD-I. Those who were originally diagnosed with ADHD-I did not fluctuate, although on occasion their symptoms were below the threshold to meet the diagnostic criteria for ADHD (Lahey & Willcutt, 2010).

A possible explanation for what seems to be a lack of stability in subtypes in children and adolescents may be the lack of developmental considerations in the description of the ADHD symptoms listed in the DSM-IV. Some of the instability may also be attributed to an increase in the demands placed on a student moving from preschool to elementary school and a decrease in the hyperactive features (Lahey & Wilcutt, 2010). In addition, there are diagnostic inconsistencies, which is significant given that a change in one symptom could change the subtype for which a person is diagnosed. A primary goal of research continues to be finding a way to identify homogeneity within the subtypes. A variety of explanations for subtype instability have been proposed such as developmental changes, differences in the severity of the subtypes, diagnostic methods, and environmental demands.

Future Directions

**Proposed Model of Severity.** More recent studies suggest that ADHD-C is a more severe version of the ADHD-H subtype. Barkley (2006b) suggests that a possible explanation as to why the hyperactive/impulsive subtype lacks discriminate validity is that ADHD-H is a milder or earlier stage of ADHD-C. The severity model of ADHD subtypes is agreed upon by others (Lahey & Willcutt, 2010; Nigg, Tannock, & Rohde, 2010). Consistent with Barkley, Lahey et al. (2005) have posited that ADHD-H was a less severe form of ADHD compared to ADHD-C; furthermore, ADHD-H either completely dissipates with age or coverts to ADHD-C.
Despite this symptomatic developmental change, early identification and treatment is considered valuable.

**Proposed Descriptive Change of an ADHD Diagnosis.** Lahey and Willcutt (2010) suggest that a more accurate method for describing a person diagnosed with ADHD would be to “qualify” the diagnosis by denoting the number of symptoms endorsed and the subtype (e.g., ADHD-I with “7 symptoms of inattention and 3 symptoms of hyperactivity”). This method provides a more precise description of the symptomatic presentation and the authors suggest that it would help to eliminate the heterogeneity within the subtypes.

**Support for a “Restricted” Type of Inattention.** Researchers have also sought methods to reduce heterogeneity within the subtypes. Grizenko, Paci, and Joober (2010) conducted an investigation that continued to support distinct differences between inattention and hyperactive/impulsive symptoms. In a study of 375 children aged 6-12 years, they found hyperactivity was linked with more conduct disorders, and stress during pregnancy, as well as other specific genetic links that were unique for those with hyperactivity. Children with inattention were older and more frequently female (Grizenko et al., 2010).

Some research suggests that the ADHD-I subtype is a separate disorder from ADHD-H. Although both experience deficits in inattention, the type of inattention they experience may be different (Milich et al., 2001; Lahey et al., 2005). When the number of hyperactive and impulsive symptoms are restricted differences within the subtype ADHD-I are apparent. Carr, Henderson, and Nigg, (2010) have found that restricting the symptoms of hyperactivity within ADHD-I subtype (ADHD-IR) reveals unique deficits in attention, that begin in the earlier stage of attentional control. This deficit is not apparent when hyperactivity and impulsivity were not restricted.
These results were supported in earlier studies (Derefinko, Adams, Millich, & Fillmore, 2008; Diamond, 2005). A constellation of symptoms referred to as Sluggish Cognitive Tempo have been thought to assist in differentiating the two different types of attention within the ADHD-I (restricted) subtype (Lahey et al., 1988; McBurnett, Pfiffner, & Frick, 2001). Since a majority of the ADHD literature has been conducted with children very limited information is known about ADHD-I in adults and college students. Therefore, it is important to consider unique differences that may be present in these populations.

**Summary.** Overall, a review of the literature has revealed that ADHD subtypes lack developmental stability. The fluctuations are most apparent within the hyperactive/impulsive subtype. This subtype tends to dissipate with age or change to the combined subtype. The combined subtype also fluctuates although it infrequently dissipates. The ADHD-C subtype either remains stable or changes to an inattentive subtype. The inattentive type is least likely to shift to another subtype. The ADHD-I subtype either remains the same or degrades to below the threshold needed for a diagnosis. Overall, subtypes are not stable. Some of the current research suggests that these fluctuations indicate differences in severity.

Although the initial purpose of adding subtypes was to eliminate or reduce heterogeneity, to date this goal has not been achieved. While an initial theoretical framework of ADHD was centered on hyperactivity, (“Hyperkinetic Reaction of Childhood,”) current research has focused on differentiating deficits in attention. This focus has unearthed a set of symptoms that were initially investigated in 1984, categorized as “sluggish cognitive tempo” (SCT). These symptoms are quite in opposition to the once dominant feature of hyperactivity. This constellation of symptoms consists of hypoactive, lethargic, sluggish, daydreamers, and
slow moving, among others. Their precise utility is still being investigated; however, current studies have found that SCT may identify a subset of ADHD-I that is homogenous.

In sum, ADHD subtypes have undergone a number of modifications over a period of thirty years. A significantly disproportionate amount of ADHD research has been performed using samples of children and a scant amount of research has been performed with adults and even more rarely with college students. Since the most prevalent subtype in adults and college students is ADHD-I, finding a method to identify a more homogenous subset of ADHD-I would yield substantial benefits for these groups. It is believed that a subset of symptoms characterized as sluggish cognitive tempo may be useful in further specifying the nature of ADHD.

**Sluggish Cognitive Tempo**

**Historical Review.** The relationship between Sluggish Cognitive Tempo (SCT) and ADHD was first investigated in studies that critiqued how ADHD was being diagnosed using the DSM-III-R. An early investigation of symptoms currently known as SCT was conducted by Lahey, Schaughency, Frame, and Strauss (1985). They compared the symptomology of ADHD-HI and ADHD-I in a small group of children and found both groups of children suffered from an attention disorder; however, their presenting symptoms were quite different. The ADHD-HI group was rated more impaired, impulsive, sloppy, irresponsible, distractible, and having hasty answers. The ADHD-I group was rated as more sluggish, drowsy, and slow. Although the term SCT was not yet used at this time, additional studies have investigated the relationship between symptoms of SCT and ADHD.

In 1988, Lahey et al. examined the symptoms of ADHD. In this study they found that the one-dimensional method for diagnosing ADHD within the DSM-III-R identified
significant symptomatic variations within the same disorder, which resulted in a high
heterogeneity. They posited that the criteria for ADHD in the DSM-III-R introduced the
possibility of two people receiving the same diagnosis despite having opposing
symptomology. For example, an individual could receive a diagnosis of ADHD in the DSM-
III-R and endorse only one symptom of hyperactivity, whereas another person could also
receive a diagnosis of ADHD and endorse multiple symptoms of hyperactivity.

Lahey et al. (1988) investigated the symptoms of ADHD and SCT by conducting a
factor analysis and a cluster analysis. The items included 13 ADHD symptoms listed in the
DSM-III, 2 additional ADHD items from the DSM-II and five items that were thought to be
associated with inattention (sluggish, drowsy, absent-minded, daydreams, and difficulty
following directions). A factor analysis identified three factors, namely, inattention-
disorganization, hyperactivity-impulsivity and sluggish tempo. Lahey et al. (1988) describes
this third factor as, “descriptive of sluggishness, day-dreaminess, and apparent difficulties in
retaining and using information (forgetfulness, and difficulty following instructions). This
factor appeared similar to a factor labeled sluggish tempo, previously identified in the
development of the Children’s Behavior Rating Scale (Neeper & Lahey, 1986).” Following
the factor analysis, a cluster analysis was performed and three clusters were identified. The
first consisted of a cluster low on all three factors. The second cluster was high on two factors,
inattention-impulsivity and sluggish tempo, and low on hyperactive-impulsivity. The final
cluster was high on both inattention-impulsivity, and hyperactivity-impulsivity and then low
on sluggish tempo. They report that 95% of the children with ADHD-I were identified in the
2nd cluster. The authors suggest that the DSM-IV field trials should include multi-dimensions
to define ADHD and further investigate the utility of the sluggish tempo symptoms relative to ADHD.

Given these results, Frick et al. (1994) analyzed the relationship between ADHD and two symptoms of SCT in field trials. Teacher ratings were used to evaluate the utility of two symptoms of SCT, *drowsy* and *daydreams*, and symptoms of ADHD in a sample of 440 children aged 4-17 years. The results indicate that these two symptoms of SCT had high positive predictive power (PPP), meaning that when SCT was present the symptoms of inattention were also present. However, the SCT symptoms had low negative predictive power (NPP) which suggested that when SCT was not present it did not predict the absence of inattention. Therefore, they concluded that SCT lacked utility and decided not to include these symptoms in the DSM-IV (Frick et al., 1994; Task Force on DSM-IV, 1991). McBurnett et al. (2001) argued that the Lahey et al. (1988) study indicated that SCT was only related to inattention within the primarily inattentive subtype of ADHD and that the relationship between SCT and inattention dissipated when the number of hyperactive/impulsive symptoms increased. In this case, SCT would not be expected to predict the absence of inattention since in some occurrences inattention co-exists with hyperactivity/impulsivity such as in the ADHD-C subtype. Therefore the absence of SCT would not predict the absence of inattention (McBurnett et al., 2001).

McBurnett, Pfiffner, and Frick (2001) conducted another study of SCT to see if they could replicate the findings of Lahey et al. (1988) using the ADHD symptoms in the DSM-IV. A factor analysis was performed to investigate the relationship between ADHD and two symptoms of SCT (daydreams, sluggish/drowsy). These symptoms were rated by parents and teachers. The sample was 693 mostly male children aged 3-18 years. An initial analysis
revealed two separate factors: SCT and inattention loaded together, and hyperactivity/impulsivity was a separate factor. When they parsed out the hyperactive/impulsive symptoms entirely, they found that SCT and inattention were two separate factors. The pure inattentive subtype of ADHD revealed an elevation in SCT. The authors concluded that SCT differentiates two types of inattention within ADHD. McBurnett et al. (2001) suggested that homogeneity within the ADHD-I subtype can be obtained by limiting the number of hyperactive/impulsive symptoms that are endorsed when assessing for SCT. Furthermore, they pointed out that ADHD-I in the DSM-III is quite different than ADHD-I in the DSM-IV, since a diagnosis of ADHD-I can include no symptoms of hyperactivity/impulsivity or as many as five symptoms of hyperactivity/impulsivity.

The research of Lahey et al. (1988) and others supported the inclusion of ADHD subtypes for the DSM-IV which was heeded; however, symptoms of SCT were not included. To this point it seems that the DSM-IV subtype ADHD-I group does not represent a purely inattentive subgroup of ADHD. In fact, a wide varying number of hyperactive/impulsive symptoms may be present within the ADHD-I subtype, which may contribute to the heterogeneity of the disorder. Some studies indicate that symptoms of SCT may be useful in identifying two types of inattention within ADHD (McBurnett et al., 2001). Identifying a subset of ADHD-I combined with SCT seems to have the potential to decrease the heterogeneity within the ADHD-I group. However, more research was needed to understand the utility of SCT. Does it identify a subtype of ADHD-I or is it a distinct disorder? The research ensued. The following studies investigated these questions in samples of children using mainly parent and teacher reports and ratings of internalizing and externalizing symptoms.
**SCT Current Studies.** Carlson and Mann (2002) evaluated the relationship between ADHD and two symptoms of SCT: daydreams; and underactive, slow moving or lacks energy. Teacher ratings were used to identify three groups, including ADHD-I, ADHD-C, and a non-diagnosed control group. The ADHD-I group was also evaluated for SCT and then placed into two groups, high SCT (ADHD-I/HSCT) or low SCT (ADHD-I/LSCT). Students who received a score of 2 or more on both of the SCT symptoms were placed in the high SCT (ADHD-I/HSCT) group and the rest who were rated less than 2 on one or both SCT symptoms were placed in the low SCT group (ADHD-I/LSCT). The breakdown of the ADHD-I group was that 28% were rated as having high-SCT and 72% were rated as having low-SCT. The authors also note that 8% of the ADHD-C group and 3% of the control group were rated as having high-SCT (Carlson & Mann, 2002).

The children in the ADHD-I/HSCT group were rated as having more internalizing symptoms such as withdrawal, social dysfunction, anxiety, depression, and less externalizing symptoms. The ADHD-I/LSCT group was rated higher in their externalizing symptoms and lower on symptoms of internalizing, which was more similar to comorbid disorders that typically occur in the ADHD-C subgroup (Carlson & Mann, 2002). They concluded that there were two different types of inattention within the ADHD-I group. Therefore, the authors found that evaluating for SCT identified a subset of ADHD-I that was more homogenous (Carlson & Mann, 2002).

Hartman et al. (2004) found mixed results when investigating the relationship between five symptoms of SCT (e.g. sluggish/slow; in a fog; drowsy/sleepy; easily confused; and daydreams) and ADHD using parent and teacher ratings in a community sample of twins aged 8-18 years. Teachers rated children with ADHD-I as having a significantly higher number of
SCT symptoms compared to ADHD-C, ADHD-HI, and non-ADHD groups. After controlling for internalizing disorders such as anxiety, depression, and intelligence, the relationship between ADHD-I and SCT remained significant in teacher ratings. These results suggest that SCT is not solely a measure of internalizing disorders. Similarly, parent ratings also indicated that SCT was highly correlated with ADHD-I. However, parent ratings indicated that ADHD-C was also significantly related to SCT. In sum, teacher and parent ratings reveal a significant relationship between SCT and ADHD-I and this relationship remained significant even after controlling for internalizing disorders and intelligence.

A confirmatory factor analysis revealed that a three factor model provided the best fit where inattention, hyperactivity/impulsivity, and SCT were all distinct and separate factors. These results were similar to McBurnett et al. (2001) with the exception that in this study, SCT remained a separate factor when hyperactive/impulsive symptoms were included.

Results similar to Hartman et al. (2004) were found in a more recent study (Garner, Marceaux, Mrug, Patterson, & Hodgens, 2010) that investigated the relationship between SCT and ADHD in a clinical sample of 322 children aged 5-17. Garner et al. (2010) utilized the Child Behavior Checklist (CBCL) (Achenbach, 1991) to assess parent and teacher ratings of four symptoms of SCT (confused or seems in a fog, daydreams, stares blankly, and apathetic or unmotivated). Teachers rated students with ADHD-I as having a significantly higher number of SCT symptoms than students with the ADHD-HI subtype. Parent ratings suggested there was no significant difference between the ADHD-I and the ADHD-C group; however, parents rated both groups as having a significantly higher amount of SCT symptoms than the control group. While a combined score from parents and teachers indicated that SCT was highest in ADHD-I group than any other group, there were participants in all the ADHD
groups as well as the control group who also had high levels of SCT. Similarly, when the parent and teacher reports were combined there was a significant positive relationship between SCT and internalizing disorders (somatization, anxiety, and depression). However, the parent ratings also revealed a positive relationship between SCT and externalizing disorders.

It is likely that parent and teacher ratings are different because they are rating observed behavior in two different settings. Others have also found differences between parent and teacher ratings where symptoms of SCT was more strongly linked to ADHD-I groups and internalizing disorders when compared to parent ratings (McBurnett et al., 2001). A confirmatory factor analysis suggested that the best fit was a three-factor model where SCT, inattention, hyperactivity/impulsivity were all separate factors. The authors suggest that SCT has a limited ability to differentiate subtypes of ADHD (Garner et al., 2010). However, parent and teacher ratings do indicate that SCT is significantly correlated with inattention, and that SCT was also a separate construct, which is consistent with others (Hartman et al., 2004; Lahey et al., 1988; McBurnett et al., 2001).

The aforementioned studies revealed overall differences between parent and teacher ratings of children and adolescents. Although teacher ratings revealed that there was a significant relationship between ADHD-I and SCT (Carlson & Mann, 2002; Hartman et al., 2004; Garner et al., 2010), parent ratings sometimes indicated there was no significant difference between subtypes (Garner et al., 2010). Internalizing symptoms were also significantly related to SCT although SCT is not solely a measure of internalizing (Hartman et al., 2004; Garner et al., 2010; Carlson & Mann, 2002). Parent and teacher ratings may differ because they are rating two different environments, that of the home verses the school (Garner
et al., 2010). Another notable concern is the variety of symptoms used to define SCT. These concerns will be addressed in more detail later.

In 2010, Harrington and Waldman evaluated the utility of SCT to discriminate between ADHD subtypes in a clinically referred sample of 166 boys and 62 girls aged 5-18 years. The ratings were done only by parents. The symptoms used to measure SCT were forgetful, daydreams, and sluggish/drowsy. The number of people in each subtype was: ADHD-I ($n = 81$), ADHD-C ($n = 124$), and ADHD-H ($n = 23$). The ADHD-I group was divided further into two groups, ADHD-I + high SCT ($n = 37$) and ADHD-I + low SCT ($n = 44$). A rating of high SCT was given if the parent rated two of the three SCT symptoms as moderate on a scale of 0-4, where 0 = none at all and 4 = very much. All of the children who did not receive a moderate rating on two or more symptoms of SCT were placed in the low SCT group. The authors claim that the high SCT and low SCT groups were distinct because the mean scores were significantly different.

The authors’ goal was to investigate the utility of identifying a subset of ADHD-I with high-SCT. The ADHD-I/HSCT group did have a significantly higher number of inattentive symptoms than the ADHD-I/LSCT group. The group with ADHD-I/HSCT had a fewer number of hyperactive/impulsive symptoms; however, this number was not significant. There were a significantly lower number of hyperactive/impulsive symptoms when they combined the ADHD-I/HSCT and the ADHD-I/LSCT group compared to the ADHD-C and ADHD-HI groups. There was also no significant difference in the number of SCT items in the ADHD-I group when compared to the ADHD-C; however, the ADHD-I group did have a significantly higher number of SCT symptoms in comparison to the control group. The ADHD-C and ADHD-HI had significantly higher levels of internalizing symptoms and
externalizing symptoms than the ADHD-I group. However, the ADHD-I/HSCT was rated significantly higher on symptoms of depression, anxiety, social phobia, and obsessions when compared to the control group. Overall, the authors suggest that in a clinical sample, the inattentive subtype may have less severe comorbid symptoms and impairment in comparison to the hyperactive/impulsive subtype. The authors also claim that SCT lacks utility in discriminating homogeneity within the ADHD-I subtype.

The results of this study may have been impacted by the use of a parent as a rater, since previous studies have indicated that parent ratings are less likely to discriminate between subtypes in their ratings of SCT and internalizing/externalizing symptoms (Hartman et al., 2004; Todd et al., 2004). The authors reveal that the number of symptoms used to define SCT may have impaired their ability to measure the construct effectively. Therefore it is not surprising that no significant differences were found. Skirbekk, Hansen, Oerbeck, and Kristensen (2013) attempted to address this limitation by using two sets of items to measure SCT.

In the study performed by Skirbekk, et al. (2011) they investigated the relationship of SCT in four groups of children: ADHD/anxiety (n = 25), ADHD (n = 39), anxiety (n = 41), and a control group (n = 36) using only parent ratings. Parent ratings of SCT were evaluated by using two different measures. One measure included 17 symptoms of SCT (Pfiffner et al., 2007) and the other measure included five symptoms of SCT (Hartman et al., 2004). Both of these measures were considered to be highly correlated (Pearson’s r = 0.77, p < 0.001). The results that are reported are based on the 17-item measure of SCT because when they relied on the five symptom cluster of SCT symptoms, the analyses were frequently not significant, although the SCT-5 trended in a similar manner as the SCT-17 symptoms.
The parent ratings of SCT (SCT-17) were highest for the ADHD/anxiety group, followed by the ADHD-only and then the anxiety-only groups. All three of the groups were rated as having more symptoms of SCT-17 than the control group. The authors reported that the anxiety only group also had more parent-reported symptoms of inattention than the control group and when they adjusted for inattention, there was no significant difference between the anxiety-only and the control group. These results suggest that SCT as defined in this study is not another measure of anxiety. Others have found that SCT is correlated with internalizing, regardless of an ADHD diagnosis (Penny et al., 2009).

One of the most recent investigations of SCT and ADHD was conducted by Barkley (2013). In this study, he explored the likelihood that SCT is a distinct disorder or a subtype of ADHD in a community sample of 1800 children aged 6 -17 years. Parent ratings were used to determine the existence of ADHD and SCT. Barkley identified a set of fourteen symptoms that have been used in several other studies (Penny et al., 2009). In this sample, a cut-off score of six ADHD symptoms and three or more SCT symptoms were used to determine group classification. Four groups were compared, consisting of SCT ($n = 41$), ADHD ($n = 95$), ADHD/SCT ($n = 61$) and a control group ($n = 1603$).

Barkley performed a factor analysis and found that SCT, ADHD-I and ADHD-HI were separate dimensions. There was also an overlap between SCT and ADHD. In fact, 59% of those rated as having SCT were also rated as having ADHD, which was most apparent with symptoms of inattention. To consider the reverse, of those rated as having ADHD 39% were also rated as having SCT. There was a strong relationship with ADHD and executive functioning deficits which was not apparent within the SCT group. The SCT group and SCT/ADHD group was rated higher on depression in comparison to the ADHD-only and the
control group. The SCT/ADHD group had more comorbid disorders than any other group. Barkley concluded that SCT and ADHD are distinct but highly related disorders (Barkley, 2013).

In regards to anxiety and depression, several studies have investigated the relationship between SCT and depression and SCT and anxiety in samples of children (Carlson & Mann 2002; Hartman et al., 2010; Garner et al., 2010; Harington & Waldman, 2010). However, in these investigations anxiety and depression are not typically separated or they have been combined with other internalizing symptoms. Studies have reported that the relationship between SCT and anxiety/depression is positive. Carson and Mann (2002) performed a pairwise analysis of variance and found that the ADHD group with high-SCT had higher amounts of anxiety and depression than the ADHD group with low-SCT. The mean scores were 4.29 with a $SD$ of 4.28 for the ADHD group with low-SCT and 7.48 with a $SD$ of 5.85 for the ADHD group with high-SCT. The results indicated a medium effect $d = .624$. To date no studies were found that investigated the relationship between SCT and anxiety or depression in adults diagnosed with ADHD.

In sum, the findings demonstrate a positive relationship between SCT and inattention when teacher or parent ratings are used. However, there seem to be significant informant differences. Studies have indicated that teacher ratings have discriminated between ADHD subtypes and revealed a consistent positive relationship between ADHD-I and SCT, and a positive relationship between SCT and internalizing symptoms, including depression and anxiety. However, parent ratings are inconsistent. At times parent ratings are the same as the teachers and indicate symptoms of SCT are most apparent in the ADHD-I subtype. Other times, parent ratings indicate the relationships between SCT and either ADHD-I or ADHD-C
are not significantly different. The results are also mixed when parent ratings are used to investigate the relationship between SCT and internalizing disorders and externalizing symptoms. Another limitation of the current studies is there is a lack of consistency regarding how SCT is defined.

**Definition of SCT.** The studies reviewed reveal that SCT is measured and defined in various ways. The definition of SCT has varied since its initial conception in 1988 (Lahey et al.). Typically, a core set of symptoms has been used to define SCT, although the number of symptoms used in the research has ranged from 2-17 items. Clearly, wide variations in the definition of SCT can create an equal level of variation in the research. It is vital for future research to utilize valid measures of SCT and there should be no less than five symptoms used to define the construct (Klein, 2005).

More consistency in measuring SCT will increase our current understanding of the relationship between SCT and ADHD-I. Penny et al. (2009) initiated the first comprehensive review and subsequent measure of the “Sluggish Cognitive Tempo (SCT) Scale.” It has been evaluated using children from both clinical and community settings and ratings from both teachers and parents (Penny et al., 2009; Jacobson et al., 2012). Another measure created by Barkley (2011), the “Adult ADHD Rating Scale-IV (BAARS-IV),” is the only measure to have normative data for adults aged 18-70 years. (This measure will be reviewed in greater detail in the method section of this paper and Table 1.1). Although the research investigating the relationship between SCT and ADHD has used differing numbers of symptoms to evaluate their relationship, the sum of information the research provides is useful.

**Gender Differences.** Previous literature has produced mixed results with respect to gender differences. Some studies (Garner et al., 2010) found that the parents did not report
gender differences on their SCT scores; however, the teachers indicated males were more likely to be rated as more sluggish than their female counterparts.

Todd et al. (2004) found that SCT was a separate factor for males; however, in females it loaded onto inattention. On the other hand, the results from parent and teacher ratings (Garner et al., 2010) indicated there were no gender differences with regard to SCT.

Another study performed in Australia (Todd et al., 2004) investigated the relationship between SCT and ADHD using only two symptoms of SCT (daydreams, low energy) and parent reports in a sample of 1430 female twins and 1414 male twins aged 7-19. In this study three nosological systems were compared: DSM-IV subtypes, Latent class analysis subtypes (LCA), and Principal component analysis (PCA). The principle component analysis revealed gender differences. In the male group, three distinct factors were evident: SCT, ADHD-I, ADHD-HI; however, in the female group SCT loaded onto ADHD-I, therefore, they were not distinct factors. The results of the LCA suggested the two SCT items lacked discriminate utility beyond the DSM-IV subtypes. Barkley (2013) also found more males were rated as having ADHD or ADHD combined with SCT; however, females were more frequently rated as SCT-only or no diagnosis. Given relatively few studies of gender and SCT, more work is needed in this area.

**SCT and Processing Speed.** ADHD has been associated with slow processing speed (Mayes & Calhoun, 2007). Given the symptomology of SCT (e.g. sluggish, slow), a relationship between SCT and slow processing speed has been suggested (Milich et al., 2001). However, few studies have investigated this relationship (Klienmann, Lewandowski, Sheffield, & Gordon, 2005). Calhoun and Mayes (2007) investigated processing speed, using the WISC-IV to compare children diagnosed with ADHD-PI and ADHD-C and found that
children diagnosed with ADHD-PI were more impaired in their processing speed. However, Murphy-Bowman (2011) and Jacobson et al. (2012) found that after controlling for inattention, SCT symptoms continued to have a significant contribution to the variance in processing speed. Others have found no relationship between SCT and processing speed in children (Bauermeister, Barkley, Bauermeister, Martinez, & McBurnett, 2012; Becker & Langberg, 2013).

**Adults and SCT.** The aforementioned investigations have all used samples of children and adolescents. Barkley (2011) self-reports that he is the first to investigate symptoms of SCT in adults. His sample was a community sample of 1249 adults aged 18-96 years. In this investigation, a total of nine symptoms of SCT were investigated: prone to daydreaming when I should be concentrating, having trouble staying alert or awake in boring situations, easily confused, easily bored, spacy or in a fog, lethargic, more tired than others, underactive or have less energy than others, slow moving, and I don’t seem to process information as quickly or as accurately as others. Barkley determined that an endorsement of five or more symptoms of SCT was above the 95th percentile and an endorsement of four or more symptoms of ADHD was above the 95th percentile. Therefore, he used these numbers to categorize the participants as either having ADHD ($n = 46$), SCT ($n = 33$) or ADHD+SCT ($n = 39$). Furthermore, 54% of those that endorsed five or more symptoms of SCT also endorsed four symptoms of ADHD, while 46% of those with SCT did not endorse four or more symptoms of ADHD. He then subdivided the ADHD+SCT group to determine subtypes: ADHD-I+SCT ($n = 19$) or 68%, ADHD-H+SCT ($n = 3$) or 10%, ADHD-C+SCT ($n = 17$) or 65%.

Overall, the results support previous findings in children that SCT is a distinct disorder. Barkley (2011) also reported that the SCT-only group was less educated and had
more difficulty organizing and problem solving compared to the ADHD only group or the non-diagnosed group, while the ADHD combined with SCT was most impaired in measures related to executive functioning. In this study, there were no gender differences in either the SCT or the ADHD group. Barkley separated the participants into six age groups and found a decline in symptoms of inattention and hyperactive/impulsive symptoms with age. The results indicated that SCT was a distinct disorder in adults, which is the same as what was found in studies with children. He also found that the SCT group was older. Although SCT is a distinct disorder, it frequently co-occurs with ADHD.

**Summary.** Research clearly supports that ADHD is chronic and significantly impairs multiple areas of functioning. Although as many as 33% of high school students diagnosed with ADHD may either fail or delay high school graduation, others not only graduate, but go on to pursue higher education. As many as 2-8% of all college students have been diagnosed with ADHD (DuPaul et al., 2009; Weyandt & DuPaul, 2006) and they make up 25% of the college students who seek academic services (Wolfe, 2001; Wolfe et al., 2009). College students with ADHD also struggle socially, academically, and emotionally. Despite the chronicity of ADHD, a majority of the research still focuses on children.

Decades of ADHD research has greatly improved our understanding of ADHD. However, there is still a great deal of controversy surrounding ADHD subtypes. One of the issues with the validity of subtypes is that it appears to fluctuate with age. The ADHD-HI subtype seems to be the least stable subtype. The hyperactive symptoms tend to diminish with age and those who are initially diagnosed with ADHD-HI in childhood tend to shift to either ADHD-I or the ADHD-C subtype. The fluctuation between subtypes tends to recede in adulthood. Therefore, ADHD subtype research with children may have limited utility with
adult groups. Additionally, given that the majority of adults with ADHD do not attend college, those that do, may form a unique group (e.g. higher functioning, greater compensatory strategies) of adults diagnosed with ADHD.

A majority of those diagnosed with ADHD do not attend college, but those who pursue a secondary degree are likely to have functional differences e.g. cognition, coping, and compensatory strategies in comparison to adults with ADHD who did not attend college. Nonetheless, college students with ADHD struggle in several areas and while ADHD research has progressed, studies with adults and college students has lagged behind.

Collectively, studies have found that a critical step in advancing ADHD research hinges on resolving the heterogeneity within the ADHD subtypes. The most commonly occurring subtypes within the adult groups are ADHD-I and ADHD-C, with the inattentive symptoms being the most frequently occurring symptoms. Some research has indicated that SCT may help delineate two homogenous subsets within the ADHD-I group. Other research has found that SCT is highly correlated but a separate disorder from ADHD. Approximately 39% of those diagnosed with ADHD also endorse SCT symptoms and 59% of those with SCT indicate that they also have ADHD, thus indicating a common co-occurrence. Teacher reports indicate that internalizing disorders such as anxiety, depression, and impaired social functioning also frequently co-occur with SCT.

Previous research that has investigated the relationship between SCT and ADHD can be improved. This research has methodological weaknesses, including differences in the number of symptoms used to define SCT. When measuring a construct, it is important to use at least five symptoms (Kline, 2005). This can be improved by using a measure that includes normative data for the sample being measured. Several of the studies may have had different
results because they used different informants. It would be important to consider informant differences when evaluating the results.

Continued research investigating the relationship between SCT and ADHD is warranted. The ADHD research with college students is scarce and, given the prevalence and impairment this disorder causes in this population, it is vital to improve our understanding of ADHD within a sample of college students. Current research indicates that there is a strong correlation between ADHD and SCT and, therefore, learning more about this relationship in a group of college students can increase our understanding of ADHD within this group. Overall, it is hoped that investigating the relationship between ADHD and SCT in college students will provide diagnostic utility and more tailored treatments.

This study is a quasi-experimental design using a college student sample. Those diagnosed with ADHD will be compared to a non-diagnosed control group consisting of non-referred college students. This study will attempt to answer the following research questions:

1. a. Do college students diagnosed with ADHD differ on the total number of SCT symptoms endorsed compared to a non-diagnosed control group of college students?
   b. What number of SCT symptoms, (0-9) (endorsed as either more often or very often) meets the symptom cut point of ≥ 95th percentile in the non-diagnosed control group of college students and those college students diagnosed with ADHD?

2. Are there gender differences for the total number of SCT symptoms endorsed? Specifically, do gender differences exist when analyzing (a) the total sample, (b) only the students diagnosed with ADHD or, (c) only the non-diagnosed control group?
3. Within the group of students diagnosed with ADHD, are there differences between self-and other-ratings of SCT at the individual item level?

4. Within the group of students diagnosed with ADHD, is there a relationship between self-reported total number of SCT symptoms, (0-9) and the total number of self-reported symptoms of ADHD (0-18) Does this relationship differ for the total number of ADHD symptoms of inattention, hyperactivity, or impulsivity?

5. Within the group of students diagnosed with ADHD, is there a relationship between self-reported total SCT symptoms and self-reported total anxiety or total depression?

6. Within the group of students diagnosed with ADHD, is there a relationship between self-reported total symptoms of SCT and cognitive abilities (e.g. Reading Fluency, and Visual Matching)?
CHAPTER THREE

METHODS

Introduction

The literature review provided a historical examination of the diagnostic challenges that have plagued the study of ADHD. A review of the literature proposed that a constellation of symptoms called SCT may be an additional subtype of ADHD. In this chapter the research questions, hypotheses and analyses are presented. In addition, the method and procedures are described. Finally, the instruments that are used are presented.

Research Questions/Design

Multiple questions regarding the relationship between SCT and ADHD in college students will be addressed. This study used a quasi-experimental research design and multiple statistical analyses were used to analyze the data.

The research questions are as follows:

1. a. Do college students with ADHD differ on the total number of SCT symptoms endorsed compared to a non-diagnosed control group of college students? b. What number of SCT symptoms (0-9) (endorsed as either more often or very often) meet the symptom cut point of ≥ 95th percentile in the non-diagnosed control group of college students and those college students diagnosed with ADHD?

   It was hypothesized that the group of students diagnosed with ADHD will have a higher mean score of the total SCT symptoms endorsed.

2. Are there gender differences for the total number of SCT symptoms endorsed?

   Specifically, do gender differences exist when analyzing (a) the total sample, (b) only the students diagnosed with ADHD or, (c) only the non-diagnosed control group?
It was hypothesized that females will have higher mean scores of SCT.

3. Within the group of students diagnosed with ADHD, are there differences between self- and other-ratings of total SCT at the individual item level?

It was hypothesized that the student self-ratings will result in higher means scores of SCT than the other-ratings.

4. Within the group of students diagnosed with ADHD, is there a relationship between self-reported total number of SCT symptoms, (0-9) and the total number of self-reported symptoms of ADHD (0-18) Does this relationship differ for the total number of ADHD symptoms of inattention, hyperactivity, or impulsivity?

It was hypothesized that there would be a positive correlation between the total number of SCT symptoms and the total number of symptoms of inattention, hyperactivity and impulsivity. The total symptoms of inattention were hypothesized to have a significantly stronger correlation with the total number of SCT symptoms than the total number of hyperactivity and impulsivity symptoms. The strength of the relationship between total SCT and total hyperactivity versus total SCT and total impulsivity were hypothesized to not be significantly different from one another.

5. Within the group of students diagnosed with ADHD, is there a relationship between self-reported total SCT symptoms and self-reported total anxiety or total depression?

It was hypothesized that SCT symptoms would have a positive relationship with both total symptoms of anxiety and depression.

6. Within the group of students diagnosed with ADHD, was there a relationship between self-reported total symptoms of SCT and cognitive abilities (e.g. Reading Fluency, and...
Visual Matching)? It was hypothesized that the total number of SCT symptoms would have a negative relationship with all cognitive abilities subtests.

**Participants**

In this study the participants consisted of two different groups of college students who were enrolled in a large public southeastern university. The total sample consisted of 223 participants. One group was clinically diagnosed with ADHD at an on-campus clinic, and the other group was a non-diagnosed control group that consisted of college students from the same university.

**ADHD Group**

There were 121 participants in the group diagnosed with ADHD. The group diagnosed with ADHD was an existing data-set that was collected as part of the university clinic’s standard evaluation procedures that are typically used to determine a diagnosis of ADHD in a sample of college students. The ethnicity of the group diagnosed with ADHD was; Caucasian 62.1%, African American 11.1%, Asian 2.3%, Hispanic 10.3%, Other 3.3%, and Unknown 10.9%.

**Control Group**

There were 102 participants in the control group. The ethnicity of the control group was; Caucasian 65.7%, African American 6.2%, Asian 3.5%, Hispanic 10.2%, Other 3%, and 11.4% Unknown. The non-diagnosed control group was recruited from general university classes that were willing to participate including General Biological Sciences (BSC 1005), Principles of Macroeconomics (ECO 2012), Principles of Microeconomics (ECO 2013), Race and Ethnicity in the US (AMR 2097), and Dynamic Earth (GLY 1000). Additional students
were recruited from common areas outside of the university library and other common areas on the campus.

**Procedures**

**Control Group.** The participants in the control group completed the surveys online using the university’s Qualtrics Survey Tool or they completed an identical paper version of the survey. Once the participant logged onto the survey he/she completed the Informed Consent form before proceeding to the survey itself. The same procedures for the Informed Consent were followed for the paper version of the survey. The survey includes the Barkley Adult ADHD Rating Scale-IV (BAARS-IV) (Barkley, 2011), and demographic items. Those who endorsed enough ADHD symptoms to meet the DSM-IV criteria for ADHD were not used in the study. Participants that reported a prior diagnosis of ADHD were also not used in this study.

Students recruited from classrooms received extra credit and a chance to sign up for a lottery to win a gift certificate worth $15.00 for their participation in the study or a $5.00 gift certificate for the university cafe. Additional students were recruited from common areas outside of the university library; these students were given a $5.00 gift certificate for the university cafe. The participants recruited from outside of the library completed the survey either online or using an identical paper form of the survey.

**Diagnostic Procedures.** The ADHD group consisted of college students who were referred to the university Adult Learning Evaluation Center to be evaluated for ADHD. The Adult Learning Evaluation Center is a clinic within the university that conducts evaluations of students who are experiencing academic difficulty. The evaluations were conducted by
graduate students who have been thoroughly trained in the ADHD evaluation procedures and have completed the appropriate coursework to administer the appropriate assessments.

Each client completed the following forms which were developed by Barkley (2011a) *Current ADHD Symptom Scale, Childhood Symptom Scale, Developmental History, Employment History, Health History, Social History, Work Performance Rating Scale, Driving Behavior Survey, Developmental History Rating Scale, and Barkley’s Deficits in Executive Functioning Scale*. They also completed a measure of academic success, the Academic Success Inventory for College Students, ASICS; Prevatt et al., 2011), a screening measure of other DSM-IV mental health disorders and demographic information were also completed.

In addition, clients were asked to choose an informant on the basis that he/she could provide information about their current symptoms and childhood symptoms. A parent or an adult sibling usually provided information regarding symptoms that were prevalent during childhood. Current symptoms and driving information was provided by an informant who was able to provide accurate information about the client’s current functioning such as a friend, roommate, or cohabiting partner. If the client currently lived at home, then this also included a parent. In this way, information was obtained from at least two informants, self and others. The following forms were completed by an informant other than the client: *Barkley Deficits in Executive Functioning Scale, Current Symptoms Scale, Childhood Symptoms Scale, Driving Behavior Scale*.

A clinical interview was conducted to obtain additional information about the client including: developmental, employment, academic, social, family, medical, and psychiatric. In
addition, questions were asked in order to screen for anti-social, or operational defiant behaviors as well as symptoms of anxiety and depression.

Measures of cognitive processing abilities were obtained using three subtests from the Woodcock-Johnson III Tests of Cognitive Abilities (WJ-III COG; Woodcock, McGrew, & Maher, 2001) including: Verbal Comprehension, Concept Formation, and Visual Matching. An estimation of academic achievement was obtained using subtests of the Woodcock-Johnson III Test of Achievement (WJ-III ACH; Woodcock, McGrew, & Mather, 2001) including: Understanding Directions, Reading Fluency, and Passage Comprehension.

A diagnosis of ADHD was determined when the following criteria was met (Barkley, 2008) (1) Evidence that ADHD symptoms first occurred in childhood (2) Childhood symptoms of ADHD were chronic and caused significant impairment no later than middle school. (3) The client was experiencing at least six symptoms of ADHD. (4) The current symptoms they were experiencing were causing significant impairment in more than one setting. (5) There were no other better explanations for the symptoms they were experiencing.

Evaluations were conducted by graduate students who received assessment training in their course work and training to conduct adult ADHD evaluations. For each ADHD evaluation an evaluation report was completed. The Clinical Director and a PhD level licensed psychologist supervised and checked each evaluation report. If there were any disagreements a third Ph.D. psychologist was consulted, until a consensus was met. In this manner consensus was achieved on all of the evaluations.

The participants in the diagnosed group signed a consent form, completed all the other required forms, and had a confirmed diagnosis of ADHD as defined in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text revision; DSM-IV-TR; American
Psychiatric Association, 2000). The ADHD group consisted of archival data obtained from 2011-2013. Those who did not receive a diagnosis were not included in this study. Additionally, of those diagnosed with ADHD, only the clients who provided written consent to participate in research were used in this study (HSC approval 2012.7742).

**Instruments**

**The Barkley Adult ADHD Rating Scale-IV (BAARS-IV): Current Symptoms Scale.**

The Current Symptoms Scale consists of 27 total symptoms. The measure includes 18 symptoms of ADHD from the DSM-IV which includes: nine symptoms of inattention, five symptoms of hyperactivity and four symptoms of impulsivity. The rating scale also contains nine items that are consistent with symptoms currently associated with Sluggish Cognitive Tempo, Daydream, Alert, Confused, Bored, Spacey, Lethargic, Underactive, Slow Moving, Slow Processing (SCT; Milich, Balentine, & Lynam, 2001; Barkley, 2011). The items are rated on how frequently they occur (0 = never/rarely, 1= sometimes, 2 = often, 3 = very often). Symptoms were considered to be present when a rating of 2 (often) or 3 (very often) were endorsed (Barkley, 2011).

The reported internal consistency of this Current Symptoms Scale Cronbach’s alpha, from the original measure, for three subscales are Inattention $\alpha = .90$, Hyperactivity $\alpha = .78$, and Impulsivity $\alpha = .81$. Test-retest reliability using the Pearson’s correlation, from the original measure, are reported to be satisfactory, Inattention $r = .66$, Hyperactivity $r = .72$, Impulsivity $r = .82$, and SCT $r = .88$. The symptoms that were used on the SCT section were also used in prior studies to assess children for SCT and were found to have good concurrent validity (Garner et al., 2010; Penny et al., 2009). Barkley, (2011) obtained normative data for this measure, which included six different adult age groups.
The Woodcock-Johnson Tests of Cognitive Abilities and Achievement-III (WJ-III; Woodcock, McGrew, & Mather, 2001) are commonly used measures of intelligence. Information was obtained from the archival ADHD data from two timed subtests. One subtest that was used was from the Woodcock-Johnson Tests of Cognitive Abilities (WJ-II COG) and the other subtest was from the Woodcock-Johnson Tests of Achievement (WJ-II ACH). The measure of the WJ-II COG that was used in this study was Visual Matching (processing speed) which uses a timed task to measure one’s speed in discriminating visual symbols. The coefficient alpha for adults, from the original measure, was $\alpha = .93$ (WJ-III; Woodcock, McGrew, & Mather, 2001). The measure of the WJ-II-ACH that was used in this study was Reading Fluency which is a timed measure of one’s ability to read and comprehend simple sentences and then decide if the sentence is true by circling “yes” or “no”. The coefficient alpha for adults, from the original measure, was $\alpha = .90$ (WJ-III; Woodcock, McGrew, & Mather, 2001).

**Symptom Checklist.** The participants in the diagnosed group also completed a self-report checklist of DSM-IV symptoms of anxiety and depression. This checklist is considered a screen for anxiety and depression. The client indicated by checking “yes” or “no” whether or not the symptoms are currently a problem, in general.

The following symptoms were evaluated to screen for depression: depressed mood, feeling hopeless, fatigued, poor concentration, difficulty sleeping, and irritable. The symptoms that were used to screen for anxiety included: feeling restless, poor concentration, feeling anxious, feeling worried, difficulty sleeping, and/or feeling irritable.
CHAPTER FOUR

RESULTS

In this chapter, the analyses are reported. This consists of descriptive data of the sample used in the study and the results of the analyses that were conducted to investigate the hypotheses.

Data Description

The study originally included 479 participants. The original number of participants in the control group was 358; however, 13 were excluded because they endorsed 6 or more symptoms of ADHD or they reported a prior diagnosis of ADHD. A disproportionate number of the control participants were female (n = 298), while only 47 were male. Therefore, in order to better match the groups, 243 females were randomly eliminated from the control group, leaving 55 females and 47 males. The final sample consisted of 102 control participants (54% female) and 121 participants with ADHD (45% female). To ensure anonymity, participants were identified numerically. When data was missing the entire case was deleted.

Power analyses were performed using G-Power 3.1.2 (Faul, Lang, & Buchner, 2007). The first power analysis was conducted with regard to the t-tests; the most stringent of these involved research question #3. A Bonferroni correction for nine tests resulted in using an alpha of .005. The effect size was estimated to be medium (.50), and the power was set to .80. This suggested that a sample size of n = 192 is required. A second power analyses was conducted for the correlational analyses; the most stringent of this involved research question
number four. Again, a Bonferroni correction for nine tests resulted in an alpha of .005. In order to achieve a medium effect size of .3 for a two-tailed point biserial correlation, and setting the power to .08, a sample size of \( n = 139 \) was required. Given that the sample size used in this study was \( n = 223 \), sufficient power was achieved.

Tests of normality were conducted and the data were not normally distributed; however, given the size of the samples, non-normality is not an issue according to the central limit theorem. Since a correlation analysis assumes that two variables have a linear relationship, this relationship was investigated with multiple scatterplots. All of the relationships were considered to be linear. The participants in the control group ranged in age from 18-30 (\( M = 20.42, \ SD = 2.44 \)). The participants in the group who were diagnosed with ADHD ranged in age from 18-35 (\( M = 23.30, \ SD = 4.63 \)) with \( t (219) = -5.9, \ p < .001 \). The difference in age between the control group and the ADHD group was significant.

A bivariate correlation was performed to investigate if there was a significant correlation between age and the total score for SCT. The results revealed that the total score for SCT and age are not significantly correlated. Since these two variables are not correlated, age was not used as a covariate in further analyses.

**Group Comparison**

In order to answer the first research question as to whether or not college students diagnosed with ADHD differ on the total score for SCT endorsed compared to a non-diagnosed control group of college students, an independent \( t \)-test was performed. The mean scores of the dependent variable, total score for SCT, were compared between college students in the control group and in the ADHD group. The mean total score and standard deviation of the SCT for college students diagnosed with ADHD were (\( M = 5.76, \ SD = 2.32 \))
while for the control group they were \((M = 1.74, SD = 1.83)\). There was a significant difference for ADHD diagnosis, with \(t (219) = 14.91, p < .001\). College students diagnosed with ADHD endorsed higher scores than the non-diagnosed, control group of college students. The Cohen’s \(d\) effect size is considered large at 1.92.

The second part of the research question examined whether or not the number of SCT symptoms that were endorsed as either *more often* or *very often* meet the SCT symptom cut point of \(\geq 95^{th}\) percentile in the control group of college students compared to those college students diagnosed with ADHD. The term \(\geq 95^{th}\) percentile refers to the number of symptoms that need to be endorsed, in order to have more symptoms than 95% of the college students that were investigated in this sample. A frequency analysis was performed in order to investigate this. The results revealed that six or more SCT symptoms would be needed to be \(\geq 95^{th}\) percentile in the control group. In the ADHD group, the results of the frequency analysis revealed that nine or more SCT symptoms would be needed to be \(\geq 95^{th}\) percentile.

**Gender Comparison**

Gender differences for the total score of endorsed SCT symptoms was investigated in three groups (a) the total sample, (b) only the control group and (c) only the students who were diagnosed with ADHD. To investigate if there were gender differences in the total score for SCT endorsed in the entire sample, a \(t\)-test was performed where gender was the independent variable and the total score for SCT was the dependent variable. No significant gender difference in the total score for SCT was found for the total sample (see Table 1).

In order to determine if there were gender differences in the total score for SCT within the control group, a second \(t\)-test was performed where gender was the independent variable
and total score for SCT was the dependent variable. No significant gender difference in the total score for SCT was endorsed within the control group (see Table 1).

The third t-test was conducted to determine if there were gender differences in the total score of endorsed SCT symptoms within the ADHD group. Gender was the independent variable and total score of endorsed SCT symptoms was the dependent variable. There was no significant gender difference in the total number of SCT symptoms endorsed for males and females within the ADHD group (see Table 1).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>Df</th>
<th>p</th>
</tr>
</thead>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>Male</td>
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<td>3.95</td>
<td>2.86</td>
<td>-.147</td>
<td>221</td>
<td>.44</td>
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<td>Female</td>
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<td>3.89</td>
<td>2.97</td>
<td></td>
<td></td>
<td></td>
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<td>Male</td>
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<td>1.88</td>
<td>.493</td>
<td>100</td>
<td>.31</td>
</tr>
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<td>Female</td>
<td>55</td>
<td>1.82</td>
<td>1.80</td>
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</tr>
<tr>
<td>ADHD</td>
<td></td>
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<td></td>
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<tr>
<td>Male</td>
<td>67</td>
<td>5.57</td>
<td>2.25</td>
<td>1.02</td>
<td>119</td>
<td>.15</td>
</tr>
<tr>
<td>Female</td>
<td>54</td>
<td>6.00</td>
<td>2.40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Informant Differences**

The third research question investigated if there were significant within group differences for self and other ratings for each of the nine individual SCT symptoms for the participants who were diagnosed with ADHD. This question was answered by first conducting a paired sample t-test for the individual SCT items and by conducting a point biserial correlation of each of the nine individual SCT items. Fourteen of the 121 participants in the ADHD diagnosed group were missing data from an informant; therefore, the number of participants evaluated was 107. Since multiple t-tests were conducted, a Bonferroni correction was performed \( p < .005 (\alpha = .05/9\) measures = .005). Nine paired sample t-tests were conducted to investigate mean differences within the ADHD group of self-reported or other
reported individual SCT symptoms. In each pair, the independent variable was rater (individual verses other) and the dependent variable was one of the nine individual SCT items.

The results indicated that the self-reported scores were significantly higher than other-reported score on the following items, using the Bonferroni-corrected alpha of $p < .005$: Daydreams, Trouble Staying Alert, Spacey, Lethargic, Underactive, and Slow Processing. The items Confused and Slow Moving were significantly higher for self-reports compared to other-reports at $p < .013$. These results suggest that college students with ADHD rate themselves as having significantly more SCT symptoms than an informant. The effect sizes ranged from medium to large and are listed on Table 8. College students with ADHD did not rate themselves as significantly higher than the control group on the following three items: Confused, Bored and Slow Moving. These results are also shown in Table 2.

<table>
<thead>
<tr>
<th>SCT</th>
<th>N</th>
<th>Mean Diff</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daydream</td>
<td>107</td>
<td>.60</td>
<td>1.03</td>
<td>6.13**</td>
<td>106</td>
<td>.65</td>
</tr>
<tr>
<td>Alert</td>
<td>107</td>
<td>.80</td>
<td>1.20</td>
<td>6.84**</td>
<td>106</td>
<td>.80</td>
</tr>
<tr>
<td>Confused</td>
<td>107</td>
<td>.29</td>
<td>1.13</td>
<td>2.65*</td>
<td>106</td>
<td>.28</td>
</tr>
<tr>
<td>Bored</td>
<td>107</td>
<td>.12</td>
<td>1.31</td>
<td>.955</td>
<td>106</td>
<td>.13</td>
</tr>
<tr>
<td>Spacey</td>
<td>107</td>
<td>.52</td>
<td>1.13</td>
<td>4.77**</td>
<td>106</td>
<td>.51</td>
</tr>
<tr>
<td>Lethargic</td>
<td>107</td>
<td>.64</td>
<td>1.28</td>
<td>5.15**</td>
<td>106</td>
<td>.62</td>
</tr>
<tr>
<td>Underactive</td>
<td>107</td>
<td>.52</td>
<td>1.16</td>
<td>4.67**</td>
<td>106</td>
<td>.58</td>
</tr>
<tr>
<td>Slow Moving</td>
<td>107</td>
<td>.32</td>
<td>1.79</td>
<td>2.79*</td>
<td>106</td>
<td>.34</td>
</tr>
<tr>
<td>Slow Processing</td>
<td>107</td>
<td>.48</td>
<td>1.16</td>
<td>4.25**</td>
<td>160</td>
<td>.48</td>
</tr>
</tbody>
</table>

Note. **$p < .001$; *$p < .013$.

The second analysis investigated the direction of the relationship between self- and other-reported scores on the nine SCT items within the ADHD group. A point biserial
correlation was conducted to determine this relationship. The direction of the relationship between self and other scores of SCT was generally positive; higher self-ratings of SCT generally indicated higher SCT ratings from the informant. A correlation investigating SCT at the item level revealed that the strongest correlation between self and other ratings of SCT was for Slow-Processing \( r = .44, p \leq .01 \) which according to Cohen’s (1988) guidelines, is considered a medium effect. The relationship between self-ratings and other ratings of SCT that were significantly correlated with the informant SCT scores were Confused \( r = .24, p \leq .01 \), and Underactive \( r = .27, p \leq .01 \) both of which are considered to be a small effect. See Table 3.

**Table 3: Point biserial correlation of self and other ratings of individual SCT items**

<table>
<thead>
<tr>
<th></th>
<th>Day-dreams (Other)</th>
<th>Alertness (Other)</th>
<th>Confused (Other)</th>
<th>Easily Bored (Other)</th>
<th>Spacey/Fog (Other)</th>
<th>Lethargic (Other)</th>
<th>Under-active (Other)</th>
<th>Slow-moving (Other)</th>
<th>Slow-processing (Other)</th>
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<tr>
<td>Day-dreams</td>
<td>.113</td>
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<td></td>
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<tr>
<td>Alertness</td>
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<td></td>
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<tr>
<td>Confused</td>
<td>.236*</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Easily Bored</td>
<td>-.037</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Spacey/Fog</td>
<td>.169</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lethargic</td>
<td>.171</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Under-active</td>
<td>.269*</td>
<td></td>
<td></td>
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<td>Slow-moving</td>
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</tbody>
</table>

*Note. * \( p \leq 0.01 \).
SCT and ADHD

The fourth research question asked if there is a relationship within the ADHD group between the self-reported total score for SCT and the following four scores: self-reported total score of ADHD, inattention, hyperactivity, or impulsivity.

A Pearson’s correlation was performed to investigate the relationship between these variables within the ADHD group. Table 4 indicates that SCT is significantly positively correlated with ADHD symptoms and inattention symptoms. According to Cohen’s effect size, both of these relationships would be considered large. This means that students who endorse high SCT symptoms also endorsed more ADHD symptoms in general and more symptoms of inattention. The relationships between SCT and symptoms of hyperactivity and impulsivity were not significant.

Table 4: Correlation between SCT, ADHD, Inattention, Hyperactivity, and Impulsivity for college students with ADHD

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>2</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. ADHD</td>
<td><strong>.439</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Inattention</td>
<td><strong>.525</strong></td>
<td><strong>.780</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Hyperactivity</td>
<td><strong>.196</strong></td>
<td><strong>.763</strong></td>
<td><strong>.276</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Impulsivity</td>
<td><strong>.177</strong></td>
<td><strong>.722</strong></td>
<td><strong>.291</strong></td>
<td><strong>.557</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note. SCT = Sluggish Cognitive Tempo. *n* = 121. **p < .001.

SCT, Anxiety and Depression

The fifth research question asked if there was a relationship within the ADHD group (*n* = 121) between the self-reported total score of SCT symptoms and self-reported total score of anxiety or total score of depression. Correlations were performed to investigate the
relationship between SCT, anxiety and depression. Table 5 shows that SCT is significantly positively correlated with both anxiety and depression (a large effect size).

Table 5: Correlation between SCT, Depression and Anxiety

<table>
<thead>
<tr>
<th></th>
<th>SCT</th>
<th>DEP</th>
<th>ANX</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.382**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>.259*</td>
<td>0.853**</td>
<td></td>
</tr>
</tbody>
</table>

Note. SCT = Sluggish Cognitive Tempo. n = 121.
*p < .01; **p < .001.

SCT and Timed Cognitive Measures

The sixth research question asked if there was a relationship within the ADHD group between the self-reported total SCT scores and two measures of cognitive abilities, Reading Fluency and Visual Matching. The results indicate that there is no significant relationship between the total SCT score and the scores on either cognitive measure for those students in the ADHD group. The results are shown in Table 6.

Table 6: Correlation between SCT, Reading Fluency and Visual Matching

<table>
<thead>
<tr>
<th>Measure</th>
<th>SCT</th>
<th>Read</th>
<th>Visual</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT</td>
<td>.056</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Fluency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Matching</td>
<td>-.117</td>
<td>.358**</td>
<td></td>
</tr>
</tbody>
</table>

Note: SCT = Sluggish Cognitive Tempo. n = 121.
**p < .01.
CHAPTER FIVE

DISCUSSION

The purpose of the present study is to increase our understanding of the relationship between SCT and ADHD in a sample of college students. Previous research has indicated that ADHD and SCT frequently co-occur in children. One study of adults also found that ADHD and SCT frequently co-occur. This is also the first known study to investigate SCT in a sample of college students diagnosed with ADHD and a non-diagnosed control group. Given the current lack of understanding of SCT and high prevalence rates of ADHD in college students, this study makes a significant contribution to the current literature by investigating SCT and its relationship with ADHD in this group.

Given that previous studies have found a significant relationship between SCT and ADHD and that both can negatively impair attention, it is important to understand this relationship and its prevalence in college students, as college students rely heavily on attention for their academic success. Additionally, college students diagnosed with ADHD may be a unique subset of adults with ADHD and, therefore, require a separate investigation.

This chapter consists of a summary of the findings and discussion. Practical implications for practice are presented along with limitations and recommendations for future research.

ADHD and Control Group Comparison

Overall the college students who were clinically diagnosed with ADHD endorsed a significantly higher number of SCT symptoms compared to college students in the control group. These results were consistent with the stated hypothesis and indicate that SCT is more common in college students clinically diagnosed with ADHD when compared to their non-
diagnosed peers. These results are also similar to other studies performed with samples of children and one adult study (Skirbekk et al 2011; Barkley, 2011). Although this finding does not tell us how SCT differs from ADHD, it does confirm that SCT symptoms are endorsed more frequently in those college students with a diagnosis of ADHD. The remaining research questions shed light on how SCT is manifested.

In this study an endorsement of six or more SCT symptoms was at or above the 95th percentile in the college student control group; whereas nine symptoms were needed to be at or above the 95th percentile for the group with ADHD. In Barkley’s (2012) study of adults with ADHD, five symptoms of SCT were needed to be at or above the 95th percentile.

These results suggest that the ratings for SCT of college students with SCT should be normed separately from non-college adults with ADHD. It is unclear why college students with ADHD endorse having more symptoms of SCT than non-college adults. It is possible that college students overall are more prone to having more symptoms of SCT such as staying alert, daydreaming, and slow processing due to the demands of studying and attending classes. Likewise, symptoms such as lethargy, spacey, and underactivity may in part, be due to a lack of sleep or social distractions when compared to non-college adults. It may be that in the college student population, it would be appropriate to use a measure of SCT with more than nine items. All nine items needed to be endorsed in our sample in order to reach the 95th percentile. Therefore, there may be ceiling effects for college students, suggesting that more items are needed for accurate discrimination within this group.

The significance of the relationship between ADHD and SCT in college students is important because identifying these additional symptoms can provide further information
about the students’ academic impairment. As a result, treatment can be improved and more specific accommodations can be identified.

**Gender Differences**

Gender differences were investigated with regard to the number of SCT symptoms endorsed in three subsets of college students: (a) the total sample, (b) only the students diagnosed with ADHD or (c), only the non-diagnosed control group. Although it was hypothesized that females would report more symptoms of SCT compared to males, in this study there were no significant gender differences in any of the aforementioned groups. Other studies have found mixed results (Garner et al., 2010; Todd et al., 2004; Barkley, 2013). Barkley (2013) found that males were rated more frequently as having ADHD combined with SCT. However females were rated more frequently as having SCT without ADHD. The present study did not examine ADHD in combination with SCT, so it is unclear if those results would be replicated. The present study suggests that separate gender norms for SCT are not needed in the college population. Additional studies are needed to replicate this finding.

**SCT Relationship with ADHD Symptoms**

The relationship between the total symptoms of SCT and overall ADHD symptoms, inattention, hyperactivity, and impulsivity were investigated within the group of students who were diagnosed with ADHD. The results revealed that the strongest significant relationship was found between SCT and inattention. Additionally SCT was significantly correlated with ADHD overall. The relationship between SCT symptoms and hyperactivity and impulsivity was not significant. These results were consistent with the hypothesis.
Others have also found that SCT most frequently co-occurs in the ADHD-I subtype (Barkley, 2011; Garner et al., 2010; Harrington and Waldman, 2010; Carlson & Mann, 2002; Hartman et al., 2004). However, previous results have been mixed and at times differences between informants (parents vs. teachers) have indicated that SCT was also significantly related to hyperactivity and impulsivity (Garner et al., 2010). Since symptoms of inattention and SCT are considered to be covert symptoms, informant ratings from parents and teachers are prone to inaccuracy. Other studies that have found mixed results used less than five symptoms to measure SCT. In comparison, this study relied on self-report and nine symptoms to measure SCT and therefore is likely to be more accurate (Klein, 2005).

Overall, the finding that SCT is more strongly related to inattention is consistent with previous research suggesting that the inattentive subtype might be better characterized as consisting of those with and without SCT. Confirming this hypothesis could best be done with factor analysis, and would require larger sample sizes. While more information is needed to understand the impairment associated with SCT in college students, it is probable that ADHD-I with SCT is a unique profile of ADHD. Therefore, the heterogeneity that currently exists among those diagnosed with ADHD would be reduced if college students who endorse a significant number of SCT symptoms are identified.

**Informant Differences**

The results in this study indicated that the self-reported SCT scores were higher than the other-reported SCT scores on the following items: Daydreams, Trouble Staying Alert, Spacey, Lethargic, Underactive, and Slow Processing. This suggests that college students with ADHD rate themselves as having significantly more SCT symptoms than an informant. The effect sizes ranged from medium to large. There could be several reasons for the
informant differences (self and other) in this study. One possible reason could be that the SCT symptoms are internal and therefore it would be difficult for an informant to recognize these symptoms. Additionally the informant is typically a parent or a close friend and their ratings may also not be accurate because they may be biased and rate the student more positively. The informants may also not be aware of the student’s ability to function in all settings and situations. A student may have higher functioning in social situations and then have tremendous challenges paying attention in specific classes or when performing specific tasks that place high demands on their specific area of low functioning. The student may also have developed significant compensatory strategies that mask their impairment. If the informant is a parent of a college student they may not be living with their parent and therefore the parent would not have the ability to observe the student’s behavior.

**Internalizing Symptoms**

In this study SCT was significantly positively related to both anxiety and depression. The strongest relationship was between SCT and depression. Previous studies investigating the relationship between SCT and anxiety and depression have been mixed. One possible cause for the mixed results may be that a majority of the studies have relied on parent and teacher ratings of children’s internal emotions which may be difficult for informants to accurately rate. This study relied solely on self-reports of internalizing symptoms. These results suggest that in this sample college students who had ADHD and SCT were likely to also have symptoms of depression and/ or anxiety. Anxiety and depression frequently co-occur with ADHD and the results in this study suggest that when SCT is also endorsed, symptoms of anxiety and depression increase. Previous ADHD research suggests that depression co-occurs in 9-32% and anxiety co-occurs 27-30% in those diagnosed with
ADHD. This suggests a wide variation for depression. Given the strong relationship between SCT and depression it would be important to evaluate for depression in college students with ADHD and SCT. They should also be evaluated for symptoms of anxiety. This information is important since additional testing and treatment for depression and anxiety may be required for college students diagnosed with ADHD and SCT.

**Processing Speed**

The final analysis investigated the relationship between SCT and two timed measures of cognitive functioning, reading fluency and visual matching. The results revealed that SCT was not significantly related to processing speed performance on these two timed measures. This was not consistent with the stated hypothesis. These results were surprising since the symptoms of SCT imply that mental functioning is slowed. However, it is likely that the processing speed was already impaired as a result of the ADHD symptoms, and therefore it is likely that there was a floor effect. Additionally, all the ADHD participants had a high SCT scores, so there is likely a ceiling effect in this sample. Previous studies investigating the relationship between SCT and cognitive functioning in children found mixed results. In some studies SCT was significantly associated with impaired processing speed (Murphy-Bowman, 2011; Jacobson et al., 2012) while others have found no relationship between SCT and processing speed in children (Bauermeister, et al., 2012; Becker & Landberg, 2013). College students with ADHD and SCT are likely to have less impairment and more compensatory strategies than non-college students with ADHD and SCT. It is also possible that the specific measures used in this study do not tap into the specific type of processing speed impairment associated with SCT in the college student population. Other studies have found that SCT is significantly associated with impaired executive functioning. In a study of adults with ADHD
and SCT, Barkley (2011) found that SCT contributed unique variance above ADHD in
deficits in executive functioning; specifically, self-organization, problem solving, self-
discipline and self-regulation of emotion. He also found unique deficits in psychosocial
functioning. In this study executive functioning was not measured, further research is needed
to understand the impairment associated with SCT in college students.

Limitations

The limitations of this study are important. The sample was one of convenience and
consisted of a group of college student from a southeastern university, it is unclear if the
results of this investigation are generalizable to college students in general. The sample
consisted of a predominately Caucasian ethnicity and therefore may not be representative of
other ethnicities. Another limitation was that only two measures were used to measure
cognitive functioning. In this study there was no significant relationship found between SCT
and two timed measures of cognitive functioning. Since in this study only two measures were
used to evaluate cognitive functioning the results found in this study are limited. In addition
there was likely a floor effect since cognitive impairment was only measured in the sample
who was diagnosed with ADHD. Other studies that use different measures of cognitive
functioning may find different results. This study utilized a measure of nine symptoms of SCT
which experts have most frequently considered to be symptoms of SCT (Barkley 2011; Penny
et al., 2009). A child rating scale with 14 symptoms of SCT (Penny et al. 2009) suggests a
wider range of symptoms may need to be investigated. In this population of college students it
seems warranted to investigate a larger number of symptoms of SCT given that all nine
symptoms were needed to be at or above the 95th percentile for the students who were
diagnosed with ADHD.
Future Research

This is the first known study to have investigated the relationship between SCT and ADHD in a sample of college students. Given the results of this investigation further research is warranted. This study found that ADHD is highly correlated with SCT in college students. Additionally, SCT was significantly correlated with symptoms of inattention, but not significantly correlated with symptoms of hyperactivity or impulsivity in general. Barkley (2011) suggests that although SCT frequently co-occurs with ADHD it is a separate attentional disorder and having ADHD and endorsing a significant number of SCT symptoms may suggest a different type of attention disorder. Others suggest that SCT delineates a subtype of inattention. In any event future research should investigate the impairment associated with SCT with and without ADHD. Additional studies that investigate this relationship in college students are important. Therefore to further this investigation a factor analysis should be performed to better understand the relationship between ADHD and SCT in college students. This study found that SCT is significantly correlated with ADHD and inattention in a college sample; however, it is not known if SCT is distinct from ADHD and inattention in college students. Understanding this relationship is important to diagnosing and our overall understanding of ADHD.

Clinical Implications

The results of this study suggest that SCT frequently co-occurs with ADHD in a sample of college students. This study also found there is a significant correlation with between SCT and anxiety/depression in college student with ADHD. Therefore it is important to evaluate college students with ADHD and SCT for anxiety and depression. Additionally, psychological services that target improving social skills, social anxiety, test taking anxiety, and group
support for depression. There was no indication that SCT was associated with impairment on
two cognitive measures of processing speed; however, since only the participants with ADHD
were evaluated on the cognitive measures and are likely to have low scores on these measures
associated cognitive impairments should continue to be explored in students who endorse
SCT. Other studies have found a significant increase in impairment on measures of executive
functioning (Barkley, 2011; Barkley, 2013). These impairments included: executive
functioning; specifically, self-organization, problem solving, self-discipline and self-
regulation of emotion; therefore, further investigation regarding impairment in these areas
may be warranted if a student endorses a significant number of SCT symptoms. Therefore
they are likely to benefit from academic coaching to help them establish a specific plan to
cope with these areas while they are in college. Barkley (2013) has also suggested that SCT
may be a type of mind-wandering that consists of a kind of multi-tasking. The mind
wandering would occur while performing a primary task while engaging in a secondary task.
An example for college students may be listening to a lecture while texting. In the case of
SCT this multi-tasking would significantly interfere with task completion. Therefore, some
accommodations that should be considered include recording a lecture, study and test taking
environments should be free of distractions and this should include limiting technology while
engaging in primary academic tasks. Since students with SCT are likely to be more distracted
than other students, they may need more time to complete assignments and tests. Therefore,
students with SCT should receive an accommodation that includes extra time for homework
assignments and test taking. These students should also be permitted to take their tests in
another room, in order to limit distractions.
The results found in this study are significant and suggest that more research investigating the relationship between ADHD and SCT in college students is warranted. More information about the relationship between ADHD and SCT will likely lead to more accurate information about their impairment and therefore more effective and targeted treatments.

Table 7: *DSM-III (1980) Diagnostic Criteria for ADHD*

<table>
<thead>
<tr>
<th>Name of Diagnostic Manual</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSM-III</td>
<td>A. Inattention. At least three of the following:</td>
</tr>
<tr>
<td></td>
<td>(1) Often fails to finish things he or she starts</td>
</tr>
<tr>
<td></td>
<td>(2) Often doesn’t seem to listen</td>
</tr>
<tr>
<td></td>
<td>(3) Easily distracted</td>
</tr>
<tr>
<td></td>
<td>(4) Has difficulty concentrating on schoolwork or other tasks requiring sustained attention</td>
</tr>
<tr>
<td></td>
<td>(5) Has difficulty sticking to a play activity</td>
</tr>
<tr>
<td>B. Impulsivity. At least three of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) Often acts before thinking</td>
</tr>
<tr>
<td></td>
<td>(2) Shifts excessively from one activity to another</td>
</tr>
<tr>
<td></td>
<td>(3) Has difficulty organizing work (this not being due to cognitive impairment)</td>
</tr>
<tr>
<td></td>
<td>(4) Needs a lot of supervision</td>
</tr>
<tr>
<td></td>
<td>(5) Frequently calls out in class</td>
</tr>
<tr>
<td></td>
<td>(6) Has difficulty waiting turn in games or group situations</td>
</tr>
<tr>
<td>C. Hyperactivity. At least two of the following</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) Runs about or climbs on things excessively</td>
</tr>
<tr>
<td></td>
<td>(2) Has difficulty sitting still or fidgets excessively</td>
</tr>
<tr>
<td></td>
<td>(3) Has difficulty staying seated</td>
</tr>
<tr>
<td></td>
<td>(4) Moves about excessively during sleep</td>
</tr>
<tr>
<td></td>
<td>(5) Is always “on the go” or acts if “driven by a motor’</td>
</tr>
<tr>
<td>D. Onset before age seven</td>
<td></td>
</tr>
<tr>
<td>E. Duration at least six months</td>
<td></td>
</tr>
<tr>
<td>F. Not due to Schizophrenia, affective disorder, or Severe or Profound Mental Retardation</td>
<td></td>
</tr>
</tbody>
</table>
Table 7: *DSM-III (1980) Diagnostic Criteria for ADHD (Continued)*

<table>
<thead>
<tr>
<th>Name of Diagnostic Manual</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSM-III</td>
<td><strong>Attention Deficit Disorder without Hyperactivity</strong></td>
</tr>
<tr>
<td></td>
<td>The criteria for this disorder are the same as those for Attention Deficit Disorder with Hyperactivity except that the individual never had signs of hyperactivity (criterion C).</td>
</tr>
<tr>
<td></td>
<td><strong>Attention Deficit Disorder, Residual Type</strong></td>
</tr>
<tr>
<td></td>
<td>A. The individual once met the criteria for Attention Deficit Disorder with Hyperactivity. This information may come from the individual or from others, such as family members.</td>
</tr>
<tr>
<td></td>
<td>B. Signs of hyperactivity are no longer present, but other signs of the illness have persisted to the present without periods of remission, as evidenced by signs of both attentional deficits and impulsivity (e.g., difficulty organizing work and completing tasks, difficulty concentrating, being easily distracted, and making sudden decisions without thought of the consequences).</td>
</tr>
</tbody>
</table>

Table 8: *DSM-III-R (1987) Diagnostic Criteria for ADHD*

<table>
<thead>
<tr>
<th>Name of Diagnostic Manual</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSM-III-R</td>
<td>A. disturbance of at least six months during which at least eight of the following are present:</td>
</tr>
<tr>
<td></td>
<td>(1) Often fidgets with hands or feet or squirms in seat (in adolescents, may be limited to subjective feelings of restlessness)</td>
</tr>
<tr>
<td></td>
<td>(2) Has difficulty remaining seated when required to do so</td>
</tr>
<tr>
<td></td>
<td>(3) Is easily distracted by extraneous stimuli</td>
</tr>
<tr>
<td></td>
<td>(4) Has difficulty awaiting turn in games or group situations</td>
</tr>
<tr>
<td></td>
<td>(5) Often blurs out answers to questions before they have been completed</td>
</tr>
<tr>
<td></td>
<td>(6) Has difficulty following through on instructions from others (not due to oppositional behavior or failure to comprehend), E.G., fails to finish chores</td>
</tr>
<tr>
<td></td>
<td>(7) Has difficulty sustaining attention in tasks or play activities</td>
</tr>
<tr>
<td></td>
<td>(8) Often shifts from one uncompleted activity to another</td>
</tr>
<tr>
<td></td>
<td>(9) Has difficulty playing quietly</td>
</tr>
<tr>
<td></td>
<td>(10) Often talks excessively</td>
</tr>
<tr>
<td></td>
<td>(11) Often interrupts or intrudes on others, e.g. butts into other children’s games</td>
</tr>
<tr>
<td></td>
<td>(12) Often does not seem to listen to what is being said to him or her</td>
</tr>
<tr>
<td></td>
<td>(13) Often loses things necessary for tasks or activities at school or home (e.g., toys, pencils, books, assignments)</td>
</tr>
<tr>
<td></td>
<td>(14) Often engages in physically dangerous activities without considering possible consequences (not for the purpose of thrill seeking, e.g., runs into the street without looking)</td>
</tr>
<tr>
<td></td>
<td>B. Onset before age seven.</td>
</tr>
<tr>
<td></td>
<td>C. Does not meet the criteria for Pervasive Developmental Disorder.</td>
</tr>
<tr>
<td></td>
<td><strong>Criteria for severity of Attention-Deficit Hyperactivity Disorder:</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Mild:</strong> Few if any symptoms in excess of those required to make the diagnosis and only minimal or no impairment in school or social functioning.</td>
</tr>
</tbody>
</table>
Table 8: *DSM-III-R (1987) Diagnostic Criteria for ADHD (Continued)*

<table>
<thead>
<tr>
<th>Name of Diagnostic Manual</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSM-III-R</td>
<td></td>
</tr>
<tr>
<td><strong>Moderate:</strong> symptoms or functional impairment intermediate between “mild” and “severe.”</td>
<td></td>
</tr>
<tr>
<td><strong>Severe:</strong> Many symptoms in excess of those required to make the diagnosis and pervasive impairment in functioning at home and school and with peers.</td>
<td></td>
</tr>
</tbody>
</table>

Note. The criteria as presented above are for Attention Deficit Hyperactivity disorder. From American Psychiatric Association (1987).

Table 9: *DSM-IV (1994) Diagnostic Criteria for ADHD*

<table>
<thead>
<tr>
<th>Name of Diagnostic Manual</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSM-IV</td>
<td>Either (1) or (2):</td>
</tr>
<tr>
<td></td>
<td>(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: <strong>Inattention</strong></td>
</tr>
<tr>
<td></td>
<td>(a) Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities</td>
</tr>
<tr>
<td></td>
<td>(b) Often has difficulty sustaining attention in tasks or play activities</td>
</tr>
<tr>
<td></td>
<td>(c) Often does not seem to listen when spoken to directly</td>
</tr>
<tr>
<td></td>
<td>(d) Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand directions)</td>
</tr>
<tr>
<td></td>
<td>(e) Often has difficulty organizing tasks and activities</td>
</tr>
<tr>
<td></td>
<td>(f) Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)</td>
</tr>
<tr>
<td></td>
<td>(g) Often loses thing necessary for tasks or activities (e.g., toys, school assignments, pencils books, or tools)</td>
</tr>
<tr>
<td></td>
<td>(h) Is often easily distracted by extraneous stimuli</td>
</tr>
<tr>
<td></td>
<td>(i) Is often forgetful in daily activities</td>
</tr>
<tr>
<td></td>
<td>(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: <strong>Hyperactivity</strong></td>
</tr>
<tr>
<td></td>
<td>(a) Often fidgets with hands or feet or squirms in seat</td>
</tr>
<tr>
<td></td>
<td>(b) Often leaves seat in classroom or in other situations in which remaining seated is expected</td>
</tr>
<tr>
<td></td>
<td>(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)</td>
</tr>
<tr>
<td></td>
<td>(d) Often has difficulty playing or engaging in leisure activities quietly</td>
</tr>
<tr>
<td></td>
<td>(e) Is often “on the go” or often acts as if “driven by a motor”</td>
</tr>
<tr>
<td></td>
<td>(f) Talks excessively <strong>Impulsivity</strong></td>
</tr>
<tr>
<td></td>
<td>(g) Often blurts out answers before questions have been completed</td>
</tr>
<tr>
<td></td>
<td>(h) Often has difficulty waiting turn</td>
</tr>
<tr>
<td></td>
<td>(i) Often interrupts or intrudes on others (e.g., butts into conversations or games)</td>
</tr>
</tbody>
</table>
Table 9: *DSM-IV (1994) Diagnostic Criteria for ADHD (Continued)*

<table>
<thead>
<tr>
<th>Name of Diagnostic Manual</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSM-IV</td>
<td>Either (1) or (2):</td>
</tr>
<tr>
<td></td>
<td>A. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7.</td>
</tr>
<tr>
<td></td>
<td>B. Some impairment from the symptoms is present in two or more settings (e.g., school work or home).</td>
</tr>
<tr>
<td></td>
<td>C. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.</td>
</tr>
<tr>
<td></td>
<td>D. The symptoms do not occur exclusively during the course of Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder, and not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).</td>
</tr>
</tbody>
</table>

Note. The criteria as presented above are for Attention Deficit Hyperactivity disorder. From American Psychiatric Association (1994).

Table 10: *Symptoms Used to Define SCT*

<table>
<thead>
<tr>
<th>Name of authors</th>
<th>List of symptoms used in various studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lahey et al., (1988)</td>
<td>1. Daydreams</td>
</tr>
<tr>
<td></td>
<td>2. Sluggish</td>
</tr>
<tr>
<td></td>
<td>3. Drowsy</td>
</tr>
<tr>
<td></td>
<td>4. Forgetful</td>
</tr>
<tr>
<td></td>
<td>5. Difficulty following instructions</td>
</tr>
<tr>
<td>Frick et al., (1994)</td>
<td>1. Often daydreams when should be attending</td>
</tr>
<tr>
<td></td>
<td>2. Sluggish/drowsy</td>
</tr>
<tr>
<td>McBurnett et al., (2001)</td>
<td>1. Daydreams</td>
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<td>Harrington and Waldman (2010)</td>
<td>2. Sluggish/drowsy</td>
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<tr>
<td></td>
<td>3. Forgetful</td>
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<tr>
<td>Carlson and Mann (2002)</td>
<td>1. Daydreams or gets lost in his/her thoughts</td>
</tr>
<tr>
<td></td>
<td>2. Underactive, slow moving or lacks energy</td>
</tr>
<tr>
<td></td>
<td>2. Sluggish/slow to respond</td>
</tr>
<tr>
<td></td>
<td>3. Seems to be in a fog</td>
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<tr>
<td></td>
<td>4. Easily confused</td>
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<tr>
<td>Name of authors</td>
<td>List of symptoms used in various studies</td>
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<tr>
<td>Garner et al., (2012)</td>
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<td>3. Confused or seems in a fog</td>
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<td>4. Stares blankly</td>
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<td>5. Apathetic/unmotivated</td>
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<td>4. Seems in a fog</td>
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<tr>
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<td>5. Easily confused</td>
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APPENDIX A

INFORMED CONSENT

1. I consent to receiving a psycho-educational assessment from the Adult Learning Evaluation Center at Florida State University.

2. I understand that no information concerning my evaluation will be released from the Adult Learning Evaluation Center within the limits of confidentiality that have been specified (see Client Information).

3. I understand the information provided to me regarding supervision and observation of services.

4. I understand that the fee for a psycho-educational assessment is $500.00 and is payable on the first day of the evaluation unless other arrangements have been finalized through financial aid.

5. I understand that it is in my best interest to put forth my best effort during the psycho-educational evaluation.

6. The following section specifically applies to a research project that you are being asked to consider.

I freely and voluntarily and without element of force or coercion, consent to be a participant in the research project, *Exploration of the Factors Underlying Academic Difficulty in College Students.*

I understand that this research is being conducted by Dr. Frances Prevatt at Florida State University. I understand the purpose of the research project is to create an archival data base that can be used to evaluate correlates of learning disability (LD) and Attention Deficit Hyperactivity Disorder (ADHD) in a college population. I am being asked to allow the results of my current evaluation to be utilized in this archival data base. I understand that all clients in ALEC, (approximately 200 per year) are asked to participate in this research. I am not being asked to do anything other than my standard evaluation; I am just allowing my data to be used later for research purposes.

I understand that I must be at least 18 years of age in order to participate in this study.

I understand that I will receive no direct benefits in return for participating in this research project. I understand that my participation is totally voluntary and I may withdraw my consent at any time in the research. I understand that if I do not agree for my data to be used, that will have no impact on my evaluation.

I understand there is no risk involved if I agree to let my data be used.

I understand that my identity will never be associated with the data (that is, my name and any identifying information will be removed.) The records will be kept private and confidential to the extent permitted by law. Data will be stored securely and only the researchers will have access to the data base.

I understand that I may contact Dr. Frances Prevatt, Florida State University, Adult Learning Evaluation Center, 214 Stone Building, *** for answers to questions about this research or my rights.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact the FSU IRB at 2010 Levy Street, Research Building B, Suite 276, Tallahassee, FL 32306-2742, or 850-644-8633, or by email at jjcooper@fsu.edu.

I do [ ] do not [ ] consent to allow my data to be used in the manner described above.

I do [ ] do not [ ] give ALEC my permission to contact me by email or telephone to describe future research projects and ask me if I would be interested in participating. If yes, this permission is granted for _____ years from today’s date.
I do [ ] do not [ ] consent to participate in an additional research study that involves the comparison of my responses to those of a group of college students without ADHD. Should I agree, I will be given an additional thirty-three questions, which will add approximately ten minutes to my psycho-educational evaluation.

I have read, understand, and agree to all Adult Learning Evaluation Center procedures outlined in this document.

Signature ___________________________            Date__________________________
Measure of Attention Deficit Hyperactivity Disorder (ADHD) and Executive Functioning in College Students

I understand that I am not required to take this survey and that I have the option to decline participation. If I agree, my responses will be used in the research project described below.

I understand that I will take this survey online at the above stated web address. I will keep this copy of the informed consent for my records, but I will sign a copy of this consent online prior to completing the survey.

I understand that this survey is being collected to serve a research study, entitled “The Psychometric Properties of the Barkley Deficits in Executive Functioning” You will be part of the control group without ADHD. If you have a current diagnosis of ADHD and you report that on the survey, then your data will not be used as part of the control group. However, you may still participate in the study and still be eligible to participate in the lottery. This study is being conducted by Dr. Frances Prevatt at Florida State University. I understand the purpose of this research project is to evaluate an existing measure that currently has no normative data for college students. I will be given a questionnaire to complete, which will take approximately 15 minutes. About 300 college students will participate in this study, 150 with a diagnosis of ADHD and 150 without a diagnosis of ADHD.

I understand that I must be at least 18 years of age in order to participate in this study.

I understand that in return for participating in this research project, I will be entered in a drawing for a 1 in 25 chance of receiving a $15 gift certificate to the store of my choosing.

I understand that my participation is totally voluntary and I may stop participation at any time in the research, and that there is no penalty for non-participation. I understand this consent may be withdrawn at any time, even after I have completed the survey.

I understand that the responses I provide today are being collected with software that is designed to secure my data and provide me with confidentiality. Although every effort will be done to ensure confidentiality of my responses, all Internet-based communication is subject to the remote likelihood of tampering from an outside source. IP addresses will not be investigated and data will be removed from the server. My data and consent form will be kept electronically on secure servers at the FSU Learning Systems Institute (LSI) and will not be disclosed to third parties. LSI has physical and environmental controls in place to protect data. Data are backed up daily.

I understand that I may contact the primary researcher, Dr. Frances Prevatt at fprevatt@fsu.edu or at 850-644-9445. I can also contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Office of the Vice President for Research, at (850) 644-8633.
I freely and voluntarily and without element of force or coercion, consent to be a participant in the research project “The Psychometric Properties of the Barkley Deficits in Executive Functioning Scale.”

It is possible that I may wonder about my responses to the questions. If after having answered the survey questions, I feel I may have some symptoms of ADHD, I can contact my local chapter for Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD) at www.chadd.org for information for assistance with resources or I may contact the following resources:

The FSU Student Counseling Center 850-644-2003 (free)
The FSU Psychology Department Clinic 850-644-3006 (sliding scale fee)
The FSU Human Services Center 850-644-3857 (free)

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact the FSU IRB at 2010 Levy Street, Research Building B, Suite 276, Tallahassee, FL 32306-2742, or 850-644-8633, or by email at jjcooper@fsu.edu.

You will be given a copy of this information to keep for your records.

**Statement of Consent:**

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

_____ YES. By checking yes, I consent to participate in this study.

________________  _________________
Signature                                          Date

________________  _________________
Signature of Investigator                    Date
Human Subjects Application For Full IRB and Expedited Exempt Review

1. Project Title and Identification

1.1 Project Title

The Psychometric Properties of the Barkley Deficits in Executive Functioning Scale (BDEFS)

Project is: Dissertation

1.2 Principal Investigator (PI)

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<tr>
<th>Name (Last name, First name MI):</th>
<th>Highest Earned Degree:</th>
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<tbody>
<tr>
<td>Prevatt, Frances F</td>
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1.3 Co-Investigators/Research Staff

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<th>Name (Last name, First name MI):</th>
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<tr>
<th>University Department: EDUCATIONAL PSYCHOLOGY AND LEARNING SYSTEMS</th>
<th>Email: <a href="mailto:tasherryy@gmail.com">tasherryy@gmail.com</a></th>
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<td>Occupational Position: Student</td>
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### 1.4 Faculty Advisor/Department Chair/Dean Information

<table>
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<tr>
<th>Name (Last name, First name MI): Becker, Betsy J; Chair</th>
<th>Highest Earned Degree:</th>
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<td>Mailing Address:</td>
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</table>
IRB Approval Form

Office of the Vice President for Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM
Date: 03/29/2013
To: Frances Prevatt

Address: 4453
Dept.: EDUCATIONAL PSYCHOLOGY AND LEARNING SYSTEMS

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
The Psychometric Properties of the Barkley Deficits in Executive Functioning Scale (BDEFS)

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be Expedited per 45 CFR § 46.11 (7) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 03/28/2014 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Betsy Becker
HSC No. 2013.10087
REFERENCES


BIOGRAPHICAL SKETCH

EDUCATION

**PhD: Counseling Psychology. Florida State University**  
Department of Educational Psychology and Learning Systems  
College of Education, Tallahassee, FL

**BA: Psychology. University of Central Florida**  
Department of Psychology, Orlando, Florida

RESEARCH EXPERIENCE

**ADHD Coach/Trainer. Florida State University**

**Research Assistant. Florida State University.** 2007-2008

**Undergraduate Research Assistant. UCF. Children’s Learning Clinic Lab-IV.** 2007-2008


**Undergraduate Research. UCF.** Applied Cognition and Technology Lab. May 2006- Aug 2007

PUBLICATIONS


doi:10.1177/1087054713480036