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Capturing the Impairment Profile of College Students with Sluggish Cognitive Tempo Symptoms

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Abstract

Over the past 15 years, researchers have shown increasing interest in Sluggish Cognitive Tempo (SCT) symptoms. Though SCT symptoms were once considered symptoms of Attention Deficit Hyperactivity Disorder (ADHD) inattentive type, controversy now exists regarding the role of the SCT symptom set in mental health. Several questions remain regarding whether SCT symptoms are separate from related symptom sets (i.e., ADHD, anxiety, depression) and whether SCT symptoms have any negative impact on a person's day-to-day functioning. This exploratory study examined a large, general sample of college students to determine (a) whether SCT symptoms form a separate factor from ADHD, anxiety, and depression in a college sample and (b) what negative outcomes, if any, were associated with SCT symptoms. Factor analyses indicated that SCT symptoms formed a statistically separate factor from symptoms of ADHD, anxiety, and depression. Students with high levels of SCT symptoms report significantly more impairment compared to students with low levels of SCT symptoms. However, regression analyses suggest that SCT symptoms do not account for significant amounts of unique impairment after controlling for related symptoms (i.e., ADHD, anxiety, depression) and variables (i.e., sleep, health, substance use). The lack of impairment associated with SCT symptoms suggests that it may serve as an underlying construct of many mental health and lifestyle variables, rather than standing independently as a mental health construct.

Keywords: sluggish cognitive tempo, impairment, ADHD, internalizing symptoms

CAPTURING THE IMPAIRMENT PROFILE OF COLLEGE STUDENTS WITH SLUGGISH COGNITIVE TEMPO SYMPTOMS

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Sluggish Cognitive Tempo (SCT) symptoms are characterized by behaviors such as "sluggishness," "daydreaming," "absent mindedness," "in a fog," "stares blankly," "apathetic or unmotivated," and "lethargy" (Barkley, 2011a; Lahey, Pelham, Schaughency, Atkins, Murphy, Hynd, Russo, et al., 1988; Penny, Waschbusch, Klein, Corkum, & Eskes, 2009). These symptoms were once included in the diagnosis of Attention Deficit Disorder (ADD) in the third edition of the Diagnostic and Statistical Manual for Mental Disorders (DSM-III; American Psychiatric Association, 1980) and were thought to be a subtype of inattention symptoms. However, SCT symptoms are no longer included as part of the diagnostic criteria for Attention Deficit Hyperactivity Disorder (ADHD) (American Psychiatric Association, 2013, *Diagnostic and Statistical Manual of Mental Disorders,* 5th ed.). Much of the research focused upon SCT symptoms has attempted to determine whether the SCT symptom set is a unique construct separate from other ADHD subtypes or from other disorders. To assess this, two primary areas require investigation. First, researchers need to ensure that the SCT symptom set does identify individuals not otherwise identified by related symptom sets (e.g., ADHD, anxiety, depression). That is, is the SCT construct measuring something not already being measured by related symptoms? Second, if SCT symptoms form a separate construct from these related symptom sets, researchers need to investigate whether SCT is associated with negative outcomes. If SCT symptoms predict significant levels of impairment and form a separate construct from related symptoms, then SCT symptoms could be considered a meaningful, independent mental health construct.

Historically, researchers have viewed SCT symptoms as a variant of inattention symptoms, and the majority of research has investigated SCT symptoms through the lens of ADHD. In factor analyses, SCT symptoms cluster together as an independent factor when compared to ADHD Inattention (ADHD-I) and ADHD Hyperactivity-Impulsivity (ADHD-HI) symptoms (Bauermeister, Barkley, Bauermeister, Martinez, & McBurnett, 2012; Garner, Marceaux, Mrug, Patterson, & Hodgens, 2010; Jacobson, Murphy-Brown, Pritchard, Tart-Zelvin, Zabel, & Mahone, 2012; Lahey, Schaugency, Hynd, Carlson, & Nieves, 1987; McBurnett, Pfiffner, & Frick, 2001). Additionally, elevated levels of SCT symptoms seem to (a) occur in a sizeable percent of the population and (b) often occur independently from elevated levels of ADHD symptoms (Barkley, 2013; Barkley, 2012a; Wood, Lewandowski, Lovett, & Antshel, 2014). SCT symptoms also appear to be uniquely associated with elevated levels of executive dysfunction and functional impairment even after controlling for symptoms of ADHD (Barkley, 2013; Barkley, 2012a; Wood et al., 2014). These findings have led some researchers to suggest that the SCT symptom set should be included as a new subtype of ADHD (Carlson & Mann, 2002; McBurnett, Pfiffner, & Frick, 2001) or even that SCT symptoms represent an entirely different disorder (Barkley, 2012a). These proposals seem hasty, however, as the majority of these studies (a) fail to examine the relationship between SCT symptoms and other symptom sets beyond ADHD, (b) occur within clinical, rather than general, samples, and (c) fail to assess other variables that might cause individuals to endorse SCT symptoms (e.g., sleep problems, health impairment, substance use).

While much of the research on SCT symptoms has focused on the relationship between SCT and symptoms of ADHD, some recent studies have shown that SCT symptoms also share a relationship with symptoms of anxiety and depression (Barkley, 2013; Barkley, 2012a; Becker &

Langberg, 2012; Garner, 2013; Wood et al., 2014). To date, the majority of research has not considered this relationship when examining SCT symptoms, and no model currently exists to aid understanding of the complex relationships between SCT, ADHD, and internalizing symptoms. Some researchers have proposed that SCT symptoms may be the byproduct of a comorbid anxiety and ADHD-I condition (Skirbekk, Hansen, Oerbeck, & Kristensen, 2011). Others have argued that neither ADHD nor internalizing symptoms fully account for SCT symptoms. Therefore, SCT symptoms represent a unique construct similar to, yet distinct from, ADHD-I, anxiety, or depression (Garner, Mrug, Hodgens, & Patterson, 2012). Further research is needed in this area to determine whether SCT is a separate construct from anxiety, depression, and ADHD.

Considering the complex relationships between symptoms of SCT, ADHD, anxiety, and depression, it becomes even more vital to control for these related symptoms when examining outcomes associated with SCT symptoms. The majority of studies that examine SCT symptoms fail to control for ADHD, anxiety, and depression. Additionally, a number of studies examine SCT symptoms only within samples of individuals diagnosed with ADHD or an internalizing disorder. These samples do not allow for the isolation and study of those with predominantly SCT symptoms and/or examine the differences among people with high levels of SCT symptoms and high levels of ADHD, anxiety, or depression symptoms. Only two studies have controlled for symptoms of ADHD, anxiety, and depression within a general college sample (Flannery, Becker, & Luebbe, 2014; Wood et al., 2014). Both studies found that even after controlling for related symptom sets, a sizeable percentage of the sample was identified as having elevated levels of SCT symptoms (13%), and these symptoms were associated with executive dysfunction and functional impairment.

Given the rates of SCT symptoms reported by college students, symptoms of ADHD, anxiety, and depression may not be the only variables researchers need to control for when attempting to determine whether SCT symptoms are associated with outcomes. These elevated rates of SCT in college students have led some researchers to speculate that college students may be reporting SCT symptoms due to poor sleep, use of alcohol or cannabis, or health problems (Wood et al., 2014). Two studies have examined the relationship between sleep and SCT symptoms in college students. Becker and colleagues (2014) found that SCT symptoms were significantly associated with poorer sleep quality, more sleep disturbance (e.g., having bad dreams, waking up during the night), and greater daytime dysfunction. Langberg and colleagues (2014) reported while SCT symptoms have considerable overlap with daytime sleepiness, they remain statistically distinct in factor analyses. No studies have yet examined alcohol use, cannabis use, or overall health when assessing SCT symptoms.

While many studies have investigated the SCT symptom set, very few have investigated specific negative outcomes associated with SCT symptoms. Preliminary findings suggest that SCT symptoms and ADHD symptoms may be equally associated with functional impairment (Barkley, 2012a; Barkley, 2013; Wood et al., 2014). However, these studies are few and focus upon general "impairment" rather than specific, real-life tasks (e.g., procrastination, task completion). Only a handful of studies have controlled for ADHD, anxiety, and depression symptom sets when examining general impairment outcomes related to SCT symptoms (Flannery, Becker, & Luebbe, 2014; Wood et al., 2014), and none of these studies have examined other potentially related variables such as sleep, alcohol use, cannabis use, or health. This represents a significant void in the literature. The current study addresses this gap in the literature by examining specific types of academic impairment (i.e., procrastination, time

management, GPA) and functional impairment while controlling for variables potentially related to SCT (i.e., ADHD, anxiety, depression, substance use, health, sleep).

The current study attempts to answer three research questions outlined above. First, this study investigated whether SCT symptoms identify a unique construct separate from ADHD, anxiety, and depression. Second, this study examined whether High and Low SCT symptom groups differ in levels of reported negative outcomes (i.e., procrastination, time management skills, functional impairment, GPA, sleep, health, substance use, and time allocation). Third, this study analyzed whether SCT symptoms are associated with a unique impairment profile (i.e., time management skills, procrastination, functional impairment, GPA) after controlling for other potentially related variables (i.e., ADHD symptoms, anxiety symptoms, depression symptoms, sleep problems, health impairment, substance use).

Background Information on Sluggish Cognitive Tempo Symptoms

The DSM-III (American Psychological Association, 1980) first introduced Attention Deficit Disorder (ADD) as a diagnosable condition in 1980. The DSM-III outlined two diagnostic categories of ADD: (a) those who displayed hyperactive and impulsive behavior in addition to inattention were identified as ADD with hyperactivity (ADD/H) and (b) those who displayed only inattention without hyperactivity were identified as ADD without hyperactivity (ADD/noH). Included among the symptoms identifying ADD/noH individuals were "sluggishness," "drowsiness," and "apparent daydreaming." Over time, researchers came to identify these symptoms as "sluggish cognitive tempo" symptoms (Lahey et al., 1988).

Though SCT symptoms were originally used to diagnose individuals with ADD, these symptoms were excluded from the DSM-IV due to their poor negative predictive power (American Psychological Association, 2000). That is, they could predict when inattention was

present in an individual, but not when inattention would be absent (Frick, Lahey, Applegate, Kerdyck, Ollendick, Hynd, et al., 1994). Since that time, researchers have attempted to clarify what exactly SCT is and what relationship it has with ADHD (McBurnett, Pfiffner, & Frick, 2001; Carlson & Mann, 2002). Even today, no consensus exists among researchers as to the utility of SCT symptoms and whether these symptoms should be considered a new disorder, a subtype of ADHD, or something else entirely.

The Sluggish Cognitive Tempo Factor

Historically, researchers have viewed SCT symptoms as a variant of ADHD symptoms. Therefore, many researchers have focused upon the relationship between SCT symptoms and ADHD symptoms of inattention. One of the most common methods for investigating this relationship has involved the use of factor analysis. The first factor analytic study of SCT was conducted prior to the removal of SCT symptoms from the DSM-IV. In 1988, Lahey and colleagues conducted a factor analytic study of ADD symptoms listed in the DSM-III. They examined 86 children referred to a clinical assessment center. Three clinicians rated the children on a list of 20 descriptors of ADD and hyperactivity with two clinicians rating each child to assess inter-rater reliability. Lahey and colleagues found that the SCT symptom set of "sluggishness," "drowsiness," and "apparent daydreaming" formed a statistically distinct factor from the ADD symptoms of inattention and of hyperactivity/impulsivity. This led Lahey and colleagues to suggest that the factors of inattention and SCT should be examined independently, rather than collapsing them into one factor/symptom set. This early work laid the foundation for considering SCT symptoms as an independent construct from ADHD symptoms of inattention.

Following the exclusion of SCT symptoms from the DSM-IV, McBurnett et al. (2001) conducted a factor analytic study using 692 clinic-referred child subjects. Similar to Lahey and

colleagues (1988), factor analyses distinguished a three-factor model in which the SCT factor was distinct from other inattention symptoms when separate from symptoms of hyperactivity. That is, two primary inattention factors were formed (inattention and SCT), while only one factor was formed for hyperactivity-impulsivity. This supported Lahey and colleagues' (1988) theory that SCT symptoms marked a separate factor that should be investigated independent from ADHD inattention symptoms.

Researchers have consistently identified the independence of the SCT factor from that of inattention and hyperactivity/impulsivity within child and adolescent samples (Bauermeister, Barkley, Bauermeister, Martinez, & McBurnett, 2012; Carlson & Mann, 2002; Garner et al., 2014; Garner, Marceaux, Mrug, Patterson, & Hodgens, 2010; Lee, Burns, Snell, & McBurnett, 2014; Leopold, Bryan, Pennington, & Willicut, 2014) and adult samples (Barkley, 2012a; Becker & Langberg, 2013; Becker, Langberg, Luebbe, Dvorsky, & Flannery, 2014). These results support the idea that SCT symptoms form a separate construct from ADHD inattention symptoms and may represent a new subset of attention symptoms with its own characteristics. Some researchers have even proposed that SCT symptoms may represent an attention disorder separate from ADHD (Barkley, 2012a). The majority of these studies, however, focused only on the relationship between SCT symptoms and symptoms of ADHD, rather than investigating other potentially related symptom sets (e.g., anxiety and depression). Only Lee and colleagues (2014) examined SCT, ADHD, and anxiety/depression symptoms when conducting a factor analysis. They found that, in a child sample, SCT symptoms formed a separate factor from ADHD, as well as anxiety/depression. This current study replicated Lee and colleague's study to determine whether SCT symptoms would form a separate construct from ADHD, anxiety, and depression symptoms within a college sample.

Measuring Symptoms of SCT

The lack of a standardized SCT measure has been one of the greatest challenges related to the study of SCT symptoms. In the past six years, researchers have begun to formulate a list of symptoms identifying SCT and to develop measures to assess SCT symptoms. The number of SCT symptoms on SCT measures range from 3 to 15 items. At this time, no universally accepted list of SCT symptoms exists. However, some researchers have begun taking steps to standardize the process.

In 2007, Achenbach and Rescorla (2007) added a four-item SCT subset to the CBCL: "confused or seems to be in a fog," "daydreams," "stares blankly," and "apathetic or unmotivated." Though this subset provides a consistent way to measure SCT symptoms, the researchers limited themselves to four symptoms similar to Lahey's original three symptoms. This narrow list of symptoms may not assess the full scope of SCT.

Shortly thereafter, Penny and colleagues (2009) developed an empirically based SCT scale for children that included 14 symptoms. In order to develop the symptom list, Penny and colleagues first contacted a number of leaders in the field of ADHD and SCT. These researchers provided a list of symptoms that they believed to be appropriate for the SCT symptom set. From there, Penny et al. went through an extensive empirical process to assess which symptoms should be included in the final SCT symptom set. This process included the use of factor analysis, item-level analyses, reliability analyses, and preliminary validity analyses. The final 14 symptoms included the following: "is apathetic," "slow/delayed in completing tasks," "unmotivated," "lacks initiative to complete tasks," "effort on tasks fades quickly," "needs extra time for assignments," "appears to be sluggish," "drowsy," "appears tired," "has a yawning/stretching/sleepy-eyed appearance," "is underactive," "daydreams," "gets lost in own

thoughts," and "seems to be in a world of their own." Penny and colleagues administered the final 14 items to the teachers and parents of 335 children recruited from elementary schools in Eastern Canada. Penny and colleagues found the internal consistency for parents (Cronbach's alpha; range = .86 - .92) and teachers (Cronbach's alpha; range = .93 - .96) to be acceptable, as well the parent test-retest reliabilities (range = .70 - .87).

Some researchers critiqued Penny and colleagues' measure, stating that the measure may not distinguish SCT symptoms from those that might be likely to be endorsed due to depression (Lee, Burns, Snell, & McBurnett, 2013). Symptoms that could easily be endorsed by a person with depression include: "appears tired," "lethargic," "slow moving," "lacks energy," "apathetic," and "unmotivated." Similarly, some of the symptoms might be due to poor sleep habits. For example, symptoms such as "drowsy," "appears tired," and "has a yawning/stretching/sleepy-eyed appearance" all might tap drowsiness rather than SCT symptoms. To address these concerns, McBurnett (2010) developed a diagnostic interview, the Kiddie-Sluggish Cognitive Tempo Diagnostic Interview Module for Children and Adolescents (K-SCT) to assess for SCT symptoms. The measure described 10 SCT symptoms in order to help rule out symptom endorsement based on depression or drowsiness. Lee and colleagues (2013) evaluated the validity of this measure by administering it to 46 elementary school teachers and 703 parents. Based upon both parent and teacher report, they found that eight of the original ten symptoms loaded onto an SCT factor separate from symptoms of ADHD, anxiety, and depression. These eight symptoms included the following: "daydreams," "alertness fluctuates," "absent-minded," "loses train of thought," "easily confused," "seems drowsy," "slow thinking," and "slow moving." Lee and colleagues found the reliability of the measure to be excellent for

teacher (Cronbach's alpha; range = 0.90 to 0.98) and parent (Cronbach's alpha; range = 0.90 to 0.96) report.

Recently, Barkley (2011a) developed a scale to assess SCT symptoms in adults. Similar to Penny and colleagues (2009) and McBurnette (2010), Barkley also used a factor analytic process to determine the final list of nine SCT symptoms included in the measure. These SCT symptoms include: "prone to daydreaming when I should be concentrating," "trouble staying awake or alert in boring situations," "easily confused," "easily bored," "spacey/in a fog," "lethargic," "underactive," "slow moving," and "not processing information as quickly as others." Barkley's measure also removed some of the symptoms that were more strongly critiqued on Penny and colleagues' (2009) measure. Barkley found both the reliability (Cronbach's alpha; .898) and the test-retest reliability (.88) for this measure to be acceptable. Barkley's scale, the only standardized measure of SCT for adults, is used in this study to examine SCT symptoms within a college sample.

While research has benefited from these newly developed, standardized measures of SCT symptoms, these measures still vary in the number of symptoms listed and the specific symptoms identified. It is necessary, therefore, for researchers to continue to refine methods of assessing SCT symptoms. One way to clarify the assessment of SCT symptoms is through identifying the impairment profile (e.g., procrastination, time management, health impairment, poorer sleep quality) associated with the SCT construct. Understanding this impairment profile (if one exists) would contribute to a more comprehensive understanding of SCT as a whole and would enable symptom lists to be refined and for other more precise methods of assessment to be developed.

Prevalence

Even with new, more reliable measures of SCT symptoms, much remains unknown about the SCT symptom set. At this time, researchers have no consistent standard for the number of SCT symptoms required for SCT to be "present" for an individual to have "high" levels of SCT symptoms. Barkley (2012a) attempted to determine a threshold for elevated SCT symptoms in adults. Barkley recruited a representative, general sample of 1,249 adults to complete several measures via online survey, including the Barkley Adult ADHD Rating Scale (BAARS – IV; Barkley, 2011a), which consists of 18 ADHD items and 9 SCT items. Barkley established a cutoff score for ADHD and SCT symptoms using a 95th percentile criterion. He found that the 95th percentile symptom cutoff for ADHD was 4 or more inattention and/or hyperactive-impulsive symptoms being endorsed as "often" or "very often." Similarly, for SCT symptoms, Barkley determined the 95th percentile symptom cutoff for SCT symptoms was 5 or more SCT symptoms being endorsed as occurring "often" or "very often." After determining symptom cutoffs, Barkley divided his sample of adults into four groups: high levels of SCT symptoms but not ADHD symptoms (High SCT; *n* =33), high levels of ADHD symptoms but not SCT symptoms (High ADHD; *n* =46), high levels of both SCT and ADHD symptoms (High SCT + ADHD; *n* =39), and controls (*n* =1,131). By identifying individuals with High SCT in this way, Barkley found that approximately half of the adults who had high levels of SCT did not exhibit high levels of ADHD symptoms.

Wood et al. (2014) replicated Barkley's study with a sample of 457 college students in order to assess impairment and executive dysfunction associated with SCT symptoms when controlling for symptoms of ADHD, anxiety, and depression. They used the same measures as Barkley, with the addition of the Depression, Anxiety, and Stress Scale (DASS; Lovibond & Lovibond, 1995). Based upon DSM-IV criteria, they used a cutoff of 6 or more ADHD

inattention and/or hyperactive-impulsive symptoms rated as occurring "often" or "very often" to identify individuals with High ADHD symptoms. For SCT symptoms, they used the same threshold that Barkley (2012a) used. That is, if a college student endorsed five or more symptoms as occurring "often" or "very often," they were considered as being High SCT. Wood and colleagues also divided my sample of college students into four groups: high levels of SCT symptoms but not ADHD symptoms (High SCT; *n* = 45), high levels of ADHD symptoms but not SCT symptoms (High ADHD; *n* = 10), high levels of both SCT and ADHD symptoms (High SCT + ADHD; *n* = 15), and controls (*n* = 387). By using Barkley's suggested threshold rather than the 95th percentile cutoff, they identified 13% (*n* = 60) of the sample has having High SCT. These results have been replicated by Flannery and colleagues (2014), who identified 12% of college students as having elevated levels of SCT. Wood and colleagues also found that of the 60 students who demonstrated High SCT symptoms, only 25% (*n* = 15) of them also displayed high levels of ADHD symptoms. That is, the majority of college students with elevated levels of SCT did not have elevated levels of ADHD symptoms.

At this point, researchers can only estimate the best threshold for SCT symptoms based upon normal distribution. The 95th percentile is a relatively arbitrary actuarial decision to identify a cutoff point. While no symptom cutoff or base rate estimate has been finalized, these studies demonstrate that high levels of SCT symptoms do occur separate from high levels of ADHD symptoms. College students in particular seem to demonstrate elevated levels of SCT symptoms that do not overlap with elevated levels of ADHD symptoms. This has led some researchers to suggest that SCT symptoms and ADHD symptoms may comprise two separate but related conditions, similar to the relationship between anxiety and depression (Barkley, 2013; Wood et al., 2014). While additional research is necessary to replicate and extend these findings,

these findings suggests that (a) SCT symptoms occur both independent of and in conjunction with high levels of ADHD symptoms and (b) the percentage of individuals experiencing high levels of SCT symptoms in the general population, as defined by Barkley, may be sizeable (5%–13%).

The Relationship between SCT Symptoms and Internalizing Symptomatology

Through investigating the relationship between ADHD and SCT symptoms, researchers discovered that a relationship also exists between SCT symptoms and internalizing behaviors (e.g., feeling anxious, being withdrawn, nervous around peers) and internalizing disorders (e.g., anxiety, depression). This expands the historic understanding of SCT symptoms as a variant of attention symptoms. Researchers began to investigate the extent to which SCT symptoms were associated with internalizing behaviors and, eventually, internalizing disorders (e.g., anxiety, depression). Though several studies have examined the relationship between SCT symptoms and internalizing symptoms, no model currently exists for understanding the relationship between the two. Without this model, it is imperative to control for anxiety and depression symptoms in addition to symptoms of ADHD when examining outcomes associated with symptoms of SCT.

The relationship between SCT and internalizing behaviors in ADHD populations.

Some of the earliest research on the relationship between SCT and internalizing behaviors attempted to determine whether individuals with ADHD-I demonstrated increased levels of internalizing behaviors if they also had high levels of SCT symptoms. For example, Carlson and Mann (2002) examined a school-based sample of 173 children who met criteria for ADHD and 173 controls. Teachers completed the DSM-IV ADHD/ODD checklist (Gaub & Carlson, 1997) and the TRF (Achenbach, 1991), a rating scale of childhood behavior problems. Carlson and Mann used the following two items to identify SCT: “daydreams or gets lost in his or her

thoughts" and "underactive, slow moving, or lacks energy." Only children who received an endorsement of "quite a bit" or "very much" on both SCT symptoms were considered "High SCT." The children were separated into those who had ADHD-I with high levels of SCT symptoms (n = 34), those with ADHD-I and low levels of SCT symptoms (n = 89), those with ADHD-Combined subtype regardless of SCT level (ADHD-C; n = 50), and controls. Based upon teacher report, children with ADHD-I and high levels of SCT symptoms exhibited the most withdrawn and anxious/depressed behavior of any of the groups. Though these results sparked interest in examining the relationship between SCT symptoms and internalizing behaviors, this study has a number of methodological limitations. The two symptoms they used to assess SCT were not statistically evaluated, nor were they likely to comprehensively assess for SCT symptoms. Additionally, the cutoff score for "High SCT" was somewhat arbitrary, particularly considering the two-item index. Furthermore, as SCT symptoms were examined only in the ADHD-I sample, this study does not indicate how strong the relationship would be between SCT and internalizing behaviors separate from symptoms of ADHD-I.

Harrington and Waldman (2010) conducted a similar study to Carlson and Mann's (2002) that had many of the same limitations. They examined parent ratings of 228 clinically referred children aged 5 – 18 years and separated them into high-SCT and low-SCT ADHD-I groups. Notably, forming groups in this way confounded rather than separated SCT symptoms and ADHD-I symptoms in this study. Parent ratings were obtained for the Emory Combined Rating Scale (ECRS; Waldman et al., 1998), a checklist developed to assess for common DSM-IV childhood psychiatric disorders. SCT symptoms were assessed using the following three items: "forgets what he or she is doing during daily activities," "stares into space and daydreams," and "seems to be tired, sleepy, or have no energy." The threshold for "High SCT" was identified as

two out of the three SCT symptoms endorsed at a moderate severity level. Hartman and Waldman found that the High SCT ADHD-I group showed significant elevations in symptoms of depression, generalized anxiety, social phobia, and obsessions relative to the control populations. However, the ADHD-C and ADHD-HI groups both exhibited higher mean levels of internalizing symptoms when compared to both high-SCT and low-SCT ADHD-I groups. These results support Carlson and Mann's (2002) finding that SCT symptoms were related to internalizing behaviors. However, Harrington and Waldman (2010)'s study suggested that SCT groups were not associated with the highest levels of internalizing symptoms when compared to other symptom groups.

Correlation-based studies also demonstrate the relationship between SCT symptoms and with internalizing problems. Drawing from a community sample of 296 twins who were oversampled for ADHD and LD, Hartman and colleagues (2004) found that parent and teacher report of SCT symptoms and the internalizing composite score on the CBCL were significantly correlated (r = .51). Garner and colleagues (2010) replicated these findings in a clinical sample of 322 children and adolescents. Again, based upon parent and teacher report on the CBCL, they found that the internalizing composite score was moderately significantly correlated with SCT symptoms (r = .22 - .28). Becker and Langberg (2012) also examined the relationship between SCT symptoms and the internalizing composite score in a clinical sample of 57 children and adolescents ages 10 – 14 years. They also used the CBCL to identify SCT symptoms and internalizing behaviors. Becker and Langberg (2012) found that the internalizing composite score correlated moderately with SCT symptoms based upon parent report (r = .61). Therefore, one common finding across all of these studies is that SCT symptoms are associated with internalizing behaviors in children and adolescents from clinical populations when compared to

controls. None of these studies used a comprehensive, standardized measure of SCT symptoms, however. Additionally, because these researchers did not control for ADHD, they could not clearly state whether the internalizing symptoms were due to SCT, ADHD, or some other condition. That is, it was unknown whether SCT symptoms would continue to be associated with internalizing behaviors if researchers controlled for ADHD symptoms.

The relationship between SCT and internalizing behaviors in general populations. A few studies have examined the relationship between SCT symptoms and internalizing behaviors in general population samples while controlling for ADHD-I symptoms. This has allowed researchers to assess whether SCT symptoms are associated with internalizing behaviors above and beyond that accounted for by ADHD-I. For example, Penny and colleagues (2009) examined SCT symptoms in a school-based sample of 335 children. They measured internalizing symptoms using the Internalizing subscale from the Pediatric Symptom Checklist (PSC; Jellinek, 1988). In their regression analyses, Penny et al. controlled for inattention symptoms and found that the relationship between SCT score and Internalizing score remained significant ($p < .001$) even after accounting for ADHD-I symptoms. Likewise, Lee and colleagues (2013) conducted a similar study in which they also controlled for ADHD symptoms when assessing the relationship between SCT symptoms and internalizing symptoms. They gathered a community sample of teachers reporting on 336 children and parents reporting on 703 children ages 5 – 13 years. Using regression analyses, the authors found that SCT symptoms predicted higher levels of anxious and depressive behavior even after controlling for ADHD-I and ADHD-HI symptoms based upon teacher report (ß = 0.409, $p < 0.001$) and parent report (ß = 0.296, $p < 0.001$). These findings suggest that the SCT symptom set is associated with higher levels of internalizing difficulties, even after controlling for symptoms of ADHD.

SCT as an independent symptom set from internalizing symptoms. Once SCT symptoms and internalizing behaviors were found to be associated even after controlling for ADHD symptoms, researchers then began to question whether SCT symptoms were actually a subtype of internalizing symptomatology rather than a subtype of inattention. Skirbekk and colleagues (2011) investigated the relationship between parent-reports of SCT symptoms and child anxiety disorders. They examined a sample of 105 children diagnosed at a child psychiatry clinic with ADHD (n = 39), anxiety disorder (n = 41), ADHD + anxiety disorder (n = 25), and controls (n = 36). The Schedule for Affective Disorders and Schizophrenia for School-Aged Children (Kiddie-SADS; Kaufman et al., 1997) was used to diagnose the children and the SCT-17 scale (Pfiffner et al., 2007) was used to assess SCT symptoms. Skirbekk and colleagues found that the highest level of parent reported SCT symptoms was within the ADHD + anxiety child group followed by the ADHD only group, the anxiety only group, and then controls. The ADHD + anxiety and the ADHD only group did not differ on level of parent-reported inattention symptoms. Therefore, Skirbekk and colleagues suggested that the difference in SCT levels between groups may have resulted because SCT symptoms occur as a product of the comorbid ADHD + ANX condition. However, an alternative explanation could be that a child with two diagnoses would be doubly at risk for demonstrating elevated SCT symptoms, particularly when SCT symptoms have been found to relate with each disorder independently.

Following the study by Skirbekk and colleagues, Garner and colleagues (2013) examined whether SCT symptoms might be related to a combined ADHD and anxiety condition. They examined a clinical sample of 73 youth ages 6 – 18 years. Parents and the child were asked to complete five SCT-items from the CBCL (Achenbach, 1991), the DBRS which measures ADHD symptoms, (DuPaul, Power, Anastopoulos, & Reid, 1998), the Child Depression Inventory (CDI;

Kovacs, 1992), and the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985). Based upon parent and child report, SCT symptom score correlated with both inattention score and child depression score but not anxiety score. Additionally, in Garner and colleagues' (2013) study, the regression models indicated that, even after accounting for internalizing symptoms, SCT symptoms remained uniquely associated with inattention. Therefore, SCT symptoms appear to predict inattention symptoms after controlling for symptoms of anxiety and depression (Garner et al., 2013) and to predict internalizing symptoms after controlling for symptoms of attention (Lee, Burns, Snell, & McBurnett, 2013; Penny, Waschbusch, Klein, Corkum, & Eskes, 2009). These findings emphasize the complex relationship SCT symptoms have with both ADHD and internalizing symptoms. The complexity of the relationships between ADHD, anxiety, depression and SCT symptoms makes it extraordinarily difficult to tease apart outcomes uniquely associated with the SCT symptom set.

Summary of SCT and internalizing symptoms. A handful of studies have provided a foundation for understanding the relationship between SCT symptoms and internalizing behaviors. At the foundational level, these results suggest that internalizing symptoms, ADHD symptoms, and SCT symptoms all share at least a moderate relationship with one another. Yet, few studies have controlled for internalizing symptoms when exploring outcomes associated with SCT symptoms. This is problematic, particularly if researchers are interested in identifying an impairment profile unique to SCT symptoms. The current study attempts to replicate and expand upon a study by Wood and colleagues (2014) that controlled for ADHD, anxiety, and depression when investigating general functional impairment associated with SCT symptoms. The current study extends these findings by examining more specific domains of impairment (i.e., GPA, time management, procrastination) as well as controlling for potentially related

variables (i.e., sleep, health, substance use). If SCT symptoms actually form a unique meaningful mental health construct separate from ADHD, anxiety, and depression, it seems natural that researchers could identify an impairment profile of these individuals that would distinguish them from individuals with these related symptoms. For example, students with elevated SCT symptoms may be more likely to procrastinate, to have a slower processing speed, or to have problems with time management, as might be suggested by some of the SCT symptoms. Whereas anxiety might be characterized as tense, hyper-alert, and time aware, SCT symptoms might be characterized as more relaxed, less time aware, and more dreamy. This study is one of the first to attempt to identify a more comprehensive impairment profile associated with SCT symptoms after controlling for related symptoms and variables.

Lifestyle Variables and SCT

As researchers investigate what, if any, impairment profile is associated with SCT symptoms, it is also important to consider lifestyle characteristics that could cause an individual to demonstrate SCT-like symptoms (Lee et al., 2013; Wood et al., 2014). As mentioned previously, some researchers have expressed concern that individuals could endorse symptoms such as "lethargic," "underactive," and "trouble staying awake" because of poor sleep habits. Becker and colleagues (2014) found that SCT symptoms were significantly associated with poorer sleep quality, more sleep disturbance (e.g., having bad dreams, waking up during the night), and greater daytime dysfunction. Langberg and colleagues (2014) reported that SCT symptoms have considerable overlap with daytime sleepiness, yet remain statistically distinct. Regression analyses indicated that SCT symptoms predicted daytime sleepiness above and beyond symptoms of ADHD, anxiety, and depression. Langberg and colleagues (2014) also identified increased levels of functional impairment for college students who exhibited a

combination of High SCT symptoms and daytime sleepiness. These results highlight the importance of attempting to control for sleep related variables when assessing SCT symptoms.

Similarly, individuals might endorse the symptoms such as "spacey/in a fog," "easily confused," or "not processing information as quickly as others" due to heavy use of substances such as cannabis or alcohol. However, no studies have yet examined alcohol or cannabis use as it relates to SCT symptoms. Previous work (Wood et al., 2014) has already identified that high levels of SCT occur at a high rate (13%) among college students compared to the rate of ADHD among college students (4 – 7%). Wood and colleagues hypothesized that college students may endorse higher levels of SCT because (a) they have poor sleep habits and therefore endorsed symptoms related to lack of sleep, or (b) they use substances that could result in outcomes similar to SCT symptoms (e.g., alcohol makes one drowsy or marijuana makes one foggy). It is possible that SCT symptoms are endorsed due to these variables and are not part of a psychological construct of SCT. If SCT is still a robust factor after controlling for these variables as well as ADHD, anxiety, and depression symptoms, then it is more probably that it is a unique psychological construct. This is particularly true if SCT symptoms account for unique variance for impairment after controlling for these symptoms. To address this possibility, I controlled for sleep, substance use, and health variables within regression analyses.

The Impact of SCT Symptoms on Behavior

After finding that high levels of SCT symptoms do occur in a sizable portion of the population and often occur independently from symptoms of ADHD, a naturally-occurring secondary question is whether these SCT symptoms are associated with any kind of impact on behavior or functioning. Preliminary findings indicate that SCT is associated with self-reported functional impairment. For example, when examining functional impairment in an adult sample,

Barkley (2012a) found that SCT symptoms accounted for a significant amount of the variance for the mean impairment score, though less variance than ADHD symptoms. Similarly, in a previous study with college students, Wood and colleagues (2014) found that SCT symptoms accounted for the most variance for mean functional impairment score even when symptoms of ADHD, anxiety, and depression were also considered. However, neither Barkley (2012a) nor (Wood et al., 2014) investigated specific areas of daily functioning.

When attempting to determine the impairment profile associated with SCT symptoms, it is crucial to delve deeper into impairment than broad measures of functional impairment. Some researchers have attempted to examine specific domains of functioning (e.g., cognitive, academic functioning) related to SCT symptoms. These studies suggest that SCT symptoms may be associated with executive function deficits, academic impairment, and/or social impairment. The number of studies examining these specific areas of deficit are relatively few, with little consistency or replication across studies. The following sections provide a review of what is currently known about SCT symptoms and impairment.

Cognitive functioning associated with SCT. Generally, two primary methods have been employed to measure cognitive functioning associated with SCT. These two methods include (a) neurocognitive performance measures and (b) executive functioning (EF) rating scales. A few studies have attempted to examine neurocognitive performance as it relates to SCT symptoms (Bauermeister, Barkley, Bauermeister, Martinez, & McBurnett, 2012; Hinshaw, Carte, Sami, Treuting, & Zupan, 2002; Huang-Pollock, Nigg, & Carr, 2005; Jarrett, Rapport, Rondon, & Becker, 2014; Skirbekk, Hansen, Oerbeck, & Kristensen, 2011; Wahlstedt & Bohlin, 2010). However, these studies are few in number, lack replication, and have several methodological limitations. First, the majority of these studies draw from a primarily ADHD or clinical

population. Only one study has examined neurocognitive performance as it relates to SCT in a general sample (Jarrett et al., 2014). Jarrett and colleague's study (2014) is also the only study to have a large sample size and to focus on an adult population. Furthermore, of the few studies that have attempted to examine neurocognitive performance and SCT, little consistency exists between studies, which makes it difficult to compare and expand literature from one study to another. In contrast, more studies have consistently measured EF on EF rating scales.

The research utilizing EF rating scales does not have the same limitations as those studies measuring neurocognitive performance. Some scholars have argued that in some instances, EF rating scales are preferable to neurocognitive performance measures. For example, Barkley and Murphy (2011) noted that measures of neurocognitive performance (e.g., drawing a nonsense figure from memory) tend to have poor ecological validity. Meanwhile, EF rating scales tend to have much higher ecological validity. As this study intends to develop a profile of the day-to-day impairment associated with SCT symptoms, it seems most valuable to examine the research using EF rating scales as these measures may relate more to everyday functioning.

As mentioned previously, Barkley (2012a) examined the relationship between SCT symptoms and executive dysfunction using a rating scale. Barkley used multiple regression analyses to examine whether SCT symptoms or ADHD symptoms accounted for the greatest amount of variance for the following five EF domains: self-management to time, self-organization and problem-solving, self-restraint, self-motivation, and self-regulation of emotion. He found that SCT symptoms rather than ADHD symptoms accounted for the most variance for the self-organization and problem-solving, the self-restraint, and the self-regulation of emotions domains. When Barkley compared his groups (i.e., High SCT, High ADHD, High SCT + ADHD, and Controls) using pairwise contrasts between groups, he found that the High SCT +

ADHD and the High SCT groups both reported more deficits related to self-organization and problem solving than either the High ADHD group or the controls. For the other four domains, the SCT + ADHD group was found to have the most executive dysfunction, and the High SCT and High ADHD groups were found to differ significantly from the controls but not from one another. This was the first time SCT symptoms were identified as being uniquely related to executive dysfunction. In addition, SCT symptoms were more strongly associated with organization and problem-solving than were ADHD symptoms.

Barkley (2013) also conducted a similar study investigating SCT and EF deficits in a child and adolescent population. He examined a general sample of 1,800 children ages 6 to 17 years. Parents completed several measures including the Child ADHD Rating Scale, Child SCT Ratings as derived from Penny and colleagues' (2009) research, the Functional Impairment Rating Scale – Children and Adolescents (BFIS-CA; Barkley 2012c), and the Deficits in Executive Functioning Scale – Children and Adolescents (BDEFS-CA; Barkley, 2012b). Barkley used a symptom cutoff of 3 or more symptoms being endorsed "often" or "very often" for SCT and a symptom cutoff of 6 or more symptoms for ADHD. He formed groups similar to his study with adults (i.e., High SCT, High ADHD, High SCT + ADHD, and Controls). Similar to his (2012) study with adults, Barkley used multiple regression analyses and found that SCT significantly contributed to scores of self-organization and problem solving. When examining the high symptom groups, Barkley found that the High SCT group demonstrated a higher executive dysfunction score than controls, but a lower score than the High ADHD or High SCT+ ADHD groups. The relationship between SCT symptoms and self-organization and problem solving skills in children is similar to that observed in Barkley's adult study. However, this study

suggested that children and adolescents with high levels of SCT may experience fewer executive function deficits than children and adolescents with high levels of ADHD symptoms.

Wood and colleagues (2014) replicated Barkley's (2012a) study by examining SCT symptoms in college students. Additionally, they extended the research by controlling for both anxiety and depression symptoms when conducting the regression analyses. In the regression model, SCT symptoms were the strongest predictor of EF total score, whereas ADHD, anxiety, and depression symptoms were weaker predictors. SCT symptoms also accounted for a greater amount of variance than ADHD-I symptoms in three of the EF domains: self-organization and problem solving, self-regulation of emotion, and self-motivation. Based upon pairwise comparisons, they found that both the High SCT and the High SCT + ADHD groups demonstrated significantly more problems in each of the five domains when compared to the control group. Like Barkley, they found that the SCT + ADHD group exhibited the most executive dysfunction across the five domains and that the SCT-only and ADHD-only groups did not differ significantly from one another on any of the domains.

A number of recent studies are consistent with the findings of Barkley (2012a; 2013) and Wood et al. (2014) and suggest that metacognition deficits, rather than behavior regulation deficits, are more commonly associated with SCT symptoms. For example, Jimenez and colleagues (2013) examined EF in 76 children and adolescents who were being treated for ADHD. The researchers conducted diagnostic interviews with the children and their parents. They also administered the Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworth, 2000) and the four SCT items on the CBCL to assess for SCT symptoms. Within the hierarchical regression analyses, SCT symptoms contributed significantly to the variance of the following EF domains even after controlling for ADHD

symptoms: working memory ($p < .05$), emotional control ($p < .05$), and planning/organizing ($p < .05$). Becker and Langberg (2013) examined SCT symptoms and executive functioning in an adolescent ADHD sample. They also used parent and teacher report on the BRIEF to assess for executive functioning, and he scale developed by Penny and colleagues was used to assess parent and teacher reported SCT symptoms. Researchers also assessed and controlled for student IQ and academic performance as measured by the Wechsler Individual Achievement Test – Third Edition (WIAT-III). SCT symptoms were not related to EFs of behavioral regulation once ADHD-HI symptoms were included in the model, but SCT symptoms were significantly associated with metacognitive EF deficits even after including ADHD-I symptoms in the model.

Although there are slight variations across these studies, results do suggest that SCT symptoms are associated with significant, unique executive dysfunction above and beyond executive dysfunction caused by co-occurring symptoms of ADHD, anxiety, or depression. This is significant, as it suggests that SCT symptoms not only occur independently from ADHD and internalizing symptoms but also are associated with equal or greater amounts of executive dysfunction. These findings also suggest that SCT symptoms are associated with self-reported executive dysfunction in the domains of self-organization and problem solving and self-regulation of emotion for children and adults. If SCT symptoms are uniquely associated with deficits above and beyond that of ADHD, anxiety, or depression, SCT symptoms may be associated with a unique impairment profile. These findings require replication, however. Additionally, none of these studies have attempted to control for related variables such as sleep, health, or substance use. The executive function deficits observed in these studies beg the question of whether these deficits result in any kind of academic impairment. For example, students who report more problems with planning and organization might report higher levels of

procrastination or a lower GPA. The following section reviews the literature on the relationship between SCT symptoms and academic performance domains.

Academic performance associated with SCT. Few studies have examined the relationship between SCT symptoms and academic performance in any depth. The majority of research suggests that SCT symptoms are associated with overall academic functioning. Results also indicate that SCT symptoms tend to be associated with the individual's general academic performance, but tend to have a weaker relationship with measures that directly assess academic skills (e.g., reading). For example, Lee and colleagues (2013) examined teacher ratings of 366 children and parent ratings of 703 children ages 5 to 13 years. Both parents and teachers were asked to complete the Child and Adolescent Disruptive Behavior Inventory (CADBI; Burns & Lee, 2010), which contained 10 SCT items and 3 to 4 academic competence items. Lee and colleagues found that higher levels of SCT predicted lower levels of academic competence even after controlling for ADHD-I and ADHD-HI symptoms based upon parent (ß = -0.206, p <0.001) and teacher report (ß = -0.261, p<0.001). They did not administer measures of specific academic skills.

Bauermeister and colleagues (2012) administered measures of general and specific academic performance to 140 children ages 6 to 11 years who were screened for ADHD. One of the measures they administered was the math and reading tests from the Woodcock Psychoeducational Battery – Spanish (WPB-S; Woodcock, 1982). Parents and teachers reported on ADHD and SCT symptoms using the ADHD Scales of the Disruptive Behavior Rating Scale (Barkley, 1997) and the Sluggish Cognitive Tempo scale. Bauermeister and colleagues utilized regression analyses and found that SCT symptoms were significantly negatively associated with general academic achievement (ß = -0.17, p = .05) and math scores (ß = -0.21, p = .01). Reading

scores were associated only with mother-reported inattention scores and were not associated with SCT. Generally, these findings are relatively weak and failed to control for intelligence or motivation, which may mediate Bauermeister and colleagues' findings. Their findings correspond with Huang-Pollock and colleagues' (2005) study of 79 children ages 8 – 12, 44 of whom were diagnosed with ADHD and 35 who were controls. Parents and teachers were asked to rate children on three SCT items: "stares into space/daydreams," "low in energy, sluggish, or drowsy," and "apathetic or unmotivated to engage in goal-directed activities." They also collected the children's Wechsler Individual Achievement Test (WIAT) word reading scaled score, in addition to several other measures. Huang-Pollock and colleagues found that reading achievement was not associated with SCT symptoms based upon parent or teacher report.

Becker and Langberg (2012) also administered measures of general academic functioning and measures of specific academic skills. In a sample of 57 youth diagnosed with ADHD, Becker and Langberg used the Impairment Rating Scale (IRS; Fabiano et al., 2006), the Homework Problem Checklist (HPC; Anesko, Schoiock, Ramirez, & Levine, 1987), and the Wechsler Individual Achievement Test – Third Edition (WIAT-III) subtests in reading, spelling and math to assess for the relationship between SCT symptoms and academic functioning. Four items from the CBCL were used to identify SCT symptoms. In contrast to previous studies, Becker and Langberg did not find a significant correlation between SCT symptoms and general academic achievement, homework skills, reading, math, or spelling skills after controlling for IQ. It is unknown why Becker and Langberg's findings differ from that of previous research. IQ may have accounted for the variance of academic achievement. Additionally, their null findings may be due to the reliance upon a small clinical sample of youth or SCT may have not been thoroughly assessed using only four items. Overall, the literature on academic performance of

children and adolescents with SCT symptoms suggests that in general, SCT symptoms tend to be correlated with parent and/or teacher reported academic performance deficits. However, when accounting for IQ or examining more standardized measures of academic performance, SCT symptoms were less associated with academic impairment.

Though the research with children and adolescents has mixed results regarding the relationship between SCT symptoms and academic functioning, research with adults supports the idea that SCT is associated with general academic impairment. Three studies have examined the relationship between SCT symptoms and academic functioning in adult populations. Barkley (2012a) administered his BAARS-IV measure to 1,249 adults between the ages of 18 – 96 years and he also assessed for demographic variables. Barkley found that the High SCT group was significantly less educated than controls based upon self-report of years of education, while the High ADHD were not significantly different from controls. The reason for this lower educational attainment is unknown.

Becker and colleagues (2014) examined the relationship between SCT symptoms and academic impairment in a sample of 768 college students. They used the BAARS-IV to assess symptoms of ADHD and SCT. Academic functioning was measured through the performance and motivation subscales of the Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1999) as well as by participant reported high school GPA. Using hierarchical regression, they found that higher levels of SCT symptoms were related to academic performance (p <.001), academic motivation (p <.001), and GPA (p < .001) among college students after controlling for demographic variables and ADHD symptoms. A second study by Becker and colleagues (2014) examined 72 college students, all of whom were diagnosed with ADHD. SCT symptoms were assessed using the BAARS-IV, while academic functioning was assessed using the School

Maladjustment subscale from the BASC-2: SRP-College and the Academic Impairment item from the Barkley Functional Impairment Scale (BFIS). After controlling for ADHD symptoms and demographic factors, SCT remained positively associated with school maladjustment and reduced the relationship between ADHD-I and maladjustment to one of non-significance. Likewise, after controlling for demographic factors and ADHD symptoms, SCT remained significantly associated with academic impairment while the relationship between academic impairment and ADHD-I diagnosis, while still significant, was greatly reduced after accounting for SCT symptoms. These studies make significant contributions to the SCT literature. First, Becker and colleagues examined academic functioning in a college population, which no previous studies have done. Additionally, their findings indicate that SCT symptoms are associated with significant academic impairment and school maladjustment even after controlling for demographic characteristics and ADHD symptoms. These studies also indicate that when SCT symptoms are accounted for, the relationship between symptoms of ADHD-I and academic impairment is weakened.

The literature suggests that individuals with high levels of SCT symptoms have lower levels of academic competence and school adjustment. However, the reason for this association is unknown. A variety of reasons could exist. Given the relationship between SCT symptoms and EF problems related to self-organization and problem solving, one might speculate that difficulties with procrastination, test preparation, study skills, test anxiety, and task organization could contribute to lower academic performance. Additionally, SCT symptoms tend to be associated with general academic impairment rather than specific skill deficits. This suggests that students with high levels of SCT may suffer from difficulties related to managing academic demands (e.g., getting homework in on time, managing deadlines) rather than executing specific

academic tasks. These problems seem especially salient to college students and their adjustment to college, as suggested by the study by Becker and Langberg (2013). Therefore, the current study investigated the underlying academic behaviors exhibited by college students with high levels of SCT.

Rationale for Present Study

Research on SCT symptoms has expanded over the past 15 years. SCT symptoms form a statistically separate factor from ADHD symptoms. Though base rates have not been estimated, SCT symptoms appear in a sizeable proportion of individuals, with college students demonstrating a particularly high endorsement of these symptoms (12 – 13%). Furthermore, SCT symptoms have been associated with functional impairment and executive function deficits even after controlling for ADHD, anxiety, and depression symptoms. Based upon these findings, researchers have proposed that SCT symptoms may represent a new subset of ADHD or even a new disorder. However, several gaps in the literature must be addressed prior to determining the place of SCT symptoms in mental health.

First, researchers must assess whether SCT symptoms form a separate factor from other related symptom sets. Currently, no studies have conducted a factor analysis with symptoms of anxiety, depression, ADHD, and SCT in a college sample. Given the relationship between symptoms of SCT and those of anxiety, depression, and ADHD, it is crucial to determine whether SCT symptoms assess a construct separate from these related symptoms.

If SCT symptoms form a statistically distinct factor separate from symptoms of ADHD, anxiety, and depression, a naturally occurring second question is whether SCT symptoms uniquely predict negative outcomes. Relatively few studies have examined negative outcomes uniquely related to the SCT symptom set. Wood and colleagues (2014) demonstrated that SCT

symptoms are associated with equal or greater levels of executive dysfunction and functional impairment when compared to ADHD and internalizing symptoms. SCT symptoms have also been associated with low academic competence and poor school adjustment in college students (Becker et al., 2014). Research needs to build upon these findings and identify specific components that might contribute to low academic competence or poor school adjustment (e.g., procrastination, time management, sleep, substance use, health). Identifying the negative outcomes associated with SCT symptoms is complicated by its association with other symptom sets (e.g.., ADHD, depression, anxiety). Only two studies to date have investigated negative outcomes associated with SCT symptoms while controlling for symptoms of anxiety and depression (Flannery et al., 2013; Wood et al., 2014). Given the close relationship between SCT symptoms and symptoms of anxiety and depression, the replication of these studies is crucial. And internalizing symptoms may not be the only variables that overlap with SCT symptoms. Researchers have hypothesized that the elevated rates of High SCT symptoms among college students may be caused by poor sleep, poor health, or substance use. Controlling for these variables, in addition to symptoms of ADHD, anxiety, and depression, may help to provide a clearer picture of the relationship between SCT symptoms and negative outcomes. If SCT symptoms are associated with a specific impairment profile, these findings would offer additional information about the SCT construct and would inform areas of potential intervention. If SCT symptoms are not associated with a unique impairment profile, researchers must ask the question of whether SCT symptoms identify a meaningful psychological construct.

The goal of this study was to assess the impairment profile of the SCT symptom set within college students. To achieve this goal, I examined the following three research questions: (a) do elevated levels of SCT symptoms form a separate factor from ADHD, anxiety and

depression symptoms, (b) do High and Low SCT symptom groups differ in levels of reported negative outcomes (i.e., procrastination, time management skills, functional impairment, GPA, sleep, health, substance use, and time allocation), and (c) are SCT symptoms associated with a unique impairment profile (i.e., time management skills, procrastination, functional impairment, GPA) after controlling for other potentially related variables (i.e., ADHD symptoms, anxiety symptoms, depression symptoms, sleep problems, health impairment, substance use). If SCT symptoms continue to account for unique variance for impairment after controlling for several related variables, it is likely that SCT symptoms represent a meaningful mental health construct. However, if SCT symptoms fail to account for unique variance above and beyond the related variables, SCT symptoms may be more indicative of the presence of several related variables rather than a unique disorder. Based upon previous research, I hypothesized that SCT symptoms would form a separate factor from ADHD and anxiety, but that some SCT symptoms might demonstrate overlap with symptoms of depression. I also hypothesized that, given the executive dysfunction associated with SCT symptoms, procrastination, time management, and functional impairment would be uniquely associated with SCT symptoms after controlling for potentially related variables.

Method

Participants

A general sample of college students was recruited from a large private university in the Northeast. These participants were recruited both from the Department of Psychology research subject pool as well as from undergraduate psychology classes. An a priori power analysis was performed using the G*Power 3.0 program (Faul, Lang, & Buchner, 2007), which indicated that in order to have power of .95, a total participant pool of at least 153 would be required to detect

weak effects (Cohen's *d* = .25). Participants were included in the study if they meet the following criteria: (a) they were between the ages of 18 and 24 years of age and (b) were fluent in written and spoken English. Exclusionary criteria for the participants include those who are outside the limits of the age range, those who are not fluent in written and spoken English, and those who have visual impairments that would prevent them from being able to read the electronic survey. A total of 984 students were recruited to participate in this study. Therefore, the current sample is considered acceptable for the purposes of this study.

Though 984 students initially participated in this study, the data from 42 participants were excluded because the students failed to complete the entire survey. Four screening questions were included in the survey in order to check for accuracy of student reporting (e.g., "if you are reading this question, select yes"). Thirty-two students failed to correctly answer at least one of the screening questions and were therefore excluded from data analysis. Therefore, this study retained a final sample of 910 (92.5%) who met study criteria, completed the entire survey, and answered all four screening questions accurately.

The final sample included 320 male participants and 591 female participants. The average age of participants was 19.41 years and ages ranged from 18 to 24. The majority of students were college freshmen (*n* = 396; 43.5%), followed by college sophomores (*n* = 201; 22.1%), college juniors (*n* = 167; 18.3%), college seniors (*n* = 142; 15.6%), and fifth year seniors (*n* = 3; 0.3%). The majority of the sample identified as Caucasian (*n* = 552; 60.7%), while 14.5% identified as Asian, (*n* = 132), 10.4% identified as Hispanic (*n* = 95), 7.4% identified as Black (*n* = 70), and 6.7% identified as biracial or other (*n* = 61). The majority of participants reported that English was their first language (*n* = 815; 89.5%). The average GPA across all participants was 3.20 (SD = .61).

Participants also reported on previous psychological diagnoses. Ninety-two (10.1%) of students reported a diagnosis of ADHD, 17 (1.9%) reported a diagnosis of a learning disability (LD), 34 (3.8%) reported vision difficulty, 60 (6.6%) reported a diagnosis of anxiety, 17 (1.9%) reported a diagnosis of OCD, 45 (4.9%) reported a diagnosis of depression, 18 (2.0%) reported a diagnosis other than those listed. Sixty-four students (7.0%) reported having multiple diagnoses. Seven hundred and seventy-five students (85.1%) reported having no psychological diagnoses. Ninety-eight (10.8%) participants reported taking some form of medication for either medical or psychological conditions.

Measures

Demographic Questionnaire. A demographic questionnaire was used to gather information from the participants regarding their age, sex/gender, ethnicity, GPA, primary language, year in college, and previous psychological diagnoses. This information was used in descriptive analyses to evaluate differences between participants with high levels of SCT and controls. A copy of the Demographic Questionnaire is included in Appendix A.

Adult ADHD Rating Scale – IV (Barkley, 2011a). The Adult ADHD Rating Scale – IV (BAARS-IV) consists of two measures. The first is a self-report of current symptoms that the individual may be experiencing. The second form is a self-report of childhood symptoms. This study utilized only the self-report of current symptoms form. The self-report of current symptoms form contains 18 ADHD items aligning with DSM-V symptoms for ADHD diagnosis. These items include 9 inattentive items, 6 hyperactive items, and 3 impulsive items. Nine SCT items are also included in the BAARS-IV self-report of current symptoms form. All participants answered each item according to a 4-point scale (1 *"not at all"*, *2 "sometimes"*, 3 *"often"*, and 4 *"very often"*).

The BAARS-IV was used for two primary reasons. First, using this measure provides consistency between this study and previous studies investigating SCT in college student and adult populations. Second, this measure provides the only empirically-based measure for SCT symptoms within an adult population. The total symptom score for ADHD-I, ADHD-HI, and SCT symptoms were calculated. The total symptom score was calculated by adding together the score endorsed for each item (1 – 4). Total symptom score ranged from 0 to 36 for ADHD-I Total Symptom, ADHD-HI Total Symptom, and SCT Total Symptom scores. Total symptom score for the two ADHD subtypes and for SCT were used as a continuous score in regression analyses. All of the ADHD-I, ADHD-HI, and SCT items were also used in the factor analysis to determine whether SCT symptoms form a unique factor separate from ADHD in college students. Finally, the number of ADHD symptoms endorsed by the High SCT group was examined in descriptive analyses.

Barkley normed the BAARS – IV on a sample of 1,249 adults who were representative of the United States adult population. For the BAARS – IV, Cronbach's alpha was found to be acceptable (Inattention = .902; ADHD Hyperactive-Impulsive = .798; SCT = .898). Additionally, the test-retest reliability for this measure was also found to be acceptable (ADHD Inattention = .66; ADHD Hyperactive-Impulsive = .74; SCT = .88). Validity of this measure has been demonstrated by high inter-observer agreement between adult respondents and someone who has known them well, with symptom rating scores found to range from r = .59 - .76. A copy of the BAARS-IV is included in Appendix B.

Barkley Functional Impairment Scale (Barkley, 2011b). The Barkley Functional Impairment Scale (BFIS) attempts to measure the perceived degree of impairment individuals experience in 15 major life activities. The activities include home life with your immediate

family; finishing chores at home and managing your household, work or occupation; social interactions with friends; activities in the community; any educational activities; marital, co-living, or dating relationships; management of your money, bills, and debts; driving a motor vehicle and your history of citations and accidents; sexual activities and sex relations with others; organization and management of your daily responsibilities; caring for yourself daily; maintaining your health; and taking care of and raising your children. Participants responded to each of the 15 activities based upon a scale ranging from zero (*no impairment)* to nine (*severe impairment).*

Previous studies of impairment in college student and adult populations have examined functional impairment broadly using the BFIS (Barkley, 2012a; Wood et al., 2014). This measure was included in the current study to (a) replicate the results of previous studies and (b) to examine whether the total impairment score provided by the BFIS correlates to the more specific behavior outcomes examined by other measures.

Cumulative scores from the 15 items on the BFIS result in two outcome scores: (a) the mean functional impairment score and (b) percentage of domains impaired. For the purposes of this study, only the mean functional impairment score was used as a continuous variable in regression analyses. Additionally, the mean functional impairment score was used to identify differences between individuals with elevated levels of SCT and controls. The BFIS score was compared to outcome scores provided by other measures to see if the mean functional impairment score was sensitive enough to identify more specific forms of impairment.

Barkley normed the BFIS on a sample of 1,249 adults who were representative of the United States adult population. Barkley's data show that the scale has high internal reliability (Cronbach's alpha = .97) and good test-retest reliability (r = .72). In terms of criterion validity,

the BFIS demonstrates good validity for impairment when compared to ratings of EF in daily life activities as measured by the Barkley Deficits of Executive Function Scale (BDEFS) and correlates with other measures of impairment (e.g., Impairment Rating Scale). A copy of the BFIS is included in Appendix C.

Alcohol Use Disorders Identification Test – Second Edition (Babor, Higgins-Biddle, Saunders, & Monterio, 2001). The Alcohol Use Disorders Identification Test – Second Edition (AUDIT) was developed by the World Health Organization (WHO) to screen for alcohol use and dependence. The AUDIT is a brief screener consisting of 10 items. Participants rated themselves on each question using a 5-point scale. Scores can range from 0 to 40. Generally, total scores of 8 or more are suggestive of harmful alcohol use.

One of the goals of this study was to determine the behaviors associated with elevated levels of SCT symptoms. In order to determine this, students were screened for alcohol use in order to ensure that SCT symptoms (e.g., being lethargic, in a fog) are not caused by something like alcohol use. Therefore, the total score was calculated from the AUDIT. In regression analyses, I controlled for students' alcohol use as reported on the AUDIT. This total score was also examined during the comparison of the High SCT group with the control group. I assessed whether the High SCT group demonstrated higher levels of alcohol use compared to a control population.

In several studies across six countries, the internal reliability for the AUDIT has been found to be adequate (median Cronbach's alpha = .80), as has the test-retest reliability (r = .86). A copy of the AUDIT is included in Appendix D.

The Cannabis Use Disorders Identification Test – Revised (Adamson, Kay-Lambkin, Baker, Lewin, Thronton, Kelly & Sellman, 2010). The Cannabis Use Disorders

Identification Test – Revised (CUDIT-R) is a tool used to screen for cannabis misuse and abuse. The CUDIT-R is an 8-item scale. Participants rated themselves on each item based upon a 5-point scale. Scores can range from 0 – 32. Similar to the AUDIT, scores of 8 or greater are indicative of potentially hazardous cannabis use.

As mentioned previously, one of the goals of this study was to determine the behaviors uniquely associated with elevated levels of SCT symptoms. Therefore, I wanted to ensure that SCT symptoms (e.g., lethargic, in a fog) were not caused by something like cannabis use. The total score was calculated from the CUDIT-R. Cannabis use as reported on the CUDIT-R was controlled for during regression analyses. This total score was also examined during the comparison of the High SCT group with the control group to determine whether the High SCT group demonstrates higher levels of cannabis use than a control population.

The internal reliability for the CUDIT-R has been found to be good (Cronbach's alpha = .92), as has the test-retest reliability (r = .87). The CUDIT-R demonstrates adequate reliability and validity even among college students who are self-reporting use via online survey (Ramo, Liu, & Prochaska, 2012). A copy of the CUDIT-R is included in Appendix E.

Depression, Anxiety, and Stress Scale (Lovibond & Lovibond, 1995). The Depression, Anxiety, and Stress Scale (DASS) is a set of three self-reported scales designed to measure depression, anxiety, and stress respectively. Each scale contains 14 items. The depression scale assesses the following symptoms: dysphoria, hopelessness, devaluation of life, self-depreciation, lack of interest/involvement, anhedonia, and inertia. The anxiety scale assesses the following symptoms: autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale assesses the following symptoms: difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive and

impatient. All participants were asked to rate how severely they have experienced each item over the past week of using a four-point scale. Depression scores are interpreted as follows: 0 – 9 is normal, 10 – 13 is mild, 14 – 20 is moderate, 21 – 27 is severe, and 28 and above is extremely severe. Anxiety scores are interpreted as follows: 0 – 7 is normal, 8 – 9 is mild, 10 – 14 is moderate, 15 – 19 is severe, and 20 and above is extremely severe.

As mentioned previously, SCT symptoms and internalizing symptoms have been found to be moderately correlated; therefore, it is important to control for internalizing symptoms when attempting to assess outcomes associated with SCT symptoms. Total symptom scores for anxiety and depression were calculated. These total symptom scores were used as continuous variables for descriptive comparisons and regression analyses and in group comparisons of High SCT and controls. Internal consistency (Cronbach's alpha) for the Depression, Anxiety and Stress scales range from .89 to .97 (Antony, Bieling, Cox, Enns, & Swinson, 1998; Brown, Chorpita, Korotitsch, & Barlow, 1997; Zlomke, 2009). Additionally, the test-retest scores range from .57 to .81 (Brown et al., 1997; Zlomke, 2009). A copy of the DASS is included in Appendix F.

Health Questionnaire. One of the goals of this study was to determine what negative outcomes are associated with the SCT symptom set after controlling for related variables. An 8-item health questionnaire was developed for this study in order to control for health when attempting to determine behaviors uniquely associated with SCT symptoms. This questionnaire asked participants to rate their overall health, as well as how frequently they have experienced allergies, colds, stomach aches, headaches/migraines, or other medical conditions over the past year. Participants then rated themselves on approximately how many days over the past year these conditions negatively impacted their functioning. Students were asked to report on

medication use and physical health conditions. An overall health score, a frequency of illness score, and a health impairment score were generated from these reports. The health impairment score was used as a continuous variable within the regression analyses. All three variables were examined when comparing High SCT students to controls in the descriptive analyses. The Health Questionnaire was found to have adequate internal consistency (Cronbach's alpha = .79). A copy of the Health Questionnaire is included in Appendix G.

The Lay Procrastination Scale – Student Version (Lay, 1986). The Lay Procrastination Scale – Student Version is a 20-item scale that measures an individual's procrastination. The student version contains items related to assignments and academic tasks. All participants were asked to answer each item based upon a 5-point scale with 1 being extremely uncharacteristic and 5 being extremely characteristic. Higher scores indicate greater levels of procrastination. Example items include "I do not do assignments until just before they are to be handed in" and "I usually have to rush to complete a task on time."

Given the nature of SCT symptoms (e.g.., sluggish, lethargic, day dreamy) and the deficits in EF demonstrated by individuals with elevated levels of SCT (Barkley, 2012; Wood et al., 2014), it was hypothesized that college students with elevated levels of SCT might have higher levels of procrastination. Therefore, total procrastination score was calculated from this measure. This score was used as a continuous variable for both regression and descriptive analyses. The Lay Procrastination Scale has good internal consistency (Cronbach's alpha = .82) and test-retest reliability (r = .80). A copy of the Lay's Procrastination Scale is included in Appendix H.

Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The Pittsburgh Sleep Quality Index (PSQI) is a self-reported questionnaire that assesses

sleep quality and disturbances over a one-month time period. In the full version of this measure, 19 items generate seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. For the purposes of this study, only a select few of the items and their corresponding component scores were used. Some researchers have hypothesized that poor sleep quality might account for some of the SCT symptoms exhibited. Therefore, items of sleep disturbance, daytime dysfunction due to sleepiness, and overall sleep quality were used in this study. Total component scores for sleep disturbance, daytime dysfunction due to sleepiness, and overall sleep quality were calculated and scored on a zero to three point scale, with zero being better functioning and three indicating worse functioning. These scores were used as continuous variables in both descriptive analyses and regression analyses. The internal homogeneity for the PSQI has been found to be acceptable (Cronbach's alpha = 0.93), as has the test-retest reliability (r = 0.85). A copy of the Pittsburgh Sleep Quality Index is included in Appendix I.

Time Management Behavior Questionnaire (Macan et al., 1994). The Time Management Behavior Questionnaire (TMB) is a 34-item measure that assesses time management in four primary factors: setting goals and priorities, the mechanics of time management, preference for organization, and perceived control of time. Participants rated themselves on each item using a 5-point scale ranging from 1 (*seldom true)* to 5 (*very often true)*. Total score can range from 0 – 170 total. Higher scores indicate greater use of time management behaviors.

Given the nature of SCT symptoms (e.g., sluggish, lethargic, day dreamy) and the deficits in EF demonstrated by individuals with elevated levels of SCT (Barkley, 2012; Wood et al., 2014), it was hypothesized that college students with elevated levels of SCT might have

difficulty with time management. Therefore, total time management score and the four domain scores were calculated from this measure. Scores were then inverted so that a higher score represented less use of time management behaviors. These scores were used as continuous variables for both regression and descriptive analyses. Internal validity (Cronbach's alpha) for each of the four time management domains ranged from .67 - .85. A copy of the Time Management Behavior Questionnaire is included in Appendix J.

Time Allocation Questionnaire. One of the purposes of this study was to understand the impairment profile of college students with elevated levels of SCT, including their use of time. Therefore, a 9-item time allocation questionnaire was generated. Items include tasks such as preparing for class, participating in co-curricular activities, working, volunteer work, and relaxation, among others. Participants were asked to rate how many hours they spend in a week doing each task. Their responses were based upon an 8-point scale ranging from 0 hours to 30+ hours per week. Each of these items was used to descriptively report on typical time allocation of college students with elevated levels of SCT symptoms. A copy of the Time Allocation Questionnaire is included in Appendix K.

Procedures

All data were collected via online survey. This survey was distributed to students via Qualtrics, an online survey engine. Students received access to the survey either via email from the researcher or via a link on the university research subject pool website. All participants completed the survey independently. No group administration was conducted. All data collected were completely confidential. Students recruited from undergraduate psychology courses were asked to provide their email address in order to receive a confirmation of completion that could be handed in to their professor. Email addresses were separated from all other data during

analysis. Students who completed the survey for an undergraduate course were awarded course credit for completing the survey.

Prior to beginning the survey, all participants were able to view an electronic letter of consent informing them of the voluntary and confidential nature of the survey. Within this letter, participants were encouraged to complete the survey in a quiet location, to answer all questions as accurately and honestly as possible, and were reminded that they could cease to take the survey at any time if they began to feel uncomfortable. All participants were provided with a visual reminder at the top of every screen that prompted them to answer the questions as honestly and accurately as possible. Prior to completing the BAARS-IV and the DASS, participants were prompted with a reminder at the top of the page to answer all questions as if they were not on medication, if they so happened to be taking medication for a mental health diagnosis. Four dummy questions were also be inserted throughout the measure (e.g., if you are reading this question, please answer "3") to ensure that students were maintaining their attention throughout the survey. Any student who failed to accurately answer any of these questions was excluded from data analysis.

Results

Data Preparation

Data input and consistency checks. The primary researcher was responsible for accessing and downloading all data from the survey engine. Data were originally transferred into Microsoft Excel, at which point the primary researcher screened the data for any missing data, participants who failed to complete the survey, participants who failed to meet study requirements (e.g., age limits), and any other errors. Screened data were transferred to SPSS 22 (SPSS Inc., 2013). SPSS statistical software was used to compute descriptive statistics, generate

graphs for data inspection, conduct factor analyses, conduct regression analyses, and to conduct secondary analyses. All data were inspected for violations of the following assumptions: normality, homogeneity of variance, linearity, and multicollinearity.

Assessing assumptions. Prior to conducting analyses, data were assessed for outliers, normality, linearity, multicollinearity, and homoscedasticity. Normality for each variable was assessed by examining skewness and kurtosis, Q-Q plots, and the histogram for each variable. Those variables that had skewness or kurtosis values greater than 1 were transformed using the logarithm function outlined by Tabachnick and Fiddell (2007). The following variables were transformed: all ADHD, anxiety, depression, and SCT items, mean functional impairment, total ADHD-I score, total ADHD-HI score, total SCT score, total anxiety score, total depression score, health impairment score, and CUDIT total score. After transformation, all variables were found to have skewness and kurtosis values less than 1, and the histogram and Q-Q plots were reasonably normally distributed. Examination of the boxplots indicated outliers for some of the variables. Outlier scores were genuine scores and were not due to error. All outliers were retained for data analysis; however, outlier scores were changed to a less extreme value as suggested by Tabachnick and Fiddell (2007). Following all transformations, visual inspection of scatterplots of these variables indicated that the variables (a) met the assumptions of normality, (b) met the assumptions of linearity and (c) met the assumptions of homoscedasticity. The data were also screened for multicollinearity. All correlations were lower than the .8 correlation suggested by Tabachnick and Fiddell (2007), with a range of .10 to .72.

Research Questions and Analyses

Three primary research questions were targeted in the following analyses. First, a factor analysis was conducted to examine whether SCT symptoms formed a statistically separate factor

from ADHD, anxiety, and depression symptoms. Second, descriptive comparisons of several behavior and lifestyle variables were conducted between individuals with high levels of SCT symptoms and controls. Finally, regression analyses investigated whether SCT symptoms accounted for unique variance for outcome variables (i.e., time management, procrastination, functional impairment, GPA) after controlling for potentially related factors (i.e., ADHD, anxiety, depression, sleep, health, substance use). This study incorporates numerous variables across three types of analyses. In an effort to clarify the variables used in each type of analysis, a variable map for this study can be found in Appendix L.

SCT as a separate factor. The first aim of this study was to determine whether SCT symptoms form a separate factor from not only ADHD symptoms, but anxiety and depression symptoms as well. Exploratory factor analysis was employed. For this analysis, all ADHD, anxiety, depression, and SCT symptom scores were used.

Results of factor analysis. An exploratory factor analysis was conducted on the 56 items with oblique rotation (direct oblimin). The Kaiser-Meyer-Olkin (KMO) measure indicated that the sample was adequate for the analysis, KMO = .96 ('surperb' according to Field, 2009). All KMO values for individual items were > .91, which is above the accepted limit of .5 (Field, 2009). Bartlett's test of sphericity chi square = 34148.35 (1540), p = < .001, indicated that the population correlation matrix was not an identity matrix and that the correlations between items were sufficiently large.

Inspection of the eigen values, the scree plot, parallel analysis, and Root Mean Square Error of Approximation (RMSEA) were all used to determine the number of factors to retain. Initially, 8 components had eigenvalues over Kaiser's criterion of 1 and in total explained 60.58% of the variance. Next, the scree plot was examined. The scree plot offered some

indication that supported either 3 or 5 components. Third, the 5 component solution was supported by the results of parallel analysis, which showed five components with eigen values exceeding the corresponding criterion values for a randomly generated data matrix of the same size (56 variables x 911 respondents). Given this evidence, a 5 factor solution was adopted. The Root-Mean-Square-Error-of-Approximation (RMSEA) for the final three-factor model was calculated at .05, which indicates adequate fit. Table 1 shows the factor loadings after rotation. A few items were removed as they did not load on any of the factors (i.e., scores < .4 cutoff suggested by Tabachnick & Fiddell, 2007). These items included DASS item 9 (i.e., "I found myself in situations that made me so anxious I was most relieved when they ended"), SCT symptom 8 (i.e., "slow moving"), and SCT symptom 9 (i.e., "I don't seem to process information as quickly or as accurately as others"). The items that cluster on the same components suggest that component 1 represents a factor of depression, component 2 represents SCT, component 3 represents hyperactivity-impulsivity, component 4 represents anxiety, and component 5 represents inattention. One ADHD-I item (i.e., "easily distracted by extraneous stimuli or irrelevant thoughts") loaded onto the SCT factor. Overall, these results suggest that seven of the SCT symptoms from the BAARS-IV form a separate factor from symptoms of ADHD, anxiety, and depression symptoms.

Descriptive comparisons of High SCT and Low SCT groups. The second aim of this study was to descriptively examine differences between participants with elevated levels of SCT symptoms (5 or more symptoms endorsed as occurring "often" or "very often") and participants with low levels of SCT symptoms (2 or fewer SCT symptoms endorsed as occurring "often" or "very often"). Participants in the high and Low SCT symptom groups were compared on several variables to determine what differences, if any, exist between groups. Due to the number

of multiple comparisons in the group comparison analyses, a bonferroni adjustment of .05/25 was used (Tabachnick & Fidell, 2007). Therefore, a difference was only considered significant if it reached the $p < .002$ level. Table 2 outlines the results of group comparisons on variables of impairment, procrastination, time management, sleep, substance use, health, ADHD symptoms, anxiety symptoms, and depression symptoms, while Table 3 outlines the results of group comparisons on time allocation.

Identification of high and low levels of SCT symptoms. Participants were identified as having elevated levels of SCT symptoms if they rated 5 or more symptoms as occurring "often" or "very often" on the Barkley Adult ADHD Rating Scale – IV. A cutoff of 5 symptoms was utilized based upon Barkley's (2011d) findings that 5 symptoms identified clinically "high" levels of SCT symptoms in adults. All participants were also screened for elevated levels of ADHD symptoms (i.e., 5 or more symptoms of inattention and/or hyperactivity-impulsivity rated as occurring "often" or "very often"), anxiety (i.e., "severe" level of symptoms indicated by a score of 15 or above on the DASS), and depression (i.e., "severe" levels of symptoms indicated by a score of 21 or above on the DASS).

Prior to screening out elevated levels of ADHD, anxiety, and/or depression, 124 (13.6%) participants met the requirements for elevated levels of SCT symptoms. After controlling for these related symptoms, 51 (5.6%) participants met criteria for High SCT symptoms alone, and these participants formed the "High SCT" group. Participants were identified as having "low" levels of SCT symptoms if they rated 2 or fewer SCT symptoms as occurring "often" or "very often." Initially, a significant proportion of the sample ($n = 658$; 72.2%) qualified as having particularly low levels of SCT symptoms. After removing individuals with elevated levels of

ADHD, anxiety, and/or depression symptoms, the "Low SCT" group totaled 620 (68.1%) participants.

Demographic and health characteristics. High and Low SCT symptom groups were compared on age, GPA, and sex. The groups did not differ significantly from one another on age, GPA, or sex.

Substance use. Groups did not differ on reported cannabis use, though the High SCT symptom group did report higher levels of reported alcohol use, (t = -2.19, p = .03, d = -.31). This difference is not significantly higher, though, due to the bonferroni adjustment.

Health. The High SCT group reported lower levels of overall health quality (t = 5.25, p <.001, d = .49), more frequent illness (t = -6.22, p <.001, d = -.60), and more overall health impairment (t = -3.95, p <.001, d = -.53) than the Low SCT group.

Sleep. The High SCT symptom group reported significantly poorer sleep quality (t = -3.88, p < .001, d = -.53) and more daytime dysfunction due to sleepiness (t = -7.71, p < .001, d = -1.09) than the Low SCT group, but not significantly different levels of sleep disturbance.

Levels of related symptoms. The High SCT symptom group reported significantly higher levels of inattention (t = -11.45, p <.001, d = -1.49), hyperactivity-impulsivity (t = -5.13, p <.001, d = -.58), anxiety (t = -7.22, p <.001, d = -.96), and depression (t = -8.00, p <.001, d = -1.06) symptoms than the Low SCT group.

Functional impairment. Both groups were compared on BFIS total functional impairment score. The High SCT group reported significantly higher mean functional impairment scores than the Low SCT symptom group (t = -5.73, p <.001, d = -.84).

Procrastination. Both groups were compared on total procrastination score as recorded by the Lay's Procrastination Scale. The High SCT group reported a significantly higher score on

the Lay's Procrastination Scale than individuals in the Low SCT group (t = -5.95, p < .001, d = -.90).

Time management and time allocation. The Time Management Behavior Questionnaire has five domains: setting goals and priorities, the mechanics of time management, preference for organization, perceived control of time, and total time management score. As all domain scores were inverted, the higher the score, the more the individual struggles with time management skills. Individuals in the Low SCT group scored significantly lower on the following scores: preference for organization (t = -4.03, p < .001, d = -.56), perceived control of time (t = -6.64, p < .001, d = -.97), and total time management (t = -4.52, p < .001, d = -.72). Due to the bonferroni adjustment, setting goals and priorities (t = -2.53, p = .01, d =.-39) and the mechanics of time management (t = -2.07, p = .04, d = -.32) were not significantly different between groups, This suggests that individuals with low levels of SCT symptoms demonstrate better time management skills, a stronger preference for organization, and more perceived control of time than individuals with high levels of SCT symptoms.

Regarding time allocation, no differences were found between groups for the time participating in preparing for class, co-curricular activities, working on or off campus, doing community service, exercising/health, or providing care to dependents. However, individuals in the High SCT group reported spending significantly more time socializing with friends (t = -3.09, p = .002, d = -.42) and relaxing (t = -3.65, p < .001, d = -.46) than individuals in the Low SCT group.

Regression analyses. The third aim of this study was to determine if SCT symptoms account for unique variance of dependent variables (i.e., time management, procrastination, functional impairment, GPA) after controlling for potentially related variables (i.e., sleep, health,

and substance use). All predictor variables used in the regression analyses were significantly correlated with SCT symptoms in bivariate correlations. Bivariate correlations for all predictor variables can be found in Table 4. Predictor variables for all regression analyses were entered in three blocks. First, participants' demographic (i.e., sex) and lifestyle variables (i.e., sleep variables, AUDIT score, CUDIT score, health impairment score) were entered. Second, total ADHD, anxiety, and depression scores were entered to determine whether these symptom sets accounted for unique variance after controlling for lifestyle variables and demographics. Finally, SCT total score was added. The dependent variables for these regression analyses include the mean functional impairment score derived from the BFIS, the five outcome domains from the TMS, the total procrastination score from the Lay's Procrastination scale, and GPA.

Functional impairment and SCT. Hierarchical multiple regression was used to assess the ability of total SCT score to predict levels of reported functional impairment after controlling for the influence of demographic characteristics, health and lifestyle characteristics, and related symptom sets. Results are detailed in Table 5. Sex, sleep variables, AUDIT score, CUDIT score, and health impairment score were entered in Step 1, explaining 23% of the variance in reported functional impairment. After entering hyperactive-impulsive, inattention, anxiety, and depression total scores at Step 2, the total variance explained by the model as a whole was 45.5%. Finally, in Step 3, SCT symptoms were entered, and the total variance explained by the model as a whole was 45.8%, F (13, 239) = 13.23, $p < .001$. After controlling for all the other variables, the SCT symptoms explained an additional .03% of variance in functional impairment (R squared change = .002, F change (1, 271) = 1.66, $p = .20$). In the final model, only total inattention score ($p < .001$), depression score ($p = .002$), and total anxiety score ($p = .007$) significantly contributed to the model.

Time management and SCT. Hierarchical multiple regression was also used to assess the ability of total SCT score to predict each of the outcome scores on the TMS (i.e., setting goals and priorities, the mechanics of time management, preference for organization, perceived control of time, and total time management score) after controlling for the influence of demographic and lifestyle characteristics, and related symptom sets. SCT symptoms did not significantly account for unique variance in any of the regression models across the five time management domains; therefore, only total time management score is reviewed below.

Total time management score. The total time management score was examined. Sex, sleep variables, AUDIT score, CUDIT score, and health impairment score were entered in Step 1, explaining 6.7% of the variance in reported abilities related to time management. After entering hyperactive-impulsive, inattention, anxiety, and depression total scores at Step 2, the total variance explained by the model as a whole was 19.2%. Finally, in Step 3, SCT symptoms were entered, and the total variance explained by the model as a whole was 19.9%, F (12, 271) = 5.60, $p < .001$. After controlling for all the other variables, the SCT symptoms explained an additional .7% of variance in setting goals and priorities (R squared change = .007, F change (1, 271) = 2.40, $p = .12$). In the final model, only total inattention score ($p = < .001$) was statistically significant. Table 6 provides an overview of these scores.

Procrastination and SCT. Hierarchical multiple regression was used to assess the ability of total SCT score to predict levels of reported procrastination, after controlling for the influence of demographic characteristics, health and lifestyle characteristics, and related symptom sets. Results can be found in Table 7. As with the other regression analyses, sex, sleep variables, AUDIT score, CUDIT score, and health impairment score were entered in Step 1, explaining 8.8% of the variance in reported abilities related to procrastination. In Step 2, hyperactive-

impulsive, inattention, anxiety, and depression total scores explained 21.7% of the variance of the model as a whole. Finally, in Step 3, SCT symptoms were entered and the total variance explained by the model was 23.0%, F (12, 271) 6.74, $p < .001$. After controlling for all the other variables the SCT symptoms explained an additional 1.3% of variance of procrastination total score (R squared change = 1.3, F change (1, 271) = 4.51, $p = .04$). In the final model, only total inattention score ($p = .001$), hyperactivity-impulsivity score ($p = .01$) and total SCT score ($p = .04$) were statistically significant. Table 7 provides an overview of these scores.

GPA and SCT. Finally, hierarchical multiple regression was used to assess the ability of total SCT score to predict levels of reported GPA after controlling for the influence of demographic characteristics, health and lifestyle characteristics, and related symptom sets. Results can be found in Table 11. Sex, sleep variables, AUDIT score, CUDIT score, and health impairment score were entered in Step 1, explaining 4.8% of the variance in reported GPA. After entering hyperactive-impulsive, inattention, anxiety, and depression total scores at Step 2, the total variance explained by the model as a whole was 6.4%. Finally, in Step 3, SCT symptoms were entered, and the total variance explained by the model as a whole was 6.7%, F (12, 271) = 1.62, $p < .09$. After controlling for all the other variables, the SCT symptoms explained an additional .3% of variance in setting goals and priorities (R squared change = .003, F change (1, 271) = .87, $p = .35$). In the final model, only CUDIT total score ($p = < .01$) significantly contributed. Table 8 provides an overview of these scores.

Summary of regression analyses. Contrary to the original hypotheses of this study, SCT symptoms did not account for significant variance for GPA, any of the time management domains, or functional impairment in the regression analyses. SCT symptoms did account for a significant proportion of variance for procrastination, but the amount of variance (1.3%) was

quite small. Interestingly, secondary analyses indicate that if the order of SCT symptoms and ADHD-I symptoms were reversed in the regression analyses, ADHD-I symptoms accounted for significant variance across all outcome variables except GPA, even after controlling for related variables. ADHD-I symptoms continued to account for unique variance above and beyond related variables, while SCT symptoms did not. This suggests that while ADHD-I symptoms continue to account for variance above and beyond related symptom sets, the variance accounted for by SCT symptoms is subsumed by related variables.

Discussion

This study investigated whether SCT symptoms form a separate construct from symptoms of ADHD, anxiety, and depression and whether SCT symptoms are associated with a unique impairment profile after controlling for several related variables. The results of this study expand the literature in a number of meaningful ways. First, this is the first study to examine whether SCT symptoms form a separate factor from ADHD, anxiety, and depression symptoms in an adult population. SCT symptoms formed a separate factor from symptoms of ADHD, anxiety, and depression in this sample. Consistent with previous studies, elevated symptoms of SCT appear to be prevalent in a substantial proportion of college students (12 - 13%; Flannery et al., 2014; Wood et al., 2014). This is one of the first studies to examine more specific measures of academic and functional impairment, while controlling for related symptoms (i.e., anxiety, depression, and ADHD) and related variables (i.e., sleep, health, substance use). Descriptive data from High SCT and Low SCT group comparisons suggest that individuals with elevated levels of SCT symptoms report more negative outcomes than the Low SCT group on a number of outcome variables, including functional impairment, procrastination, time management, health impairment, AUDIT scores, and sleep problems. However, when related symptoms and variables

were controlled for in regression analyses, SCT symptoms did not account for unique variance for any of the time management domains, functional impairment, or GPA. SCT symptoms only accounted for unique variance for procrastination, and even then the proportion of variance was very small (1.3%). These findings highlight the highly interrelated and convoluted nature of SCT symptoms and other related symptom sets, and suggest that SCT symptoms are not associated with a unique impairment profile.

SCT Symptoms as a Separate Factor from Related Symptom Sets

The first aim of this research study was to identify whether SCT symptoms formed a separate factor from symptoms of ADHD, depression, and anxiety. This is the first study to explore whether SCT symptoms form a separate factor from ADHD, anxiety, and depression symptoms in an adult population. Consistent with hypotheses and with previous research, results clearly demonstrated that SCT symptoms form a statistically separate factor from the three other symptom sets (Bauermeister, Barkley, Bauermeister, Martinez, & McBurnett, 2012; Garner, Marceaux, Mrug, Patterson, & Hodgens, 2010; Jacobson, Murphy-Brown, Pritchard, Tart-Zelvin, Zabel, & Mahone, 2012; Lahey, Schaugency, Hynd, Carlson, & Nieves, 1987; Lee et al., 2014; McBurnett, Pfiffner, & Frick, 2001). These results indicate that SCT symptoms do measure a unique symptom set statistically distinct from depression, addressing the concerns of some researchers who have hypothesized that SCT and depression symptoms may assess similar constructs (Lee et al., 2013).

Interestingly, two of the SCT items from the Barkley BAARS-IV scale did not load onto any of the factors. These items included “slow moving” and “I don’t seem to process information as quickly or as accurately as others.” It is surprising that these two variables did not load onto any factor, as the items seem to get at the heart of what would be expected from

someone who has SCT (e.g., processing information more slowly than others). One hypothesis as to why these two items did not load onto any factor is that they may appear more negatively worded than other SCT symptoms on the BAARS-IV. College students, for example, might be less likely to endorse items that speak specifically to them being "slow," either physically or mentally. These results also suggest that the term "sluggish cognitive tempo" may be inaccurate for what SCT symptoms measure. With the exclusion of the two "slow" based symptoms listed above, the remaining SCT symptoms could be more accurately summarized as symptoms related to alertness, motivation, or awareness than the pace of cognitive processing. The one ADHD inattention item (i.e., "easily distracted by extraneous stimuli or irrelevant thoughts") which loaded onto the SCT factor is also consistent with a conceptualization of these symptoms that relate more to alertness or awareness than sluggish cognitive processing. Overall, these findings confirm and extend findings from previous research and suggest that SCT symptoms form a construct distinct from depression, anxiety, and ADHD symptoms, though this construct may be more focused on alertness or awareness than slow cognition.

Impairment Profile Associated with SCT Symptoms

The second aim of this study was to identify an impairment profile associated with SCT symptoms through (a) high and Low SCT symptom group comparisons and (b) regression analyses. This is one of the first studies to descriptively compare high and Low SCT groups while controlling for elevated levels of ADHD, depression, and anxiety. While the High SCT group reported significantly more impairment in several domains, the regression analyses suggest that SCT symptoms do not account for unique variance for functional impairment, time management or GPA after controlling for related variables. Results are further discussed below.

Prevalence estimates. When identifying high and Low SCT symptom groups, 13% of the sample reported "high" levels of SCT symptoms based upon Barkley's cutoff score of five symptoms. These findings are consistent with previous research on SCT symptoms in college students (Flannery et al., 2014; Wood et al., 2014). Notably, not all college students reported SCT symptoms. In this sample, 68% of participants reported 2 or fewer SCT symptoms. These results suggest that SCT symptoms are more prevalent among college students than either adults (5%; Barkley, 2012a) or children (5%; Barkley, 2013), but that the college sample is fairly polarized between those who report high levels of SCT symptoms (5 or more) and those who report low levels of SCT symptoms (2 or fewer).

College students encounter several developmental challenges associated with emerging adulthood, which may help to account for the high prevalence rates in college students. During this period, college students (i.e., emerging adults) are faced with a wide array of possibilities for their future, begin to explore their own life goals, attempt to become independent from parents, and experience a sense of instability as they transition from adolescence (Arnett, 2000). It may be that these developmental challenges cause students to more frequently endorse symptoms such as "easily confused," "sluggish," or "daydreaming." This developmental period is also associated with gaining independence in decision making that allows the student to set their own study schedule, social calendar, social habits, sleep patterns, and health habits. Therefore, emerging adults may be more prone to report more procrastination, weaker time management skills, higher levels of substance use, and poorer levels of sleep as they learn to make these decisions on their own away from the support of their families.

A second consideration is the cutoff score for "High" SCT symptoms. The cutoff of 5 SCT symptoms endorsed as "often" or "very often" may not be the appropriate symptom cutoff

for college students and may overestimate the number of participants who meet criteria for elevated levels of SCT. The studies examining the prevalence of SCT symptoms in child or adolescent populations adjusted the cutoff to 3 symptoms of SCT being endorsed as "often" or "very often." Similarly, the SCT symptom cutoff for college students may need to be adjusted. For example, secondary analyses indicate that while 5 symptoms appear to be an appropriate cutoff for a general adult population (see Barkley, 2012a), the 95th percentile cutoff for college students is 7 symptoms (5.4% of sample). An alternative explanation is that college students, for whatever reason, exhibit more SCT symptoms of greater severity than individuals at other ages. This may be due to environmental factors associated with the college experience (e.g., less sleep, substance use, increased academic and social demands). Regardless of the explanation, it is clear that college students report more SCT symptoms as occurring "often" or "very often" than do child or adult populations, and a symptom cutoff of 5 may be too liberal for college students.

Academic management outcome variables. In terms of academic variables, descriptive data analyses indicate that the High SCT group reported significantly more procrastination and weaker time management skills in three of the five time management domains. This is consistent with previous research that found SCT symptoms to be associated with academic impairment and maladjustment in college students (Becker et al., 2014) and with executive functioning deficits related to planning and organization (Barkley, 2011a; Barkley, 2013; Wood et al., 2014). This also corresponds with previous suggestions that SCT symptoms might be associated with task and time management (Wood et al., 2014).

Despite reporting more procrastination and less time management skills, students' GPA did not differ significantly between High and Low SCT groups. It may be that individuals with elevated SCT symptoms have more problems managing time for academic tasks, but this

weakness does not impact their overall outcome (e.g., GPA) (Becker, Ciesielski, Rood, Froehlich, Garner, Tamm, & Epstein, 2014). However, the average reported GPA was quite high (GPA = 3.2) and the range was narrow, with the majority of students reporting a GPA between 2.9 and 3.5. This truncated range calls into question the accuracy of self-reported GPA and the meaningfulness of this variable is as a measure of overall academic performance.

Lifestyle outcome variables. In terms of lifestyle variables, the High SCT symptom group reported significantly more functional impairment and more sleep problems (i.e., poorer sleep quality and more daytime dysfunction due to sleepiness) than the Low SCT symptom group. This replicates findings from other studies of SCT and college students or adults (Barkley, 2011d; Becker, Luebbe, & Langberg, 2014; Langberg, Becker, Dvorsky, & Luebbe, 2014; Wood et al., 2014) and suggests that, though sleep and SCT form statistically separate factors, individuals with elevated SCT symptoms present with more sleep problems than students without High SCT symptoms.

This study is one of the first to investigate the relationship between substance use and SCT symptoms. The High SCT symptom group reported higher alcohol use scores on the AUDIT than the Low SCT group, though this difference was not statistically significant due to the bonferroni adjustment. Based on CUDIT report, the two groups did not differ significantly on reported cannabis use. These findings are similar to the pattern of alcohol and cannabis use reported by college students with ADHD (Rooney, Chronis-Tuscano, & Yoon, 2012) and suggest that college students with High SCT symptoms may be more likely to have more alcohol related problems than students with low levels of SCT symptoms. These findings are preliminary, however; additional research needs to be conducted on this topic prior to making any firm conclusions.

This study is also one of the first to examine health and SCT symptoms. The health questionnaire was developed for this study; therefore, no clinical interpretation of these scores is provided. However, these findings suggest that college students with High SCT symptoms report more illnesses, experience more impairment due to illness (e.g., feeling sluggish, fatigued, or restricted in daily activities), and rate their overall physical health as poorer than individuals with Low SCT symptoms. The causal relationship between health and SCT symptoms is unknown; however, these findings could indicate that students endorse more SCT symptoms because of various illnesses. This supports the decision to control for health variables when conducting the regression analyses.

Finally, time allocation was examined to better understand how college students with High SCT symptoms spend their time compared to students with low levels of SCT symptoms. The High SCT group reported spending significantly more time socializing and relaxing per week than the Low SCT group. Given that students in the High SCT group reported higher procrastination scores, it may be that college students with High SCT symptoms spend more time with friends or relaxing because they are procrastinating on other tasks. Conversely, it may be that college students spend more time with friends for certain reasons (e.g., drinking alcohol) which in turn causes college students to endorse more symptoms of SCT.

Mental health outcome variables. Though "high" levels of ADHD, anxiety, and depression symptoms were controlled in the descriptive analyses, the High SCT group reported significantly more symptoms of all three related symptom sets than the Low SCT group. Given the previous literature that has demonstrated moderate relationships between symptoms of SCT and symptoms of ADHD, anxiety, and depression, these findings are unsurprising. It is important to note that the descriptive comparisons between groups controlled for high levels of ADHD,

anxiety, and depression symptoms. Therefore, despite controlling for these elevated symptoms, the High SCT symptom group continued to be associated with more ADHD, anxiety, and depression symptoms than the Low SCT symptom group. These findings suggest that, in general, it is most common to find elevated levels of SCT symptoms in conjunction with more symptoms of these other related symptom sets. These findings emphasize the highly interrelated nature of SCT symptoms and symptoms of ADHD, anxiety, and depression and the importance of controlling for these related symptoms when attempting to assess impairment associated with SCT symptoms.

Regression analyses versus group comparisons. While descriptive group comparisons indicate that participants in the High SCT group demonstrate significantly more functional impairment, health impairment, sleep problems, poorer time management skills, and higher alcohol use scores, SCT symptoms failed to account for unique variance for any of the outcome variables (i.e., time management domains, functional impairment, GPA) in the regression analyses, with the exception of procrastination. Even then, the amount of variance accounted for by SCT was very small (1.3%). These findings are in direct contrast to previous findings by Wood and colleagues (2014) which found that SCT symptoms accounted for more variance in functional impairment than symptoms of ADHD, anxiety, or depression.

These results bring to light the complicated relationship between SCT symptoms, related variables, and impairment. From group analyses, it is clear that SCT symptoms can identify a subset of people who report significant levels of impairment compared to those who do not report elevated levels of SCT symptoms. However, regression analyses suggest that SCT symptoms do not significantly predict impairment after controlling for related symptoms. One explanation for the discrepancy between the group analyses and the regression analyses is that

the other variables in the regression analyses (i.e., sleep, health, substance use, ADHD, anxiety, depression), and not SCT symptoms, may be responsible for the impairment experienced by these students. Notably, secondary analyses indicate that ADHD-I symptoms continued to account for significant variance across all outcome variables except GPA, even after controlling for related variables. This suggests that ADHD-I symptoms do significantly contribute to impairment after controlling for related variables, while SCT symptoms do not. If SCT symptoms do not account for unique variance of impairment, as suggested by this study, researchers must ask whether the SCT symptom set should be considered a meaningful mental health construct or if it represents a different construct entirely.

It is difficult to determine the place of SCT symptoms in mental health. As demonstrated by the factor analysis, SCT symptoms do form a separate construct from ADHD, anxiety, and depression. SCT symptoms remain moderately correlated with symptoms of inattention, which suggests some similarities with ADHD inattention symptoms. Yet, unlike symptoms of inattention, SCT symptoms do not uniquely predict impairment which suggests that SCT should not be considered as a separate disorder at this time. Based upon these findings, one possible explanation is that SCT symptoms form a transdiagnostic construct that is often associated with mental health difficulties but may not cause impairment in the same way as a mental health disorder (e.g., motivation, self-esteem). For example, SCT symptoms may represent a construct similar to motivation that contributes to mental health problems. This would be consistent with the dual pathway model of ADHD which suggests that underlying deficits in EF and deficits in motivation both contribute to ADHD. From this perspective, some SCT symptoms could be viewed as a certain "style" of functioning, which could become impairing if an individual exhibited excessive amounts of this "style." Likewise, similar to motivation, having a SCT

"style" might make an individual more vulnerable to experiencing mental health problems, sleep, substance use, and/or health impairment in times of high stress. To date, relatively little research has investigated SCT as a more dimensional, transdiagnostic entity and no research has examined the connection between motivation and SCT symptoms. Future research should consider these relationships.

Limitations

The findings of this study should be considered in light of several limitations. First, this study recruited a large sample of college students; however, all measures were based upon self-report without a corresponding report from an outside observer (e.g., family member). Therefore, the data may be subject to bias, exaggeration, inconsistency, and limited effort. Future studies would benefit from incorporating multiple informants and direct measures to reduce the likelihood of bias or exaggeration.

Though this study attempted to control for several related variables and to measure several impairment domains, it did not comprehensively assess all possible variables. Several other factors may have contributed to the endorsement of SCT symptoms but were not assessed in this study (e.g., caffeine, obesity, motivation, personality, IQ). Social behavior was not examined, though previous research has suggested SCT may be associated with some impairment in this area. Additionally, this study did not utilize direct behavioral observations or performance measures. This is particularly relevant as one of the goals of this study was to assess an impairment profile of students with elevated levels of SCT symptoms and all data collected in this study is indirect in nature.

Third, the average GPA was higher than expected (3.2) and the range was severely restricted with the majority of people reporting GPA that falls between 2.9 and 3.5. This suggests

that GPA may have limited utility in this study and may not be an accurate indicator of an individual's overall academic performance.

Finally, the external validity of this study is limited in that the sample comes from one private university in the Northeast. The majority of participants were female and Caucasian. Therefore, this sample may not be representative of the general college population. Furthermore, as this is not a longitudinal study and did not incorporate a retest component, it is difficult to determine whether SCT symptoms are more related to the environment (i.e., state) or to the individual (i.e., trait).

Future Research

These findings bring to light several areas for future research in the area of SCT symptoms. First and foremost, researchers need to recognize the complex relationship SCT symptoms have with several other variables. Historically, most research on SCT symptoms has been conducted with ADHD samples. However, as the results from this study demonstrate, SCT symptoms are related to several other variables beyond ADHD (e.g., anxiety, depression, sleep, health, substance use). The relatively few studies that examine SCT symptoms within a general population have failed to account for variables other than ADHD when investigating impairment and SCT symptoms. This study is the first to control for related variables such as sleep, substance use, and health when investigating impairment associated with SCT. This is also the first study to suggest that, once controlling for these related variables, SCT symptoms may not significantly predict impairment. Therefore, replication of these findings across populations (e.g., child, adolescent, adult) is crucial.

Second, this study does not provide a comprehensive picture of all impairment domains. Therefore, future studies should examine more domains (e.g., social functioning) of impairment

using a variety of methods (e.g., direct observation, standardized performance measures, self-report). Though this study suggests that SCT symptoms do not account for significant amounts of variance as it relates to impairment, it is impossible to make generalizations about SCT symptoms and impairment without broader consideration of more impairment domains and without replicating this study across samples.

Third, more comprehensive work needs to be done to determine "high" levels of SCT symptoms. As mentioned previously, the 95th cutoff for adults was found to be 5 symptoms, 3 symptoms for children, and potentially 7 symptoms for college students. However, relatively few studies have attempted to assess prevalence of SCT symptoms. Furthermore, future studies need to examine the factor structure of SCT symptoms within college students. In this study, two of the items (i.e., "slow moving" and "I don't seem to process information as quickly or as accurately as others") did not load onto the factor at all. This calls into question which SCT items are appropriate to measure SCT in college students. Research in this area would allow researchers to consistently measure and compare high symptom groups across studies.

Finally, very few longitudinal studies have yet been conducted. The research would benefit significantly from following individuals with SCT over time to determine whether SCT is a stable trait for the individual or whether SCT changes based upon environmental conditions the person is experiencing (e.g., caffeine, academic demands, work demands, sleep).

Conclusion

This study offers a glimpse into the impairment profile (or lack thereof) associated with symptoms of SCT. Much speculation exists regarding the nature of SCT symptoms. College students, in particular, have been shown to report high levels of SCT symptoms (Wood et al., 2014). However, relatively few studies have controlled for related symptom sets and variables

when examining the impairment profile associated with symptoms of SCT. This study confirmed that SCT symptoms form a separate factor from symptoms of ADHD, anxiety, and depression in factor analyses. In the group comparisons, individuals in the High SCT symptom group reported a more impaired profile than individuals in the Low SCT symptom group. However, SCT symptoms did not account for unique variance for impairment for most domains once related symptoms of ADHD, anxiety, depression, sleep, health, and substance abuse were controlled for. This suggests the related variables, rather than SCT, are associated with impairment.

The findings from this study were exploratory in nature and highlight the complex relationship between SCT symptoms and several other related variables (i.e., ADHD, anxiety, depression, sleep problems, health impairment, and substance use). These results raise the question of whether SCT symptoms form an important independent construct, or whether they represent a construct that is not a separate disorder but rather a side effect of several interrelated factors (e.g., sleep problems, anxiety, and ADHD). Though SCT symptoms remain a construct worthy of further study, this study calls for pause in the attempts to identify SCT symptoms as a unique subset or disorder. The lack of impairment associated with SCT symptoms suggests that it may serve as an underlying construct of many mental health and lifestyle variables, rather than standing independently as a mental health construct.

Table 1

Summary of Items and Factor Loadings from Five-Factor Solution Exploratory Factor Analysis with Direct Oblim Rotation: Communalities, Eigenvalues, and Percentage of Variance

	Factor Loading					
Item Number	1	2	3	4	5	Communality
DASS 37	**.887**	-.073	-.020	.050	.042	.717
DASS 17	**.868**	-.036	.041	.012	-.017	.729
DASS 21	**.866**	-.147	.023	.016	.081	.791
DASS 34	**.857**	-.039	.030	-.013	-.020	.727
DASS 24	**.806**	-.051	-.007	-.059	.047	.704
DASS 16	**.786**	.028	-.048	-.056	.038	.693
DASS 38	**.769**	-.159	-.028	-.084	.092	.645
DASS 10	**.763**	.115	.007	.027	.035	.653
DASS 13	**.743**	.169	.010	.005	-.103	.615
DASS 26	**.743**	.087	.031	-.055	-.106	.618
DASS 3	**.697**	.113	-.009	-.047	.033	.610
DASS 31	**.692**	.020	.008	-.097	.059	.611
DASS 42	**.519**	.215	.004	-.141	.030	.527
DASS 5	**.408**	.286	.047	-.104	.063	.461
SCT 2	.078	**.728**	.051	.076	.088	.625
SCT 1	.112	**.657**	.175	.095	-.024	.538
SCT 6	.091	**.642**	-.119	-.211	.091	.608
SCT 7	.080	**.583**	-.160	-.235	.186	.606

SCT 5	-.021	**.580**	.067	-.176	.219	.616
SCT 4	.171	**.558**	.132	.123	.151	.521
ADHD-I 8	.110	**.497**	.200	.167	.290	.563
SCT 3	-.064	**.453**	.051	-.175	.318	.512
SCT 9	-.023	.376	.047	-.190	.341	.482
SCT 8	-.005	.364	-.066	-.270	.316	.460
ADHD-HI 7	.031	-.108	**.750**	-.009	.022	.549
ADHD-HI 6	.043	-.050	**.748**	.088	.016	.527
ADHD-HI 8	.056	-.056	**.732**	-.007	.069	.573
ADHD-HI 9	-.034	-.142	**.697**	-.038	.145	.529
ADHD-HI 1	-.009	.301	**.536**	-.101	-.071	.486
ADHD-HI 5	-.041	.187	**.529**	-.108	-.158	.354
ADHD-HI 3	-.018	.275	**.510**	-.118	.019	.487
ADHD-HI 4	.071	.060	**.473**	-.093	.241	.478
ADHD-HI 2	-.022	-.091	**.432**	-.115	.354	.428
DASS 41	.032	-.180	.119	**-.697**	-.067	.538
DASS 7	-.073	.146	.087	**-.681**	-.037	.508
DASS 15	.059	-.022	-.099	**-.647**	.085	.466
DASS 23	-.020	-.180	-.035	**-.639**	.222	.465
DASS 4	.017	.014	.018	**-.624**	.012	.420
DASS 25	.059	-.002	.088	**-.620**	-.104	.431
DASS 20	.269	-.048	.020	**-.545**	.041	.547
DASS 36	.305	-.121	-.009	**-.520**	.053	.523

DASS 28	.340	.040	.062	**-.516**	-.072	.597
DASS 19	.056	-.037	.006	**-.509**	.040	.302
DASS 30	.251	.091	.033	**-.494**	-.018	.501
DASS 2	-.023	.061	.064	**-.436**	.064	.246
DASS 40	.308	.173	.092	**-.405**	-.096	.504
DASS 9	.223	.288	.079	-.384	-.088	.473
ADHD-I 4	.083	.011	.045	-.020	**.683**	.550
ADHD-I 5	.054	.122	-.058	.008	**.670**	.523
ADHD-I 7	-.017	.023	.073	-.075	**.631**	.478
ADHD-I 3	.001	-.114	.103	-.080	**.620**	.428
ADHD-I 1	.100	.134	.055	.014	**.608**	.527
ADHD-I 9	.024	.264	.151	.026	**.521**	.539
ADHD-I 2	.152	.188	.088	.006	**.512**	.507
ADHD-I 6	.134	.310	.005	.030	**.462**	.485
Eigenvalues	18.41	4.94	2.67	1.90	1.60	
% of Variance	33.47	8.98	4.86	3.46	2.92	

Note. Factor 1 = Depression. Factor 2 = Sluggish Cognitive Tempo. Factor 3 = Hyperactive Impulsive. Factor 4 = Anxiety. Factor 5 = Inattention.

Table 2

Means and Standard Deviation Comparisons of Students with High Levels of SCT and Low Levels of SCT on Academic and Health Variables

	Low SCT (n = 620)		High SCT (n = 51)			
Variable	*M*	SD	*M*	SD	*t*	*d*
Age	19.38	2.20	19.24	1.20	.42	-.08
GPA	3.22	.64	3.13	.41	.92	-.17
Procrastination	53.98	10.26	62.75	8.03	-5.95***	-.90
Goals and Priorities	28.07	8.80	31.29	7.65	-2.53*	-.39
Time Management	36.73	9.67	39.61	8.18	-2.07	-.32
Preference Organization	16.73	5.59	20.04	6.27	-4.03***	-.56
Control of Time	10.72	2.88	13.51	2.89	-6.64***	-.97
Total Time Management	92.25	18.83	104.45	14.65	-4.52***	-.72
Depression Total	2.91	4.32	8.04	5.32	-8.00***	-1.06
Anxiety Total	2.78	3.32	6.33	4.01	-7.22***	-.96
Inattention Total	12.75	3.01	17.82	3.33	-11.45***	-1.49
Hyperactive-Impulsive	12.32	2.98	14.57	3.28	-5.13***	-.58
AUDIT Total	6.88	4.96	8.47	5.44	-2.19*	-.31
CUDIT Total	5.74	5.04	5.88	4.76	-.13	.21
Health Quality	3.69	.77	3.29	.87	5.25***	.49
Health Impairment	11.96	4.13	14.37	4.88	-3.95***	-.53
Illness Frequency	11.60	3.28	13.61	3.39	-6.22***	-.60
Mean FI Score	2.26	1.33	3.37	1.29	-5.73***	-.84

Sleep Quality	1.00	.61	1.35	.82	-3.88***	-.53
Sleep Disturbance	.06	.29	.08	.34	-.40	.06
Daytime Dysfunction	.83	.60	1.51	.64	-7.71***	-1.09
	%	(n)	%	(n)	x^2	
Sex					9.19**	
Male	38.3	237	19.6	10		
Female	61.7	381	80.4	41		

Note. Due to the bonferroni adjustment, only those variables that are $p < .002$ are considered significant. Daytime Dysfunction = daytime dysfunction due to sleepiness total score; Sleep Disturbance = sleep disturbance total score; Sleep Quality = sleep quality total score; AUDIT Total = total score on AUDIT; CUDIT Total = total score on CUDIT; Inattention Total = total ADHD inattention score on BAARS-IV; Hyperactive-Impulsive = Total ADHD hyperactive impulsive score on BAARS-IV; Anxiety Total = score on the DASS in the anxiety domain; Depression Total = score on the DASS in the depression domain. SCT Total = Sluggish Cognitive Tempo score on BAARS-IV; Health Quality = overall reported quality of health; Health Impairment = how regularly students experience impaired due to illness; Frequency of Illness = how frequently student reports being sick.

*p = .05, **p < .01, ***p < .001

Table 3

Means and Standard Deviation Comparisons of Students with High Levels of SCT and Low Levels of SCT on Time Allocation

	Low SCT (n = 620)		High SCT (n = 51)			
Variable	*M*	SD	*M*	SD	*t*	*d*
Class Preparation	3.73	1.57	3.27	1.19	2.04*	-.34
Co-Curricular	2.81	1.45	2.76	1.66	.20	-.03
On Campus Job	1.67	1.19	2.00	1.59	-1.83	.23
Off Campus Job	1.34	1.00	1.37	1.31	-.21	.03
Volunteering	1.60	.88	1.43	.76	1.32	-.21
Socializing	4.27	1.82	5.10	2.10	-3.09***	-.42
Relaxing	3.63	1.56	4.49	2.16	-3.65***	-.46
Providing Care	1.20	.57	1.31	1.09	-1.23	.13
Exercise/Health	2.72	1.24	2.33	1.42	2.11*	-.29

Note. Due to the bonferroni adjustment, only those variables that are $p < .002$ are considered significant. More lengthy descriptions of each variable can be found in Appendix K.

*p = .05, **p < .01, ***p < .001

Table 4

Correlations, Means, and Standard Deviations for Sluggish Cognitive Tempo and Predictor Variables (N = 910)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1. SCT	-	.72**	.51**	.53**	.54**	-.80*	.14**	.13**	.33*	.29**	.12**	.50**
2. ADHD-I		-	.56**	.48**	.49**	-.09**	.20**	.24**	.27**	.28**	.13**	.41**
3. ADHD-HI			-	.32**	.45**	.01	.23**	.12*	.23**	.18**	.15**	.23**
4. Depression				-	.74**	-.08*	.06	.17**	.20**	.28**	.12**	.43**
5. Anxiety					-	-.05	.10**	.18**	.27**	.26**	.15**	.38**
6. GPA						-	-.01	-.20**	.07*	-.04	-.01	-.03
7. AUDIT							-	.21**	.18**	.10**	-.05	.07*
8. CUDIT								-	.08	.05	.18**	.10*
9. Health Impairment									-	.24**	.22**	.34**
10. Sleep Quality										-	.11**	.39**
11. Sleep Disturbance											-	.09**
12. Daytime Dysfunction												-

Mean	16.23	14.89	13.77	5.59	4.83	3.20	7.32	6.25	12.88	1.12	.10	1.05
SD	5.57	5.08	4.56	7.86	5.92	.60	5.42	5.52	4.70	.67	.40	.72
Minimum	9.00	9.00	9.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00
Maximum	36.00	36.00	35.00	42.00	35.00	4.00	30.00	30.00	26.00	3.00	3.00	3.00

Note. Inattention Total = total ADHD inattention score on BAARS-IV; Hyperactive-Imp Total = Total ADHD hyperactive impulsive score on BAARS-IV; Anxiety Total = score on the DASS in the anxiety domain; Depression Total = score on the DASS in the depression domain. SCT Total = Sluggish Cognitive Tempo score on BAARS-IV; Daytime Dysfunction = daytime dysfunction due to sleepiness total score; Sleep Disturbance = sleep disturbance total score; Sleep Quality = sleep quality total score; AUDIT Total = total score on AUDIT; CUDIT Total = total score on CUDIT

*p = .05, **p < .01, ***p < .001

Table 5

Results of Regression of Mean Functional Impairment Score on Predictor Variables

Predictor Variables	ΔR^2	*B*	β	*t*
Step 1	.23***			
Sex		.02	.04	.76
Daytime Dysfunction		.11	.33	5.45***
Sleep Disturbance		.03	.04	.72
Sleep Quality		.04	.11	1.96
Health Impairment		.01	.05	.85
AUDIT Total		.01	.10	1.76
CUDIT Total		.09	.14	2.45*
Step 2	.46***			
Hyperactive-Imp. Total		.16	.08	1.51
Inattention Total		.53	.29	5.91***
Anxiety Total		.10	.17	2.89**
Depression Total		.10	.19	3.23***
Step 3	.46			
SCT Total		.01	.09	1.29

Note. Daytime Dysfunction = daytime dysfunction due to sleepiness total score; Sleep Disturbance = sleep disturbance total score; Sleep Quality = sleep quality total score; AUDIT Total = total score on AUDIT; CUDIT Total = total score on CUDIT; Inattention Total = total ADHD inattention score on BAARS-IV; Hyperactive-Imp Total = Total ADHD hyperactive impulsive score on BAARS-IV; Anxiety Total = score on the DASS in the anxiety domain;

Depression Total = score on the DASS in the depression domain. SCT Total = Sluggish Cognitive Tempo score on BAARS-IV

*p = .05, **p < .01, ***p < .001

Table 6

Results of Regression of Time Management Scale Total on Predictor Variables

Predictor Variables	ΔR^2	*B*	β	*t*
Step 1	.07			
Sex		-6.08	-.15	-2.40*
Daytime Dysfunction		3.96	.15	2.25*
Sleep Disturbance		-1.47	-.03	-.49
Sleep Quality		1.67	.06	.91
Health Impairment		-.23	-.06	-.86
AUDIT Total		.38	.11	1.68
CUDIT Total		-1.09	-.02	-.34
Step 2	.19			
Hyperactive-Imp. Total		-16.58	-.11	-1.62
Inattention Total		60.48	.43	5.84***
Anxiety Total		-.71	-.02	-.21
Depression Total		2.81	.07	.98
Step 3	.20			
SCT Total		.47	.14	1.55

Note. Sex = self-report of either male or female; Daytime Dysfunction = daytime dysfunction due to sleepiness total score; Sleep Disturbance = sleep disturbance total score; Sleep Quality = sleep quality total score; AUDIT Total = total score on AUDIT; CUDIT Total = total score on CUDIT; Inattention Total = total ADHD inattention score on BAARS-IV; Hyperactive-Imp Total = Total ADHD hyperactive impulsive score on BAARS-IV; Anxiety Total = score on the

DASS in the anxiety domain; Depression Total = score on the DASS in the depression domain.

SCT Total = Sluggish Cognitive Tempo score on BAARS-IV;

*p = .05, **p < .01, ***p < .001

Table 7

Results of Regression of Procrastination on Predictor Variables

Predictor Variables	ΔR^2	*B*	β	*t*
Step 1	.07***			
Sex		1.58	.07	1.12
Daytime Dysfunction		3.41	.23	3.48***
Sleep Disturbance		-.11	-.01	-.06
Sleep Quality		-.48	.03	.47
AUDIT Total		.26	.13	2.05*
CUDIT Total		1.82	.06	1.02
Health Impairment		-.02	-.01	-.13
Step 2	.19***			
Hyperactive-Imp. Total		-12.45	-.15	-2.20*
Inattention Total		35.57	.44	6.20***
Anxiety Total		-1.33	-.05	-.71
Depression Total		1.72	.08	1.08
Step 3	.20*			
SCT Total		.36	.18	2.12*

Note. Sex = self-report of either male or female; Daytime Dysfunction = daytime dysfunction due to sleepiness total score; Sleep Disturbance = sleep disturbance total score; Sleep Quality = sleep quality total score; AUDIT Total = total score on AUDIT; CUDIT Total = total score on CUDIT; Inattention Total = total ADHD inattention score on BAARS-IV; Hyperactive-Imp Total = Total ADHD hyperactive impulsive score on BAARS-IV; Anxiety Total = score on the

DASS in the anxiety domain; Depression Total = score on the DASS in the depression domain.

SCT Total = Sluggish Cognitive Tempo score on BAARS-IV;

*p = .05, **p < .01, ***p < .001

Table 8

Results of Regression of GPA on Predictor Variables

Predictor Variables	ΔR^2	*B*	β	*t*
Step 1	.02			
Sex		.02	.02	.27
Daytime Dysfunction		-.03	-.03	-.51
Sleep Disturbance		.03	.02	.33
Sleep Quality		-.04	-.04	-.66
AUDIT Total		.01	.04	.67
CUDIT Total		-.32	-.20	-3.12**
Health Impairment		.01	.09	1.33
Step 2	.03			
Hyperactive-Imp. Total		.36	.08	1.06
Inattention Total		-.40	-.09	-1.15
Anxiety Total		.02	.02	.21
Depression Total		-.14	-.11	-1.41
Step 3	.03			
SCT Total		-.01	-.09	-.93

Note. Sex = self-report of either male or female; Daytime Dysfunction = daytime dysfunction due to sleepiness total score; Sleep Disturbance = sleep disturbance total score; Sleep Quality = sleep quality total score; AUDIT Total = total score on AUDIT; CUDIT Total = total score on CUDIT; Inattention Total = total ADHD inattention score on BAARS-IV; Hyperactive-Imp Total = Total ADHD hyperactive impulsive score on BAARS-IV; Anxiety Total = score on the

DASS in the anxiety domain; Depression Total = score on the DASS in the depression domain.

SCT Total = Sluggish Cognitive Tempo score on BAARS-IV;

*p = .05, **p < .01, ***p < .001

Appendix A: AUDIT

Box 10

The Alcohol Use Disorders Identification Test: Self-Report Version

PATIENT: Because alcohol use can affect your health and can interfere with certain medications and treatments, it is important that we ask some questions about your use of alcohol. Your answers will remain confidential so please be honest.
Place an X in one box that best describes your answer to each question.

Questions	0	1	2	3	4	
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
8. How often during the last year have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
9. Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year	
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year	
					Total	

Appendix B: BAARS-IV

[See copyrighted material.]

Appendix C: Barkley Functional Impairment Scale

[See copyrighted material.]

Appendix D: CUDIT-R

The Cannabis Use Disorder Identification Test - Revised (CUDIT-R)

Have you used any cannabis over the past six months? YES / NO

If YES, please answer the following questions about your cannabis use. Circle the response that is most correct for you in relation to your cannabis use *over the past six months*

1. How often do you use cannabis?

Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
0	1	2	3	4

2. How many hours were you "stoned" on a typical day when you had been using cannabis?

Less than 1	1 or 2	3 or 4	5 or 6	7 or more
0	1	2	3	4

3. How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?

Never	Less than monthly	Monthly	Weekly	Daily or almost daily
0	1	2	3	4

4. How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis?

Never	Less than monthly	Monthly	Weekly	Daily or almost daily
0	1	2	3	4

5. How often in the past 6 months have you devoted a great deal of your time to getting, using, or recovering from cannabis?

Never	Less than monthly	Monthly	Weekly	Daily or almost daily
0	1	2	3	4

6. How often in the past 6 months have you had a problem with your memory or concentration after using cannabis?

Never	Less than monthly	Monthly	Weekly	Daily or almost daily
0	1	2	3	4

7. How often do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children:

Never	Less than monthly	Monthly	Weekly	Daily or almost daily
0	1	2	3	4

8. Have you ever thought about cutting down, or stopping, your use of cannabis?

Never	Yes, but not in the past 6 months	Yes, during the past 6 months
0	2	4

This scale is in the public domain and is free to use with appropriate citation:

Adamson SJ, Kay-Lambkin FJ, Baker AL, Lewin TJ, Thornton L, Kelly BJ, and Sellman JD. (2010). An Improved Brief Measure of Cannabis Misuse: The Cannabis Use Disorders Identification Test – Revised (CUDIT-R). *Drug and Alcohol Dependence* 110:137-143.

Appendix E: Depression, Anxiety, and Stress Scale (DASS)

[See copyrighted material.]

Appendix F: Health Questionnaire

Please circle the most appropriate answer for each question.

1. On a scale from 1 – 5, with one being very poor and 5 being excellent, how would you rate your overall physical health?
    a. 1 = Very poor
    b. 2 = Poor
    c. 3 = Average
    d. 4 = Above Average
    e. 5 = Excellent

2. Over the past 12 months:
    a. How often have you experienced allergies?
        i. None
        ii. Seasonal, once per year
        iii. Seasonal, 2 – 3 times per year
        iv. Consistently, throughout the entire year

    b. How many days have you felt sluggish, fatigued, or restricted in daily activities by allergies?
        i. Not at all
        ii. 1 – 4 days
        iii. 5 – 7 days
        iv. 8 – 14 days
        v. 14 – 30 days
        vi. 30+ days

    c. How often have you experienced head colds/sinus infections?
        i. Never
        ii. 1 – 2 times per year
        iii. 3 - 5 times per year
        iv. 6 - 9 times per year
        v. 10 or more times per year

    d. How many days have you felt sluggish, fatigued, or restricted in daily activities by colds/sinus infections?
        i. Not at all
        ii. 1 – 4 days
        iii. 5 – 7 days
        iv. 8 – 14 days
        v. 14 – 30 days
        vi. 30+ days

    e. How often have you experienced stomach aches or nausea?
        i. Never
        ii. 1 – 2 times per year

iii. 3 - 5 times per year
iv. 6 - 9 times per year
v. 10 or more times per year

f. How many days have you felt sluggish, fatigued, or restricted in daily activities by stomach aches or nausea?
   i. Not at all
   ii. 1 – 4 days
   iii. 5 – 7 days
   iv. 8 – 14 days
   v. 14 – 30 days
   vi. 30+ days

g. How often have you experienced headaches or migraines?
   i. Never
   ii. 1 – 2 times per year
   iii. 3 - 5 times per year
   iv. 6 - 9 times per year
   v. 10 or more times per year

h. How many days have you felt sluggish, fatigued, or restricted in daily activities by headaches or migraines?
   i. Not at all
   ii. 1 – 4 days
   iii. 5 – 7 days
   iv. 8 – 14 days
   v. 14 – 30 days
   vi. 30+ days

i. How often have you experienced other medical conditions?
   i. Never
   ii. 1 – 2 times per year
   iii. 3 - 5 times per year
   iv. 6 - 9 times per year
   v. 10 or more times per year

j. How many days have you felt sluggish, fatigued, or restricted in daily activities by other medical conditions?
   i. Not at all
   ii. 1 – 4 days
   iii. 5 – 7 days
   iv. 8 – 14 days
   v. 14 – 30 days
   vi. 30+ days

k. How regularly do you take medication:

i. Less than once a month
ii. Monthly
iii. 2 – 3 times a month
iv. Weekly
v. 2 – 3 times a week
vi. Daily

l. How many days have you felt sluggish, fatigued, or restricted in daily activities by your medication?
i. Not at all
ii. 1 – 4 days
iii. 5 – 7 days
iv. 8 – 14 days
v. 14 – 30 days
vi. 30+ days

3. Do you have any medical condition that impacts your physical health?
a. _____YES
b. _____NO

4. If yes, please list the health condition:_____

5. Do you take any medication(s):
a. _____Yes
b. _____No

6. If yes, please list the medication(s):_____

Appendix G: Pittsburg Sleep Quality Scale (select items)

[See copyrighted material]

Appendix H: Lay's Procrastination Scale

[See copyrighted material.]

Appendix I: Research Study Demographic Questionnaire

Research Study Questionnaire

Age: _____ Sex: _____

Year in School:

____Freshman ____Senior

____Sophomore ____Fifth Year Senior

____Junior ____Other

Ethnicity: (Please check)

____American Indian or Alaska Native

____ Asian (including Indian subcontinent and Philippines)

____ Black or African American (including African and Caribbean)

____ Hispanic or Latino (including Spain)

____ Native Hawaiian or Other Pacific Islander

____ White (Including Middle Eastern)

Current GPA: _____

Primary language:

(Please Circle) English Other _____

Please check any disorder with which you have been **diagnosed**:

ADHD/ADD None

Learning Disabled

Vision Impairment

Hearing Impairment

Anxiety Disorder

Obsessive Compulsive

Disorder

Depression

Conduct Disorder

Traumatic Brain Injury

Autism Spectrum Disorder

Other:_____

Appendix J: Time Management Behavior Scale

[See copyrighted material.]

Appendix K: Time Allocation Survey

Time Allocation Survey

Survey based upon the National survey of student engagement.

About how many hours do you spend in a typical 7-day week doing the following?

8-point scale broken into segments of 5 hours (0, 1 – 5, 6 – 10, 11 – 15, 16 – 20, 21 – 25, 26 – 30, 30+)

1. Preparing for class (studying, reading, writing, doing homework or lab work, analyzing data, rehearsing, and other academic activities)
2. Participating in co-curricular activities (organizations, campus publications, student government, fraternity or sorority, intercollegiate or intramural sports, etc.)
3. Working for pay on campus.
4. Working for pay off campus.
5. Doing community service or volunteer work.
6. Socializing with friends (spending time with friends, chatting with friends online, talking on the phone).
7. Relaxing (watching TV, playing video games, browsing Facebook or the internet)
8. Providing care for dependents (children, parents, etc.)
9. Exercising or maintaining your health (working out, running, bicycling, fitness classes, healthy meal planning/preparation).

Appendix L: Variable Map of Variables by type of Statistical Analysis

1. **Factor Analysis (56 items total)**
    a. 9 SCT symptoms from the BAARS-IV
    b. 9 ADHD-I symptoms from the BAARS-IV
    c. 9 ADHD-HI symptoms from the BAARS-IV
    d. 14 Anxiety items from the DASS
    e. 14 Depression items from the DASS

2. **High SCT and Low SCT group Comparisons**
    a. Predictor Variables
        i. SCT symptoms (High SCT = 5 or more; Low SCT = 2 or fewer)
    b. Outcome variables
        i. Total anxiety score as measured by the DASS
        ii. Total depression score as measured by the DASS
        iii. Mean functional impairment score as measured by the BFIS
        iv. GPA as reported on the demographic questionnaire
        v. Three sleep domains as measured by the PSQI
            1. Sleep quality
            2. Sleep disturbance
            3. Daytime dysfunction due to sleepiness
        vi. Heath Impairment score as measured by the Health Impairment Questionnaire
        vii. Total AUDIT score
        viii. Total CUDIT score
        ix. Total procrastination score as measured by the Lay's Procrastination scale
        x. Five time management domains as measured by the Time Management Behavior Scale
            1. Setting goals and priorities
            2. Mechanics of time management
            3. Preference for organization
            4. Perceived control of time
            5. Total time management score
        xi. Nine time allocation domains
            1. Preparing for class
            2. Participating in co-curricular activities
            3. Working on campus
            4. Working off campus
            5. Volunteer work
            6. Relaxation
            7. Socializing with friends
            8. Providing care for dependents

9. Exercising or maintaining health

3. **Regression Analyses**
    a. Predictor variables (entered hierarchically into the model)
        i. Sex as reported on the demographic questionnaire
        ii. AUDIT total score
        iii. CUDIT total score
        iv. Three sleep domains as measured by the PSQI
            1. Sleep quality
            2. Sleep disturbance
            3. Daytime dysfunction due to sleepiness
        v. Heath Impairment score as measured by the Health Impairment Questionnaire
        vi. Total ADHD Inattention score as measured by the BAARS-IV
        vii. Total ADHD Hyperactivity-Impulsivity score as measured by the BAARS-IV
        viii. Total anxiety score as measured by the DASS
        ix. Total depression score as measured by the DASS
        x. Total SCT score as measured by the BAARS-IV

    b. Outcome variables
        i. Mean functional impairment as measured by the BFIS
        ii. GPA as reported on demographic questionnaire
        iii. Five time management domains as measured by the Time Management Behavior Scale
            1. Setting goals and priorities
            2. Mechanics of time management
            3. Preference for organization
            4. Perceived control of time
            5. Total time management score
        iv. Total procrastination score as measured by Lay's Procrastination Scale

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Wood, W.M., Lewandowski, L., Lovett, B., & Antshel, K. (2014). Impairment and executive functioning associated with sluggish cognitive tempo symptoms in emerging adulthood. *Journal of Attention Disorders.* Advance online publication. doi: 10.1177/1087054714560822

Curriculum Vitae

Whitney L.M. Wood

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Syracuse University
Syracuse, NY 13244

EDUCATION

2010 – 2015 (expected)	Ph.D.	Syracuse University: Syracuse, NY Department of Psychology Ph.D. in School Psychology (APA-accredited, NASP Approved) Dissertation: *Capturing the Impairment Profile of Sluggish Cognitive Tempo Symptoms* Advisor: Lawrence J. Lewandowski, Ph.D.
2014 – 2015 (expected)	Doctoral Internship	The May Institute: Randolph, MA Applied Behavioral Services Track (APPIC and APA-accredited) Rotations: May Center School for Brain Injury and Related Disorders; May Center School for Autism and Developmental Disabilities
2010 - 2013	M.S.	Syracuse University: Syracuse, NY Department of Psychology M.S. in Psychology Thesis: *Impairment and Executive Functioning Associated with Symptoms of Sluggish Cognitive Tempo, ADHD, Anxiety, and Depression* Advisor: Lawrence J. Lewandowski, Ph.D.
2006 - 2010	B.A.	Cedarville University: Cedarville, OH Major: Psychology Magna Cum Laude

SCHOLARLY PUBLICATIONS

REFERRED JOURNAL ARTICLES

1. Kates, W.R., Russo, N., **Wood, W.,** Fremont, W.P., Faraone, S.V., & Antshel, K.A. (in press). Neurocognitive and Familial Moderators of Psychiatric Risk in Velo-cardio-facial (VCFS; 22q11.2 Deletion) Syndrome: A Longitudinal Study, *Psychological Medicine*.

2. **Wood, W.,** Lewandowski, L., Lovett, B., & Antshel, K. (in press). Impairment and executive functioning associated with sluggish cognitive tempo symptoms in emerging adulthood, *Journal of Attention Disorders.*

3. Lewandowski, L., **Wood, W.,** & Lambert, T. (in press). Private room as a test accommodation. *Assessment and Evaluation in Higher Education.*

4. Firmin, M., **Wood, W.,** Firmin, R., Wood, J. (2010). Self-admitted pretensions of Mac users on a predominantly PC university campus. *Educational Media International*. *47*, 1-17.

5. Firmin, M., Firmin, R., Wood, J., & **Wood, W**. (2010). Social Influences Related to College Students' Use of Macintosh Computers on an All-PC Campus. *Computers & Education, 55,* 1542–1551.

MANUSCRIPTS IN PREPARATION

1. **Wood, W.,** Lewandowski, L., Antshel, K., & Lovett, B. (2014). Time management skills and academic impairment associated with sluggish cognitive tempo symptoms. Manuscript in preparation.

REFERRED BOOK CHAPTERS

1. Lewandowski, L., **Wood, W.,** & Miller, L. (2015). Technological Applications for Individuals with Learning Disabilities and ADHD. In J. Luiselli & A. Fisher (Eds.), *Computer-Assisted and Web-Based Innovations in Psychology, Special Education, and Health.* Elsevier Publishing: Waltham, MA. Manuscript accepted for publication.

SCHOLARLY PRESENTATIONS

REFERRED PRESENTATIONS

1. **Wood, W.,** Lewandowski, L., & Potts, H. (2015, February). *Functional Impairment and School Mental Health: Beyond the symptom checklist.* Paper to be presented at the annual convention of the National Association of School Psychologists, Orlando, FL.

2. **Wood, W.** & Lewandowski, L. (2015, February). *Sluggish Cognitive Tempo: A primer for school psychologists.* Paper to be presented to the annual convention of the National Association of School Psychologists, Orlando, FL.

3. **Wood, W.,** Lewandowski, L., & Lovett, B. (2014, February). *Impairment and Executive Functioning Associated with Sluggish Cognitive Tempo.* Poster presented at the annual convention of the National Association of School Psychologists, Washington, D.C.

4. Kates, W.R., **Wood, W.,** Fremont, W.P., Faraone, S.V., Russo, N., & Antshel, K.A. (2013, June). *Moderators of Psychiatric Risk in Velo-cardio-facial Syndrome (VCFS): A Longitudinal Study.* Poster presented at the annual Velo-Cardio-Facial Syndrome Educational

Foundation Inc. International Scientific Educational Conference, Dublin, Ireland.

5. Eckert, T. L., Hier, B. O., Koenig, E. A., Alvis, A. V., Lambert, T. L., Sullivan, W. E., & **Wood, W**. (2013, February). *The contributions of reading skills to students' writing outcomes.* Poster presented at the annual convention of the National Association of School Psychologists, Seattle, WA.

6. **Wood, W.,** Lewandowski, L., & Lambert, T. (2011, February). *Separate Room Test Accommodations: A Comparison of Individual versus Group Test Taking.* Poster presented at the National Association for School Psychology 2012 Annual Convention. Philadelphia, PA.

7. Firmin, M., **Wood, W**., Firmin, R., & Wood, J. (2010, March). *The Mac image: Self-admitted pretensions of Mac users on a predominantly PC university campus.* Paper presented at the 26th Annual Conference of the National Social Science Association. Las Vegas, NV.

8. Fox, C. Becknell, McDonald, D., Sizemore, D., Steiner, H., Belden, A., Grigsby, M., **Wood, W.,** Firmin, R., & Everitt, J. (2009, October). *Comparing males and females on the effects of glucose and emotional arousal on memory.* Poster session at the 39th Annual Meeting of the Society for Neuroscience, Chicago, IL.

INVITED PRESENTATIONS

1. Silber, J. & **Wood, W**. (March, 2015). *Evidenced Based Treatments for Students with Traumatic Brain Injury.* Invited address for the Brain Injury Association of Massachusetts.

2. Griffin, K. & **Wood, W.** (October, 2011). *Cognitive Late Effects in Survivors of Childhood Cancer.* Invited address for the New York Association of School Psychologists.

GRANTS AWARDED

2012 **SUNY Upstate Clinical Support Grant**, Syracuse, NY
Grant Summary: Awarded a clinically based grant used for the purchase of training materials to assist caregivers of children with cancer and/or sickle cell to become educational advocates for their children. Total awarded: $1,000.

TEACHING EXPERIENCE

INSTRUCTOR

2013 – 2014 **PSY 445 – Behavior Disorders in Childhood**
Department of Psychology, Syracuse University: Syracuse, NY

Summers 2012, 2014 **PSY 335 – Child Development**
Department of Psychology, Syracuse University: Syracuse, NY

Summers **PSY 205 – Foundations of Human Behavior**

2013, 2014 Department of Psychology, Syracuse University: Syracuse, NY

2013 **SB 122 – Adolescent Psychology**
Department of Psychology, Cazenovia College: Cazenovia, NY

TEACHING ASSISTANT

2010 - 2011 **PSY 205 – Foundations of Human Behavior**
Department of Psychology, Syracuse University: Syracuse, NY

MENTORSHIP

Summers **Teaching Mentor**
2011 – 2013 Graduate Student Teaching Assistant Orientation Program
Syracuse University: Syracuse, NY

AWARDS AND HONORS

2010 – 2015 (expected) **Completion of the Future Professoriate Program**
Awarded Certificate in University Teaching
Syracuse University: Syracuse, NY

2014 **Ted Bernstein Award for Leadership in School Psychology**
New York State Association of School Psychologists: Albany, NY

2012 - 2014 **Graduate Travel Award – NASP Conference**
Syracuse University: Syracuse, NY

2010 - 2015 **Graduate Tuition Scholarship**
Syracuse University: Syracuse, NY

2009 **Stanley Ballard Award for Excellence in Psychology**
Cedarville University: Cedarville, OH

PROFESSIONAL AFFILIATIONS

Association for Behavior Analysis International

APA Division 16: School Psychology

APA Division 37: Society for Child and Family Policy and Practice

APA Division 53: Child and Adolescent Psychology

National Association for School Psychologists

New York State Association of School Psychologists

PROFESSIONAL SERVICE

2012 – Present	**Student Reviewer** Journal of Abnormal Child Psychology Journal of Attention Disorders
2012 – 2014	**Student Representative to the Faculty** Syracuse University School Psychology Program: Syracuse, NY
2011 – 2012 2013 – 2014	**School Psychology Representative** Psychology Action Committee at Syracuse University: Syracuse, NY
2012 – 2013	**Psychology Action Committee Co-President** Syracuse University: Syracuse, NY
2010 – 2011	**Psychology Action Committee Secretary** Syracuse University: Syracuse, NY
2010 – 2013	**School Psychology Graduate Admissions Co-Coordinator** Syracuse University: Syracuse, NY