

**Do Symptoms of Sluggish Cognitive Tempo Independently Predict Social Functioning or Risky Behavior in a College Student Sample?**

by

Claire Louise Kirk

A dissertation submitted to the Graduate Faculty of  
Auburn University  
in partial fulfillment of the  
requirements for the Degree of  
Doctor of Philosophy

Auburn, Alabama  
August 4, 2018

Copyright 2018 by Claire Louise Kirk

Approved by

Steven Shapiro, Chair, Associate Professor of Psychology  
Christopher Correia, Professor of Psychology  
Christine Totura, Assistant Professor of Psychology  
Sacha Pence, Assistant Professor of Psychology

## Abstract

As evidence for the discriminant validity of SCT continues to emerge, researchers must further examine the ways in which SCT affects functioning in order to eventually tailor treatments to this population. The current study examined whether SCT symptoms in college students are predictive of social functioning and risky behavior, particularly alcohol and cannabis use, risky sex, and unsafe driving, above and beyond those of commonly comorbid disorders, including symptoms of ADHD, depression, and anxiety. An online survey was administered to a sample of college students attending a Southeastern university. Hierarchical multiple regression analyses were completed, in which, along with demographic variables, SCT and other symptoms of psychopathology (i.e., ADHD-Inattention, ADHD-Hyperactive/Impulsive, anxiety, and depression) were entered as independent variables, predicting each measure of impairment (i.e., social functioning and risky behavior). Results indicated that, at a modest level, SCT independently predicted specific aspects of social impairment among college students, including the ability to initiate relationships, and the ability to assert influence over others (e.g., express displeasure toward others' actions and say "no" when asked to do something that causes discomfort). Regression results also indicated that SCT did not independently predict risky behavior among college students, including substance use, risky sexual behavior, and risky

driving. Overall, the current study adds to the existing and growing body of literature suggesting that symptoms of SCT are predictive of social functioning across development.

## Acknowledgments

I would like to express sincere gratitude to Dr. Steven Shapiro for granting me the opportunity to earn a doctorate degree from Auburn University. Thank you for taking a chance and selecting me to join your lab in 2013. This dissertation project would not have been possible without your dedication and guidance. I would also like to thank my committee members, Drs. Correia, Pence, and Totura for their support throughout my milestones. Thank you to past mentors at Mississippi State University, Drs. Kevin Armstrong and Jared Keeley, who helped initiate this journey. Thanks also to Nadi Nuhu, Steven Boomhower, and John Michael Falligant for being my confidants and greatest source of strength throughout graduate school. I will always appreciate your words of encouragement, loyalty, and camaraderie. Thank you to my patients, past and present (particularly those at Mt. Meigs), for reminding me of why I am earning this degree. Finally, I would like to express sincerest gratitude to my parents, William and Constance Kirk. Through your example, support, and love, you have helped me to accomplish my dream of becoming a clinical child psychologist. Onward and upward!

## Table of Contents

Abstract.....	ii
Acknowledgments.....	iv
List of Tables .....	vii
Introduction .....	1
SCT Comorbidities and Distinctions .....	3
Psychosocial Functioning .....	5
The Proposed Study .....	13
Method .....	15
Participants and Procedure .....	15
Measures .....	15
Data Analytic Screening .....	21
Results .....	23
Correlational Analyses .....	23
Regression Analyses .....	29
Discussion .....	40
Interpersonal Competence .....	40
Driving .....	43
Alcohol and Cannabis Use.....	45
Risky Sexual Behavior.....	46

Limitations .....	48
Implications/Future Directions .....	49
References .....	51

## List of Tables

Table 1 .....	16
Table 2 .....	25
Table 3 .....	26
Table 4 .....	27
Table 5 .....	28
Table 6 .....	34
Table 7 .....	35
Table 8 .....	36
Table 9 .....	37
Table 10 .....	38
Table 11 .....	39

## Introduction

Sluggish Cognitive Tempo (SCT) has received increased interest and attention from researchers over recent years, with progressively more data indicating the internal validity and external validity of the construct (see Becker et al., 2016). Improved understanding of SCT has solidified the importance of continuing to study this construct, as symptoms have been shown to cause distress and impaired functioning across numerous domains, from childhood through adulthood (Becker et al., 2016). As evidence for the discriminant validity of SCT continues to emerge, researchers must further examine the ways in which SCT affects functioning in order to eventually tailor treatments to this population.

SCT was excluded from the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013)* due to remaining questions regarding the diagnostic validity of the construct, particularly as it relates to an agreed upon set of symptoms, whether SCT is empirically distinct from dimensions of Attention-Deficit/Hyperactivity Disorder (ADHD) and other psychological disorders, and the degree to which SCT is uniquely associated with functional impairment (Becker, Marshall, & McBurnett, 2014). Although an inclusive set of symptoms has yet to be universally accepted (Becker et al, 2016), indicators of SCT are most commonly characterized by symptoms of: mental fogginess, daydreaming, staring blankly, mental confusion, drowsiness/sleepiness, lethargy, sluggishness/slow moving, and apathy (Barkley, 2012; Garner, Marceaux, Mrug, Patterson, & Hodgens, 2010; Penny, Waschbusch, Klein, Corkum, & Eskes, 2009). Reflecting the aggregation of theoretical considerations and research findings, for example, nine SCT items included on the Barkley Adult ADHD Rating Scale-IV (BAARS-IV; Barkley, 2011a) have consistently been found to form a separate factor from DSM symptoms of ADHD in both child and adult, as well



as clinical and non-clinical samples (Barkley, 2011; Barkley, 2012; Becker, Langberg, Luebke, Dvorsky, & Flannery, 2014). Further, several factor analytic studies using adult and college student samples have found SCT to load onto one factor, providing evidence for a one-dimensional conceptualization of SCT (Barkley, 2012; Becker et al., 2014; Leopold, Bryan, Pennington, & Willcutt, 2015).

Although knowledge about SCT has greatly increased in recent years, there are many questions left unanswered, pertaining to both the construct's internal and external validity. Further, much less is known about SCT and adult populations, as most of the research has focused on children and adolescents. Even fewer studies have focused on the college student population—a demographic for which SCT symptoms might be uniquely relevant. For example, Becker et al. (2014) found that SCT is consistently associated with lower academic functioning and internalizing symptoms in college students with and without ADHD. College success is a significant predictor of outcomes in adulthood, highlighting the critical need for studying SCT in this population (Becker et al., 2014). Additionally, some studies have found that SCT may be particularly prevalent in the college student population, with elevated symptoms of SCT found in 12-14% of college student samples (e.g., Wood, Lewandowski, Lovett, & Antshel, 2017). Data on college students with SCT, despite being a typically higher-functioning population, could provide a better understanding of the developmental nature of the construct.

The purpose of the proposed study is to expand upon existing clinical and developmental literature by examining the relationship between SCT symptoms and psychosocial functioning in college students, namely, social functioning and risky behavior. The association between SCT and behaviors that might lead to functional impairment were studied while accounting for commonly comorbid symptoms, such as those of ADHD, anxiety, and depression. Rather than

relying on global measures of functioning, measures were used to assess specific domains of social functioning and risky behavior, in order to gain a better understanding of the particular domains in which these students are impaired.

Furthermore, one notable weakness of the current SCT literature is the consistent use of ADHD samples, which creates an automatic confound between the SCT and ADHD symptom sets. Using only ADHD participants to study SCT makes it difficult to identify distinctive features potentially associated with SCT, and causes the construct to look like simply a subtype of ADHD (Barkley, 2012). Therefore, the current study employed a more general, non-ADHD-specific sample in order to distinguish SCT from ADHD and common comorbidities.

### **SCT Comorbidities and Distinctions**

Several studies have examined the distinction of SCT from symptoms of other forms of psychopathology, contributing to knowledge on the construct's internal validity. SCT is often comorbid with the predominately inattentive presentation of ADHD (ADHD-PI), with an estimated prevalence rate of 30-63% (Garner et al., 2010). Studies show that SCT symptoms are significantly less correlated with ADHD symptoms than the two ADHD symptom dimensions are with each other (Barkley, 2012, 2013; Burns, Servera, Bernad, Carrillo, & Cardo, 2013; Jacobson et al., 2012; Penny et al., 2009).

Additional distinctions between ADHD and SCT have been identified, such as differences in demographic, neuropsychological, comorbidity, and impairment characteristics. Specifically, studies suggest that SCT may have a later age of onset than ADHD, and that females are more likely than males to exhibit SCT symptoms (Barkley, 2012). Studies of executive functioning (EF) indicate that EF is not as widely or severely affected in individuals with SCT as those with ADHD (Bauermeister, Barkley, Bauermeister, Martinez, & McBurnett,

2012; Wahlstedt & Bohlin, 2010). Additionally, SCT symptoms are more highly correlated with internalizing symptoms than are ADHD symptoms, with a positive relationship to anxiety and depression (Becker & Langberg, 2013; Becker, Luebke, Fite, Stoppelbein, & Greening, 2014; Penny et al., 2009). Further, a negative correlation has been found between SCT and symptoms of Oppositional Defiant Disorder (ODD), which often co-occurs with ADHD (Barkley, 2013; Burns et al., 2013; Lee, Burns, Snell, & McBurnett, 2014).

Importantly, studies suggest that when comorbid, SCT and ADHD have an additive effect, thereby resulting in significantly more impairment than either construct alone (Barkley, 2012; Barkley, Murphy, & Fischer, 2008; Jarrett, Rapport, Rondon, & Becker, 2017; Wood et al., 2017). Researchers purport that, while moderately correlated, ADHD and SCT are as distinct as other psychological disorders, such as anxiety and depression (Barkley, 2015). However, as previously mentioned, the majority of SCT research has employed a primarily ADHD sample to glean information on SCT, which confounds the two symptom sets, making it difficult to examine characteristics unique to SCT.

SCT symptoms are also significantly associated with internalizing symptoms, particularly anxiety and depression (Becker & Langberg, 2013; Becker et al., 2014; Penny et al., 2009). Factor analytic studies indicate that SCT and internalizing symptoms are statistically distinct, despite being related. Becker and colleagues (2013) found SCT to be a robust predictor of anxious and depressive symptoms across two college student samples—one with rigorously diagnosed ADHD, and the other, a general college student sample. Results suggested that SCT symptoms are strongly associated with internalizing symptoms in college students with and without ADHD, reiterating the significance of SCT for mental health outcomes (Becker et al., 2013).

Overall, additional research is necessary, particularly with non-ADHD samples, to determine whether SCT is indeed a distinct disorder, or simply a correlate that cuts across numerous psychological disorders, similar to emotion dysregulation (Becker et al., 2016). Therefore, when studying SCT, it is critical to consider whether the construct is associated with impairment even after other symptoms of psychopathology are controlled, specifically ADHD, anxiety, and depression.

### **Psychosocial Functioning**

Critical questions also remain about SCT and its relation to functional impairment. Current literature indicates that SCT impairs different facets of daily functioning across age groups, with the majority of research focusing on children and adolescents. These latter studies suggest that SCT negatively affects written language, reading, organization, homework completion, and peer relations beyond the contribution of ADHD (Barkley, 2014; Langberg, Becker, & Dvorsky, 2014; Marshall, Evans, Eiraldi, Becker, & Power, 2014; Mikami, Huang-Pollock, Pfiffner, McBurnett, & Hangai, 2007; Willcutt et al., 2014).

Mirroring the ADHD literature, attention has slowly turned to adults with SCT, revealing pertinent impairment for these individuals as well. Barkley (2012) published the inaugural study on SCT in adults, with results documenting impairment across numerous domains, including friendships, romantic relationships, home life and parenting, occupational functioning, management of finances, and health maintenance. Results of Barkley's (2012) study also suggested that adults with SCT tend to obtain significantly less education and have a lower yearly household income than adults with ADHD and controls. Additionally, adults with SCT expressed significantly more deficits in the EF domains of self-organization, problem solving, self-discipline, and self-regulation of emotions, as well as greater occupational and educational

impairment (Barkley, 2012). This study was a catalyst for additional work on adults with SCT. SCT literature has recently expanded to college students, with studies focusing on SCT and sleep, academic problems, internalizing symptoms, executive functioning, and social functioning (Becker, Luebbe, & Langberg, 2014; Becker et al., 2013; Flannery, Becker, & Luebbe, 2016; Flannery, Luebbe, & Becker, 2017; Jarrett et al., 2017; Langberg et al., 2014; Wood et al., 2017).

In a recent study, Flannery et al. (2017) used the Barkley Functional Impairment Scale (BFIS; Barkley, 2011) to measure specific areas of self-reported functional impairment in college students with SCT while controlling for symptoms of ADHD, depression, and anxiety. Study results indicated that SCT was significantly positively associated with functional impairment in several domains, including chores, managing money, work, educational activities, social situations with strangers, social situations with friends, and community activities. Researchers also demonstrated that SCT was a significant predictor of overall functional impairment and executive functioning deficits. Of note, SCT was not significantly correlated with the BFIS domains of romantic relationships and sexual activities or driving.

Using similar methods, Wood et al. (2017) found that SCT symptoms are common among college students and account for more variance in functional impairment and executive functioning deficits than ADHD, anxiety, and depression. Results of the abovementioned studies indicate the need for more in-depth approaches to examining psychosocial functioning in college students with SCT, which the current study aims to accomplish.

**Social functioning.** One of the more robust findings in the child SCT literature is the impairment of social functioning. Numerous studies reflect an association between SCT in children/adolescents and social dysfunction, particularly related to withdrawal, isolation, low initiative in social situations, peer neglect, and social anxiety (Becker, 2014; Becker & Langberg,

2013; Becker et al., 2014; Mikami et al., 2007; Rondon, Hilton, Jarrett, & Ollendick, 2018; Severa, Bernad, Carillo, Collado, & Burns 2015; Willcutt et al., 2014). It is perhaps no surprise that SCT is associated with social dysfunction, as the symptom set lends itself to difficulty interacting with others. For instance, studies have found that the daydreamy, sluggish, slow, lethargic, and confused behaviors associated with SCT are responsible for the social withdrawal and peer neglect that is characteristic of this population (Becker, 2014; Becker, Garner, Tamm, Antonini, & Epstein, 2017).

However, it is not clear if the social impairment associated with SCT is expressed similarly throughout development, or if social impairment even persists through adulthood for these individuals. Results from a preliminary study by Becker et al. (2017) indicate that social functioning indeed continues to be negatively affected in adults with SCT. For instance, the study found that SCT was strongly correlated with poorer socioemotional adjustment, including loneliness and low self-esteem. There is currently a dearth of literature on social functioning in college students with SCT, although social functioning may be critical for college student success and retention. For instance, in a large-scale study across 48 institutions, Robbins, Allen, Casillas, Peterson, and Le (2006) found social connection to be predictive of retention at four-year universities. In addition, Turner (2016) discovered that social engagement was viewed by 94% of college students surveyed as essential to connecting and integrating freshman students into the college community. Further, feelings of rejection and not fitting in are closely related to student attrition (Heisserer & Parette, 2002).

The United States has a high college attrition rate, with 30% of college students leaving after their first year (Schneider, 2010). Importantly, 4.7% of students leave their university each year due to mental illness, citing social isolation as one of several influences in their decision

(O’Keeffe, 2013). Perhaps additional knowledge regarding how SCT affects social functioning in college students, could aid in identifying those students, and providing them with the services they need to succeed across numerous domains.

Flannery and colleagues (2016) explored the association between social functioning and SCT in college students, while controlling for ADHD and internalizing symptoms. The authors demonstrated that SCT is indeed uniquely associated with social functioning above and beyond commonly comorbid symptoms, albeit with mixed results. Specifically, SCT was found to be related to social impairment as measured by items pertaining to social interactions from the Barkley Functional Impairment Scale (BFIS; Barkley, 2011b), but was unrelated to the Interpersonal Relations scale of the Behavior Assessment System for Children 2<sup>nd</sup> edition, Self-Report of Personality-College Version (BASC-2-SRP-CV; Reynolds & Kamphaus, 2004) in the regression analyses. These opposing results are most likely the effect of differences in what the two scales measure.

For instance, the social interaction items on the BFIS measure perceived difficulties in social interactions with friends, acquaintances, and strangers, whereas the BASC Interpersonal Relations scale assesses broader perceptions of social worth. Therefore it is unclear whether SCT is predictive of social impairment in college students. However, results indicated a significant indirect effect from SCT to social impairment via greater difficulties in regulating emotions. In other words, young adults with SCT may experience difficulty regulating negative emotions, leading to feelings of low social worth and relationship problems (Flannery et al., 2016).

The proposed study approached the question of social functioning by more specifically defining and measuring this construct, in turn, providing more detailed information regarding dimensions of social functioning of college students with SCT symptoms, while controlling for

commonly co-occurring symptoms. Specifically, interpersonal competence was assessed, which is a multifaceted construct generally defined as the ability to interact successfully with others (Giromini et al., 2016). Interpersonal competence is critical to numerous areas of life, such as romantic relationships (Frisbie, Fitzpatrick, Feng, & Crawford, 2000), professional success (Riggio & Taylor, 2000), and self-esteem (Buhrmester, Furman, Wittenberg, & Reis, 1988). Further, impaired social competence is associated with vulnerability to stress and negative life events (Cummings et al., 2013), loneliness (Ditommaso, Brannen-McNulty, Ross, & Burgess, 2003), and psychopathology (Skodol et al., 2005).

Altogether, social competence is the extent to which an individual shows social and emotional intelligence, in addition to specific behavioral or social skills in a variety of contexts (Buhrmester et al., 1988). Because different social situations require different interpersonal skills, it is important to assess an individual's interpersonal competence across multiple domains (Buhrmester et al., 1988). For this reason, consistent with the approach taken for this study, Buhrmester and colleagues (1988) suggested measuring separate facets of interpersonal competence, including the initiation of relationships, negative assertion, disclosure of personal information, emotional support, and conflict management.

**Risky behavior.** College has long been considered a time during which individuals are particularly susceptible to risky behavior. In fact, college years are associated with the highest rates of illicit drug use (Substance Abuse Mental Health Services Administration [SAMHSA], 2013), binge drinking (SAMHSA, 2013), drunk or drugged driving (National Highway Traffic Safety Administration, 2009), and casual or “hookup” sex (Bogle, 2008) in an individual's lifetime. These risky behaviors seem to be interconnected, with higher rates of substance abuse (e.g., alcohol and cannabis) associated with increased risky sexual behavior (e.g., unprotected or



unplanned sex) and risky driving (e.g., speeding) among college students (Kiene, Barta, Tennen, & Armeli, 2009).

Wechsler, Lee, Kuo, and Lee (2000) found that heavy drinking was endorsed by 40% of college students surveyed, reportedly often leading to negative consequences. In a survey of college freshmen, 22% reported engaging in sexual situations they later regretted while under the influence of alcohol, and 14% endorsed driving while intoxicated (Read, Wood, Kahler, Maddock, & Palfai, 2003). Cannabis use is also widespread among college students, with rates ranging from 13 – 49%, depending on the time frame of use (Johnston, O’Malley, Bachman, & Schulenberg, 2009; Ford & Arrastia, 2008).

Additionally, risky behavior independent of substance use is observed in the college student population, including higher rates of risky driving behaviors (Boyce & Gellar, 2002; Graziano et al., 2015) and risky sexual behavior. In one study, only 38% of sexually active college students reported the use of condoms, putting the majority at increased risk for sexually transmitted infections and unplanned pregnancies (McGuinness & Ahern, 2009). Further, the American College Health Association (2013) found that 31% of college students surveyed reported not using condoms, and 12% of college students reported using no birth control the last time they had sex.

Increased autonomy and opportunity for risk-taking likely contribute to the risky behavior often seen in the college student population (Bjork, Smith, Danube, & Hommer, 2007). Potential consequences of these risk-taking behaviors are significant, and can include personal injury, unplanned pregnancy, sexually transmitted infections, legal problems, educational difficulties, and/or suicide and death (Jackson, Sher, & Park, 2005; Moore et al., 2017).

Altogether, college students' engagement in risky behavior is a significant public health problem (Wechsler et al., 2002), and therefore important to further explore contributing factors.

It is well established that college students with ADHD have a propensity for engaging in risky behavior, including alcohol and drug misuse, unhealthy sexual behavior, and reckless driving (Baker, Prevatt, & Proctor, 2012; Barkley, Murphy, DuPaul & Bush, 2002; Marsh, Norvilitis, Ingersoll, & Li, 2015; Rooney, Chronis-Tuscano, & Yoon, 2012). An estimated 2-8% of college students report clinically significant levels of ADHD symptoms, depending on the demographics of the sample as well as criteria used to establish clinical significance (DuPaul et al., 2001; Pope et al., 2007). Further, approximately 25% of students receiving disability services on college campuses are registered as having ADHD (Wolf, 2001; Wolf, Simkowitz, & Carlson, 2009). The high comorbidity rate between ADHD and SCT compels researchers to investigate whether college students with SCT symptoms display similar risky behavior (e.g., reckless driving, drug and alcohol abuse, unsafe sex), independent from symptoms of other psychological disorders.

Internalizing symptoms that commonly occur with SCT symptoms have also been linked to risky behavior, as both anxiety and depression have been associated with increased substance use (Schwinn, Schinke, & Trent, 2010). Interestingly, individuals with cannabis dependence are over five times more likely to have an anxiety disorder (Stinson, Ruan, Pickering, & Grant, 2006), and 73.1% of cannabis-dependent adults meet criteria for an anxiety disorder (Agosti, Nunes, & Levin, 2002). Specifically, Social Anxiety Disorder (SAD) is robustly related to alcohol abuse and dependence, as well as cannabis dependence (Agosti et al., 2002; Buckner et al., 2008; Buckner et al., 2012; Grant et al., 2005; Lopez-Quintero et al., 2011). Further, 48% of individuals with a lifetime diagnosis of SAD also meet criteria for a lifetime diagnosis of an

alcohol use disorder (AUD; Grant et al., 2005). SAD is also prospectively related to the onset of cannabis dependence, and social anxiety tends to be related to more and/or more severe cannabis-related problems for these individuals (Buckner et al., 2008). Of note, cannabis use is related to anxiety above and beyond other variables, such as gender, race, and other co-occurring psychological disorders (Buckner et al., 2008).

Researchers purport that individuals with SAD use substances with anxiolytic properties (e.g., alcohol and cannabis) to cope with their anxious symptoms. Further, these individuals may come to believe that they need anxiolytics to cope with negative affective states related to social anxiety. Consequently, they become less likely to engage in adaptive coping strategies, and become more dependent on substances for emotion regulation. The use of alcohol or cannabis to cope with anxiety increases these individuals' vulnerability to substance-related problems, including dependency (Buckner et al., 2008).

Elevated levels of substance use have been linked to risky sex and risky driving, perhaps placing college students with SCT symptoms at higher risk for engaging in these behaviors. Additionally, SCT symptoms alone indicate the potential for unsafe, risky driving, such as trouble staying awake/alert, being easily confused, feeling spacy/in a fog, often feeling tired, and slowly or inaccurately processing information. These symptoms and the potential for accidents and injuries to themselves and others makes risky driving an important variable to assess in relation to SCT.

SCT symptoms alone may also increase students' risk for unsafe sexual behavior, such as feeling spacy/in a fog, slowly or inaccurately processing information, and being easily confused. These symptoms could be precursors to engaging in risky sexual behavior, due to lack of alertness and forethought in the sexual situation at hand, particularly after ingesting alcohol,

cannabis, or other psychoactive substances. Casual sex among college students frequently occurs, as “hook-ups” are regarded as normal sexual practice among students (Grello, Welsh, & Harper, 2006).

College students are susceptible to engaging in particular risky sexual behaviors, including using drugs or alcohol prior to or during sexual activity, not engaging in safe sex communication, having sex with multiple partners, and inconsistently using condoms during vaginal and anal intercourse (Gullette & Lyons, 2006). Threats posed by these risky behaviors include damage to romantic relationships, family conflicts, damage to social reputations, health problems, and legal disputes. Importantly, risky sexual behavior can lead to unintended pregnancies and sexually transmitted infections (STIs; Turchik & Garske, 2009). Altogether, the current study aims to determine whether SCT symptoms alone are predictive of substance use, and/or potential negative consequences of that use, particularly related to alcohol and cannabis, as well as risky sex and risky driving.

### **The Proposed Study**

In sum, there is still much to learn regarding the psychosocial functioning associated with SCT, despite an increase in knowledge on the topic over recent years. Further, there is a dearth of literature focusing on SCT in adults, particularly college students—a population that is vulnerable to risky behavior and for which social functioning is important. Research on SCT and psychosocial functioning in college students could aid in filling the gap between the adolescent and adult SCT literature, as well as assist in the design of interventions for these students. The proposed study aims to increase understanding of the psychosocial functioning of college students with SCT symptoms, and help propel future studies on college students and adults with SCT.

The purpose of the proposed study is to examine whether SCT symptoms are predictive of social functioning and risky behavior, particularly alcohol and cannabis use, risky sex, and unsafe driving, above and beyond those of commonly comorbid disorders, including symptoms of ADHD, depression, and anxiety, in college students. An online survey comprising reliable, valid, and detailed measures was administered to a sample of college students attending Auburn University. Hierarchical multiple regression analyses were completed, in which, along with demographic variables, SCT and other symptoms of psychopathology (i.e., ADHD- Inattention, ADHD-Hyperactive/Impulsive, anxiety, and depression) were entered as independent variables, predicting each measure of impairment (i.e., social functioning and risky behavior).

Overall, the current study aims to:

- 1) Test whether SCT symptoms are independently predictive of college students' social functioning, as a way to better understand the particular aspects of social functioning that might be affected by these symptoms.

- 2) Test whether SCT symptoms are independently predictive of risky behavior among college students, including elevated alcohol and cannabis use, risky sex, and risky driving, in order to understand problems most often experienced by these students.

Based on existing literature, it is hypothesized that:

- 1) SCT symptoms will independently predict social impairment among college students, although *a priori* hypotheses will not be made regarding the aspects of social impairment seen in this population due to a dearth of literature on the subject.

- 2) SCT symptoms will independently predict elevated alcohol and cannabis use, risky sex, and risky driving among college students.

## Method

### Participants and Procedure

The current sample included 946 undergraduate students who participated in an Institutional Review Board (IRB)- approved study examining SCT symptoms, risky behavior, and social functioning. Participants were recruited from psychology and business courses offering extra credit for research participation at Auburn University via SONA-systems. Mean age of the participants was 19.66 years ( $SD= 1.26$ ; range= 18-24), 72.3 percent of the sample was female, and 90.2% identified as White.

After reading an Information Letter and providing informed consent, participants completed the study measures on a computer of their choice. All participants completed an online Qualtrics survey comprised of questions pertaining to demographic information, as well as measures of psychopathology, social functioning, and risky behavior. The study measures took approximately 25 minutes to complete.

### Measures

**Demographic factors.** Information about participants' age, sex, race/ethnicity, year in college, and marital status were obtained through self-report. The week in which participants submitted the survey, and whether they were a psychology or business student was documented to examine group differences among the dependent variables. Participants' demographic information is presented in Table 1.

**Table 1.** Demographic Characteristics.

Characteristic	Frequency (%)
Gender	
Male	262 (27.7)
Female	684 (72.3)
Race	
White	850 (89.9)
Non-White	92 (9.7)
Missing	4 (.4)
Relationship status	
Married/Living together	33 (3.5)
Single	912 (96.4)
Missing	1 (.1)
SONA student	
Yes	753 (79.6)
No	193 (20.4)
Week survey submitted	
1	54 (5.7)
2	199 (21.0)
3	225 (23.8)
4	159 (16.8)
5	144 (15.2)
6	107 (11.3)
7	58 (6.1)
Age	
18	158 (16.7)
19	337 (35.6)
20	229 (24.2)
21	142 (15.1)
22	59 (6.2)
23	13 (1.4)
24	8 (.8)
College Level	
Freshman	394 (41.6)
Sophomore	271 (28.6)
Junior	172 (18.2)
Senior	107 (11.3)
Missing	2 (.3)

**SCT and ADHD symptoms.** The Barkley Adult ADHD Rating Scale-IV (BAARS-IV; Barkley, 2011a) was used to assess symptoms of ADHD and SCT. The BAARS-IV is an adult self-report measure, and includes 18 items corresponding to *DSM-IV* (APA, 1994) ADHD criteria, along with nine SCT items. Participants responded to each item using a 4-point scale (1 = *not at all* to 4 = *very often*) based on how often each statement described their behavior over the past six months. The SCT items included on the BAARS-IV were selected from symptom sets used in previous studies of SCT in children (Garner et al., 2010; Penny et al., 2009), and form a separate factor from DSM symptoms of ADHD (Barkley, 2011a). A four-factor structure of the BAARS-IV was established in a nationally representative sample of adults (Barkley, 2011a), and replicated in a large college student sample (Becker et al., 2014). The subscales of the BAARS-IV have demonstrated satisfactory internal consistency and test-retest over a 2- to 3-week time period (Barkley, 2011a). In the present study,  $\alpha$ s = .85, .84, and .75 for the SCT, inattention, and hyperactivity-impulsivity scales, respectively.

**Depressive symptoms.** Participants' depressive symptoms were assessed using the eight-item Patient Health Questionnaire (PHQ-8; Kroenke et al., 2009). Respondents reported on a 4-point scale how often over the past two weeks they have been bothered by each PHQ-8 symptom (e.g., 0 = *not at all*, 1 = *several days*, 2 = *more than half the days*, 3 = *nearly every day*), yielding a dimensional score. As a shortened version of the PHQ-9 (Kroenke & Spitzer, 2002), the PHQ-8 consists of eight of the nine symptom criteria for depressive disorders on which the *DSM-IV* (APA, 1994) is based, omitting the criterion related to suicidal or self-injurious thoughts. The PHQ-8 is a reliable and valid, widely used diagnostic and severity measure for depressive disorders, as demonstrated by large clinical studies, as well as an epidemiological population-



based study (Kroenke et al., 2009; Kroenke, Spitzer, Williams, & Lowe, 2010). In the present study,  $\alpha = .87$ .

**Anxious symptoms.** The GAD-7 (Spitzer, Kroenke, Williams, & Lowe, 2006), which is based on *DSM-IV* (APA, 2004) criteria for anxiety disorders, was used to assess anxious symptoms. This measure inquires about frequency of symptoms over the past two weeks, using a four-point scale (e.g., 0 = *not at all* to 3 = *nearly every day*). The GAD-7 has good psychometric characteristics, and scores are not influenced by sex, age, or racial ethnicity (Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007; Spitzer et al., 2006). Factor analysis demonstrates a one-dimensional structure, and validity was established in a large, population-based study (Lowe et al., 2008). The GAD-7 has demonstrated good internal consistency ( $\alpha = .89$ ), is highly correlated with other well-established measures of anxiety, and has demonstrated good sensitivity and specificity as a screener for different forms of anxiety (Lowe et al., 2008; Spitzer et al., 2006). In the present study,  $\alpha = .92$ .

**Social functioning.** The Interpersonal Competence Questionnaire (ICQ; Buhrmester, Furman, Wittenberg, & Reis, 1988) was used to measure participants' social functioning. The ICQ is a 40-item measure that assesses five separate domains of social competence, including (a) initiation of relationships (e.g., "Introducing yourself to someone you might like to get to know or date"); (b) negative assertion (e.g., "Saying "no" when a date/acquaintance asks you to do something you don't want to do"); (c) disclosure of personal information (e.g., "Telling a close companion about the things that secretly make you feel anxious or afraid"); (d) emotional support (e.g., "Being a good and sensitive listener for a companion who is upset"); and (e) conflict management (e.g., "Being able to put begrudging (resentful) feelings aside when having a fight with a close companion"). Participants responded on a 5-point Likert-type scale ranging

from 1 (“I am poor at this; I’d feel so uncomfortable and unable to handle this situation, I’d avoid if possible”) to 5 (“I’m extremely good at this; I’d feel very comfortable and could handle this situation very well”).

The ICQ was developed and validated among college students, with exploratory and confirmatory factor analyses supporting the independence of the five dimensions. The ICQ demonstrates good internal consistency (subscale  $\alpha$ s from .77 to .86), test-retest reliability, and convergent/discriminant validity (Buhrmester et al., 1988; Eberhart & Hammen, 2006; Giromini et al., 2016; Herzberg et al., 1998). The ICQ is a widely accepted scale for identifying individuals with deficient social skills across multiple domains, and has been translated into numerous languages and used internationally (Coroiu et al., 2015; Cummings et al., 2013; Giromini et al., 2016; Gorska, 2011; Kanning, 2006; Schlegel, Grandjean, & Scherer, 2013; Yang & Brown, 2015). In the present study,  $\alpha$ s ranged from .85 to .91.

**Alcohol use.** The Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) was used to assess participants’ alcohol consumption, drinking behaviors, and alcohol-related problems. The AUDIT is a 10-item self-report screening tool developed by the World Health Organization (WHO) and has been validated across genders, in a wide range of racial/ethnic groups, and with college students (e.g., Daeppen, Yersin, Landry, Pecoud, & Decrey, 2000; DeMartini & Carey, 2012; Fleming, Barry, & Macdonald, 1991). Respondents are encouraged to respond to the survey questions in terms of standard drinks, and are given a chart demonstrating the number of standard drinks in different alcoholic beverages for reference. Responses to each AUDIT item are scored on a 4-point scale, producing a maximum possible score of 40 (Saunders et al., 1993). In the present study,  $\alpha = .79$ .

**Cannabis use.** The Cannabis Use Disorder Identification Test- Revised (CUDIT-R; Adamson et al., 2010) was used to assess the frequency and consequences of participants' cannabis use. Respondents answered questions related to their cannabis use over the past six months using a 5-point Likert-type scale, ranging from 0 (never) to 4 (4 or more times a week). The CUDIT-R is comprised of eight items capturing important features of consumption patterns, cannabis problems, dependence symptoms, and psychological features (Adamson et al., 2010). The CUDIT-R has superior psychometric properties as compared to other commonly used measures of cannabis use, with high sensitivity (91%) and specificity (90%; Adamson et al., 2009). This measure also discriminates well between different levels of cannabis use and cannabis use disorders (Adamson et al., 2009). In the present study,  $\alpha = .75$ .

**Risky sexual behavior.** Participants' risky sexual behavior was assessed using the Sexual Risk Survey (SRS; Turchik & Garske, 2009), which is a college student self-report measure. The SRS is comprised of 23 items inquiring about the frequency of participation in various sexual acts and scenarios. Respondents are asked to provide the number of times these situations have occurred over the past six months. The SRS items produce an overall risky sex scale, as well as six separate, but correlated subscales (e.g., sex risk taking with uncommitted partners, risky sex acts, impulsive sexual behavior, intent to engage in risky sexual behavior, and risky anal sex acts). The SRS has empirical support for its dimensional approach to risky sex behavior, and well-established reliability and validity for use with college students (Marcus, Fulton, & Turchik, 2011; Turchik & Garske, 2009). In the present study, although three of the five subscales demonstrated acceptable to excellent internal consistency (.70 to .90), two showed poor levels (intent to engage in risky sexual behavior = .58; risky anal sex acts = .36) and will

not be considered further in this study. These two subscales have two and three items, respectively, and generated a low base rate of responding.

**Risky driving behavior.** Risky driving was measured using the Driving Behavior Survey—Self-Report Form (DBS-SR; Barkley & Murphy, 2006). The DBS-SR inquires about the frequency of various safe driving behaviors, such as using turn signals, checking the “blind” spots before changing lanes, and driving at a rate that is within the posted speed limits. The DBS-SR is comprised of 26 items, and respondents answer on a 4-point scale from 1 (not at all or rarely) to 4 (very often). The scale has demonstrated good internal consistency ( $\alpha = .81$ ) and significantly correlates with adverse driving outcomes, such as speeding citations and crash frequency in young adults (Barkley, Murphy, DuPaul, & Bush, 2002). In the present study,  $\alpha = .87$ .

### **Data Analytic Strategy**

**Data screening.** Screening for careless and invalid survey responses was accomplished through strategies outlined by Meade and Craig (2012). First, five “bogus” items were inserted throughout the survey, to identify participants who were not carefully reading the items or randomly responding (e.g., “I have never taken a shower”). Second, an “honesty question” was included at the end of the survey, asking participants whether their responses were accurate (i.e., accurate throughout the first half, second half, or the entire survey). Respondents were notified that the way in which they answer this question would not affect their participation in the study, or class credit. A response time threshold was established (based on sample descriptive statistics), with very fast survey completion time assumed to be low quality in nature. However, surveys with fast response times were individually inspected before being omitted from analyses. Outliers ( $\pm 3$  SDs from the measure’s mean) were also excluded from the study. Lastly, if more

than 20% of a participant's data were missing, the responses were removed from data analyses, as the data were likely invalid (Peng, Harwell, Liou, & Ehman, 2006). Overall, approximately 12% of the original data were discarded based on the abovementioned data screening methods.

Multiple imputation, as outlined by Acock (2005) was used to address missing data. This strategy allowed for the pooling of existing parameter estimates in order to obtain an improved parameter estimate in place of missing values (Acock, 2005). All analyses were conducted using the *Statistical Package for the Social Sciences (SPSS), Version 23* (IBM Corp, 2014). The amount of missing values ranged from nearly 0% for many variables, to as high as 5% for two variables related to sexual behavior. Data were primarily missing due to item nonresponse. Analysis variables were included in multiple imputation under the assumption that values were missing at random (MAR; Schafer & Graham, 2002). Using the multiple imputation function in SPSS (IBM Corp, 2014), five imputed datasets were generated, based on Rubin's (1987) work, demonstrating that five imputations are typically sufficient. Analyses run on each dataset were pooled according to Rubin's (1987) rules. Imputed values compared reasonably to observed values, therefore, imputed results were used in the current study.

**Correlation analyses.** Correlations were examined to determine which independent variables (i.e., SCT, ADHD, anxiety, and depression) and demographic variables (i.e., sex, age, race, marital status, psychology vs. business student, week survey was submitted, college level) were associated with the dependent variables of interest (i.e., social functioning, risky behavior), and were thus retained for inclusion in the regression analyses. Specifically, independent variables included (1) scores produced by the BAARS-IV subscales (e.g., SCT, inattention, and hyperactivity/impulsivity); (2) the total GAD-7 score; and (3) the total PHQ-8 score. Dependent variables included (1) scores produced by all five of the ICQ subscales; (2) the total AUDIT

score; (3) the total CUDIT-R score; (4) scores from the three internally consistent SRS scales; and (5) the overall score on the DBS-SR.

**Regression analyses.** Hierarchical regression analyses were conducted as outlined by Cohen, Cohen, West, and Aiken (2003) to examine whether SCT symptoms were associated with difficulties in social functioning and risky behavior after controlling for ADHD, anxious, and depressive symptoms, as well as demographic variables. Separate analyses were conducted for social functioning and risky behavior, with dimensions of psychopathology (i.e., SCT, ADHD, anxiety, and depression) as independent variables, and measures of social functioning or risky behavior as dependent variables. To test for multicollinearity, variance inflation factors (VIF) and tolerance values were examined for each predictor in the models. VIF scores greater than 10 and tolerance values less than 0.1, indicated multicollinearity (Cohen et al., 2003).

## **Results**

### **Correlational Analyses**

The absolute values of skewness and kurtosis were below 2.0 for all study variables except for the uncommitted partner subscale of the SRS (kurtosis = 2.94), race (skewness = -2.71, kurtosis = 5.37), and marital status (skewness = 5.06, kurtosis = 23.68). Log transformation of the variables did not significantly change the results; therefore, the original variable data were used. Variable means, standard deviations, and ranges are displayed in Table 2. Correlations were examined to determine which independent variables were associated with the dependent variables of interest and therefore retained for inclusion in the regression analyses.

As displayed in Table 3, several psychopathology variables, including ADHD-PI, ADHD-HI, PHQ-8, GAD-7, and SCT, were significantly negatively associated with social functioning as measured by the ICQ subscales (i.e., initiating relationships, providing emotional

support, asserting influence, self-disclosure, and conflict resolution). These correlations ranged from  $-.07$  (between emotional support and GAD-7) to  $-.27$  (between initiating relationships and PHQ-8). ADHD-PI, ADHD-HI, PHQ-8, GAD-7, and SCT were therefore included in subsequent ICQ-related models.

As presented in Table 4, alcohol use, as measured by the AUDIT, was significantly positively associated with ADHD-PI, ADHD-HI, PHQ-8, GAD-7, and SCT. Significant correlations ranged from  $.17$  between the AUDIT and SCT, to  $.30$  between the AUDIT and PHQ-8. These variables were therefore retained for subsequent AUDIT-related analyses. Also displayed in Table 4, cannabis use, as measured by the CUDIT, was significantly positively associated with ADHD-PI ( $.15$ ) and GAD-7 ( $.16$ ). ADHD-PI and GAD-7 were therefore retained for subsequent CUDIT-related regression analyses. Driving behavior, as measured by the Driving Behavior Survey, was significantly negatively associated with ADHD-PI, ADHD-HI, PHQ-8, GAD-7, and SCT, and were therefore retained for subsequent driving behavior-related regression analyses. Correlations ranged between  $-.08$  (GAD-7) to  $-.25$  (ADHD-PI).

As evident in Table 5, risky sexual behavior subscales (i.e., uncommitted partner, risky sex acts, and impulsive behavior) were significantly positively associated with ADHD-PI, ADHD-HI, PHQ-8, and SCT, with correlations ranging from  $.07$  (risky sex acts with ADHD-PI) to  $.13$  (impulsive behavior with SCT). ADHD-PI, ADHD-HI, PHQ-8, and SCT were therefore included in subsequent SRS-related analyses.

**Table 2.** Descriptive Statistics for Independent and Dependent Variables

	<i>Mean</i>	<i>SD</i>	<i>Range</i>
ADHD1	14.77	4.08	9-31
ADHD2	14.98	3.87	9-30
PHQ-8	4.33	4.47	0-24
GAD-7	4.72	4.83	0-21
SCT	16.84	4.72	9-34
Uncomm	3.84	5.54	0-29
RiskyS	3.53	3.99	0-17
Impuls	3.30	3.84	0-19
AUDIT	6.77	5.11	0-27
CUDIT	5.73	4.99	0-24
Driving	92.34	9.11	45-109
IniRel	26.55	6.88	8-40
EmSup	31.01	5.14	13-40
Assert	28.12	5.52	9-40
Self Dis	24.50	6.69	8-40
Resol	27.38	5.27	9-40

*Note.* Race (0 = nonwhite; 1 = white). Gender (0 = male; 1 = female). SONA (0 = no; 1 = yes). Marital Status (0 = single; 1 = married or living together). Week = week survey was submitted; ADHD1 = Attention-Deficit/Hyperactivity Disorder, Predominately Inattentive Type; ADHD2 = Attention-Deficit/Hyperactivity Disorder, Hyperactive Impulsive Type; PHQ-8 = Patient Health Questionnaire-8; GAD-7 = Generalized Anxiety Disorder-7; SCT = Sluggish Cognitive Tempo; Uncomm = uncommitted partner; RiskyS = risky sex; Impuls = impulsive behavior; AUDIT = Alcohol Use Disorders Identification Test; CUDIT = Cannabis Use Disorder Identification Test; IniRel = initiating relationships; EmSup = providing emotional support; Assert = asserting influence; Self Dis = self-disclosure; Resol = conflict resolution.



**Table 3.** Pearson/Point-Biserial Correlations For Independent Variables and ICQ Scores.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Week	--															
2. Race	-.02	--														
3. Age	.13***	-.13***	--													
4. Gender	-.12***	.01	-.10**	--												
5. SONA	-.03	.63	-.13***	.30***	--											
6. R Stat	.03	-.05	.17***	-.02	.07*	--										
7. ADHD1	.11**	.01	.01	-.07*	-.05	.05	--									
8. ADHD2	.00	.10**	.00	.07*	.02	.05	.48***	--								
9. PHQ-8	-.21***	-.10**	-.03	.11**	-.03	.06	.42***	.30***	--							
10. GAD-7	-.19***	-.06	.01	.15***	-.00	.07*	.36***	.35***	.75***	--						
11. SCT	.09**	.03	-.05	.07*	-.02	.05	.65***	.47***	.53***	.48***	--					
12. IniRel	.09**	.01	-.02	.05	-.04	-.03	-.17***	.07*	-.27***	-.22***	-.20***	--				
13. EmSup	.04	.01	.02	.16***	.07*	-.01	-.19***	.03	-.14***	-.07*	-.14***	.58***	--			
14. Assert	.03	-.09**	.00	-.06	-.12***	-.01	-.21***	.03	-.22***	-.21***	-.24***	.56***	.41***	--		
15. SelfDis	.03	.03	-.06	.02	-.03	-.05	-.10**	.05	-.17***	-.16***	-.14***	.45***	.40***	.45***	--	
16. Resol	.07*	-.00	.04	-.04	-.03	-.00	-.18***	-.09**	-.23***	-.22***	-.20***	.47***	.59***	.37***	.36***	--

*Note.* Week = week survey was submitted; R Stat = relationship status; ADHD1 = Attention-Deficit/Hyperactivity Disorder, Predominately Inattentive Type; ADHD2 = Attention-Deficit/Hyperactivity Disorder, Hyperactive Impulsive Type; PHQ-8 = Patient Health Questionnaire-8; GAD-7 = Generalized Anxiety Disorder-7; SCT = Sluggish Cognitive Tempo; IniRel = initiating relationships; EmSup = providing emotional support; Assert = asserting influence; SelfDis = self-disclosure; Resol = conflict resolution.  
\*p < .05 \*\*p < .01 \*\*\*p < .001

**Table 4.** Pearson/Point-Biserial Correlations For Independent Variables and Driving Behavior/Substance Use.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Week	--													
2. Race	-.02	--												
3. Age	.13***	-.13***	--											
4. Gender	-.12***	.01	-.10**	--										
5. SONA	-.03	.63	-.13***	.30***	--									
6. R Stat	.03	-.05	.17***	-.02	.07*	--								
7. ADHD1	.11**	.01	.01	-.07*	-.05	.05	--							
8. ADHD2	.00	.10**	.00	.07*	.02	.05	.48***	--						
9. PHQ-8	-.21***	-.10**	-.03	.11**	-.03	.06	.42***	.30***	--					
10. GAD-7	-.19***	-.06	.01	.15***	-.00	.07*	.36***	.35***	.75***	--				
11. SCT	.09**	.03	-.05	.07*	-.02	.05	.65***	.47***	.53***	.48***	--			
12. AUDIT	-.19***	.11**	-.06	-.06	-.06	-.07	.21***	.22***	.30***	.26***	.17***	--		
13. CUDIT	-.07	-.07	.03	-.11	.01	.11	.15*	.10	.19	.16**	.01	.21***	--	
14. Driving	.02	.05	.02	.02	.00	-.02	-.25***	-.16***	-.17***	-.08**	-.19***	-.21***	-.26***	--

*Note.* Week = week survey was submitted; R Stat = relationship status; ADHD1 = Attention-Deficit/Hyperactivity Disorder, Predominately Inattentive Type; ADHD2 = Attention-Deficit/Hyperactivity Disorder, Hyperactive Impulsive Type; PHQ-8 = Patient Health Questionnaire-8; GAD-7 = Generalized Anxiety Disorder-7; SCT = Sluggish Cognitive Tempo; AUDIT = Alcohol Use Disorders Identification Test; CUDIT = Cannabis Use Disorder Identification Test

\*p < .05 \*\*p < .01 \*\*\*p < .001

**Table 5.** Pearson/Point-Biserial Correlations For Independent Variables and SRS Scores.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Week	--													
2. Race	-.02	--												
3. Age	.13***	-.13***	--											
4. Gender	-.12***	.01	-.10**	--										
5. SONA	-.03	.63	-.13***	.30***	--									
6. R Stat	.03	-.05	.17***	-.02	.07*	--								
7. ADHD1	.11**	.01	.01	-.07*	-.05	.05	--							
8. ADHD2	.00	.10**	.00	.07*	.02	.05	.48***	--						
9. PHQ-8	-.21***	-.10**	-.03	.11**	-.03	.06	.42***	.30***	--					
10. GAD-7	-.19***	-.06	.01	.15***	-.00	.07*	.36***	.35***	.75***	--				
11. SCT	.09**	.03	-.05	.07*	-.02	.05	.65***	.47***	.53***	.48***	--			
12. Uncomm	.02	-.03	-.03	-.02	-.02	-.00	.10**	.10**	.14***	.02	.11**	--		
13. RiskyS	.09**	-.01	.07*	-.01	.00	.15***	.07*	.06	.05	.01	.08*	.50***	--	
14. Impuls	.07*	.04	-.12***	-.06	-.08*	-.06	.13***	.14***	.08*	-.00	.13***	.70***	.37***	--

*Note.* Week = week survey was submitted; R Status = relationship status; ADHD1 = Attention-Deficit/Hyperactivity Disorder, Predominately Inattentive Type; ADHD2 = Attention-Deficit/Hyperactivity Disorder, Hyperactive Impulsive Type; PHQ-8 = Patient Health Questionnaire-8; GAD-7 = Generalized Anxiety Disorder-7; SCT = Sluggish Cognitive Tempo; Uncomm = uncommitted partner; RiskyS = risky sex acts; Impuls = impulsive behavior.

\*p < .05 \*\*p < .01 \*\*\*p < .001

## Regression Analyses

Next, hierarchical regression analyses were conducted to examine whether SCT symptoms were associated with difficulties in social functioning or increased risky behavior after controlling for demographic characteristics and symptoms of ADHD, anxiety, and depression. Regression assumptions were examined across analyses, including multicollinearity, normality, linearity, and homoscedasticity. For all regression analyses, VIF values were below 10, and tolerance values were above 0.1, indicating no problems with multicollinearity.

Concerns related to assumptions included the regressions in which SRS subscales, the AUDIT, and the CUDIT were outcome variables. These regression models did not meet assumptions of normality, linearity, or homoscedasticity. For these models, log transformations were performed, however, did not significantly change the results of the models. Therefore, the original data were used. Imputed data are presented in the hierarchical multiple regression tables below. Results of hierarchical multiple regression analyses are displayed in Tables 6, 8, and 10, with associated standardized beta coefficients presented in Tables 7, 9, and 11.

**Interpersonal Competence.** Results of hierarchical multiple regressions involving the ICQ subscales are listed in Table 6. Significance of the change in  $F$  (Table 6, first column) indicated that after entering the week in which the survey was submitted, both ADHD scales added additional unique variance to the prediction of initiating relationship. The internalizing scales were added in step 3, and also contributed significantly to the model, with only the PHQ-8 contributing unique variance (Table 7). Lastly, and most critical for the hypotheses, both the significance of change in  $F$  values (Table 6) and the standardized beta coefficients (Table 7) indicated that SCT contributed unique (albeit modest) variance to the measurement of the initiating relationships ICQ subscale. Examination of the standardized beta values (Table 7)

indicated that ADHD-HI had the most significant predictive power for initiating relationships with more HI symptoms predicting a higher level of relationship initiation. The other unique predictors showed a negative relationship to this subscale.

As found in the second column of Table 6, significance of the change in  $F$  indicated that after entering gender and whether the participant submitted their survey through SONA systems, ADHD-PI added additional unique variance to the prediction of providing emotional support in interpersonal relationships. The internalizing measures were added in step 3, and contributed significantly to the equation (Table 6), with only the PHQ-8 contributing unique variance (Table 7). Finally, in step 4, both the significance of change in  $F$  values (Table 6) and the standardized beta coefficients (Table 7) indicated that SCT did not contribute unique variance to providing emotional support as measured by the ICQ. Examination of the standardized beta values (Table 7) indicated that ADHD-PI had the most significant predictive power for providing emotional support, with fewer inattentive symptoms predicting a higher level of emotional support. The PHQ-8 also showed a negative relationship to this ICQ subscale, indicating that individuals with higher levels of depressive symptoms provide emotional support to others at lower rates than individuals with less depression.

As listed in the third column (asserting displeasure with others) of Table 6, significance of the change in  $F$  showed that after entering race and whether the participant submitted their survey through SONA systems, ADHD-PI added unique variance to the equation (Table 7). The internalizing scales were added in step 3 and contributed significantly to the model (Table 6), however, did not individually contribute unique variance (Table 7). Lastly, SCT was entered, with both the significance of change in  $F$  values (Table 6) and the standardized beta coefficients (Table 7) indicating that SCT contributed modest, yet unique variance to the measurement of the

asserting influence ICQ subscale. The standardized beta values (Table 7) indicated that ADHD-PI and SCT had the most significant predictive power for asserting influence, with both variables having negative relationships to the subscale. Specifically, higher levels of inattention and SCT seems associated with a lower self-reported ability to express displeasure toward others' actions, and say "no" when asked to do something that causes discomfort.

Regarding respondents' report of sharing personal and sensitive information to others, significance of the change in  $F$  (Table 6, fourth column) indicated that ADHD-PI significantly contributed to the model, however, the subscale did not add unique variance to the equation (Table 7). This was also the case for the internalizing scales and SCT. Examination of the standardized beta values (Table 7) showed that none of the included variables had significant predictive power for self-disclosure.

As displayed in the fifth column (managing interpersonal conflict) of Table 6, significance of the change in  $F$  indicated that after entering the week in which the survey was submitted, the ADHD subscales significantly contributed to the model, however, did not individually contribute unique variance to the equation (Table 7). The internalizing scales were added in step 3, and also significantly contributed to the model (Table 6), with only the GAD-7 adding unique variance (Table 7). Lastly, SCT was entered and did not significantly contribute to the measurement of the conflict resolution ICQ subscale, based on both the significance of change in  $F$  values (Table 6) and the standardized beta values (Table 7). Examination of the standardized beta coefficients (Table 7) indicated that the GAD-7 had the most (and only) significant predictive power for conflict resolution, which indicated that higher levels of anxiety predicted a lower ability to resolve interpersonal conflict.

**Driving.** Results of hierarchical multiple regressions involving risky driving are listed in Table 8. Significance of the change in  $F$  (first column) indicated that the ADHD scales significantly contributed to the model, with only ADHD-PI adding unique variance to the equation (Table 9). The internalizing scales (step 2) both added unique variance to the equation (Table 9). Lastly, SCT was added to the model, and was not shown to significantly contribute to the measurement of driving behavior (Table 8). Standardized beta values (Table 9) indicated that ADHD-PI and the PHQ-8 had the most significant predictive power for driving behavior, with higher inattentive and depressive symptoms indicating riskier driving. Higher levels of anxiety were associated with safer self-reported driving behavior.

**Alcohol and Cannabis Use.** Regarding alcohol use (second column of Tables 8 and 9), after entering race and week in which survey was submitted, significance of change in  $F$  values indicated that both of the ADHD subscales added unique variance to the equation. The internalizing scales also significantly contributed to the model (Table 8), with only the PHQ-8 contributing unique variance (Table 9). Lastly, SCT did not contribute significantly to the AUDIT scores. Examination of the beta values (Table 9) indicated that the PHQ-8 had the most significant predictive power for the AUDIT, with more depressive symptoms predicting a higher level of alcohol consumption. More inattentive and hyperactive-impulsive symptoms were also predictive of higher levels of alcohol use.

Also in Table 8 (column 3; cannabis use), significance of the change in  $F$  indicated that ADHD-PI contributed significantly to the model, although it did not add unique variance to the equation (Table 9). The GAD-7 was entered in step 2, and added unique variance to the CUDIT, with higher levels of anxiety predicting more cannabis usage (Table 9).

**Risky Sexual Behavior.** Results of hierarchical regression models involving risky sexual behavior are displayed in Table 10. As listed in column one (sex with uncommitted partners) of Table 10, both ADHD subscales contributed significantly to the model, although neither added unique variance to the equation (Table 11). The PHQ-8 added unique variance to the equation (Table 11). Lastly, SCT did not significantly contribute to the measurement of the uncommitted partners SRS subscale, based on both the significance of the change in  $F$  (Table 10) and the beta values (Table 11). Examination of the standardized beta coefficients (Table 11) indicated that the PHQ-8 had the most (and only) significant predictive power, suggesting that higher levels of depression is associated with a higher incidence of having sex with uncommitted partners. .

In the second column (engaging in risky sexual acts) of Table 10, it is shown that after adding marital status, week survey was submitted, and age, significance of the change in  $F$  indicated that ADHD-PI did not significantly contribute to the model. SCT was not shown to significantly contribute to the measurement of the risky sex acts, based on both the significance of the change in  $F$  values (Table 10) and examination of the standardized beta values (Table 11).

For engaging is impulsive sexual behaviors, significance of the change in  $F$  (Table 10, third column) indicated that after entering SONA, week survey was submitted, and age, both ADHD scales contributed significantly to the model. However, only ADHD-HI added unique variance to the equation (Table 11). The PHQ-8 did not significantly contribute to the model (Table 10). Lastly, SCT did not significantly contribute to the measurement of the impulsive sexual behaviors SRS subscale (Table 10). Examination of the beta values (Table 11) indicated that ADHD-HI alone uniquely predicts impulsive sexual behaviors, with more HI symptoms predicting higher levels of impulsive sexual behaviors.



**Table 6.** Hierarchical Multiple Regression Model Predicting Interpersonal Competence Questionnaire Scores From Demographic Variables and ADHD, Internalizing, and SCT Symptoms.

Predictor	Initiating Relationships	Providing Emotional Support	Asserting Influence	Self-Disclosure	Conflict Resolution
Demographic Variables	Week Submitted	SONA & Gender	SONA & Race	--	Week Submitted
$R^2$	.008	.027	.020	--	.005
$\Delta F$	7.19** -7.25**	13.18*** -13.22***	9.66*** -9.71***	--	4.93* -5.02*
$df(1,2)$	1,944	2,943	2,939	--	1,944
ADHD Scales	ADHD-PI & HI	ADHD-PI	ADHD-PI	ADHD-PI	ADHD-PI & HI
$R^2$	.073	.059	.068	.011	.039
$\Delta F$	33.12*** -33.43***	31.76*** -31.99***	48.29*** -48.33***	10.24** -10.34**	16.63*** -16.74***
$df(1,2)$	2,942	1,942	1,938	1,944	2,942
Internalizing Scales	GAD-7 & PHQ-8	GAD-7 & PHQ-8	GAD-7 & PHQ-8	GAD-7 & PHQ-8	GAD-7 & PHQ-8
$R^2$	.125	.068	.095	.032	.066
$\Delta F$	27.75*** -28.01***	4.19* -4.26*	13.67*** -13.73***	10.21*** -10.34***	13.29*** -13.40***
$df(1,2)$	2,940	2,940	2,936	2,942	2,940
SCT					
$R^2$	.134	.068	.101	.034	.069
$\Delta F$	9.02** -9.18**	.32 - .37	6.12* -6.18*	1.68 - 1.76	2.62 - 2.74
$df(1,2)$	1,939	1,939	1,935	1,941	1,939

*Note.* A range of results is reported for  $\Delta F$  because a single pooled result is not produced for these statistics by SPSS for imputed data. Dashes indicate that the predictors were not entered into the model, based on zero-order correlations.

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

**Table 7.** Standardized Beta Values for Variables in Full Hierarchical Regression Model Predicting Interpersonal Competence Questionnaire Scores From Demographic Variables and ADHD, Internalizing, and SCT Symptoms.

Predictor	Initiating Relationships	Providing Emotional Support	Asserting Influence	Self-Disclosure	Conflict Resolution
Week Submitted	.065*	--	--	--	.053
SONA	--	.015	-.123***	--	--
Gender	--	.158***	--	--	--
Race	--	--	-.101**	--	--
ADHD-PI	-.124**	-.127**	-.088*	-.004- .005	-.083
ADHD-HI	.270***	--	--	--	.041
GAD-7	-.066	.058	-.076	-.058	-.097*
PHQ-8	-.167** - .166**	-.128*	-.078	-.091	-.079
SCT	-.136**	-.028	-.110*	-.061	-.077

*Note.* A range of results is reported for standardized beta because a single pooled result is not produced for these statistics by SPSS for imputed data. Dashes indicate that the predictors were not entered into the model, based on zero-order correlations.

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

**Table 8.** Hierarchical Multiple Regression Model Predicting Driving Behavior and Substance Use Scores From Demographic Variables and ADHD, Internalizing, and SCT Symptoms.

Predictor	Driving Behavior Survey	AUDIT	CUDIT
Demographic Variables		Race & Week Submitted	
$R^2$	--	.048	--
$\Delta F'$	--	18.56***	--
$df(1,2)$	--	2,743	--
ADHD Scales		ADHD-PI & ADHD-HI	
$R^2$	.064	.110	.022
$\Delta F'$	31.08***-31.18***	25.78***-25.84***	6.50*-6.70*
$df(1,2)$	2,915	2,741	1,297
Internalizing Scales		GAD-7 & PHQ-8	
$R^2$	.079	.143	.035
$\Delta F'$	7.39**-7.46**	14.62***-14.71***	4.04*-4.09*
$df(1,2)$	2,913	2,739	1,296
SCT			
$R^2$	.079	.146	--
$\Delta F'$	.22-.30	1.83-1.96	--
$df(1,2)$	1,912	1,738	--

*Note.* ADHD = Attention-Deficit/Hyperactivity Disorder; ADHD-PI = Attention-Deficit/Hyperactivity Disorder, Predominately Inattentive presentation; ADHD-HI = Attention-Deficit/Hyperactivity Disorder, Hyperactive Impulsive presentation; SCT = Sluggish Cognitive Tempo; GAD-7 = Generalized Anxiety Disorder- 7; PHQ-8 = Patient Health Questionnaire- 8. A range of results is reported for F-change because a single pooled result is not produced for these statistics by SPSS for imputed data. Dashes indicate that the predictors were not entered into the model, based on results from zero-order correlations.

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

**Table 9.** Standardized Beta Values for Variables in Full Hierarchical Regression Model Predicting Driving Behavior and Substance Use Scores From Demographic Variables and ADHD, Internalizing, and SCT Symptoms.

Predictor	Driving Behavior Survey	AUDIT	CUDIT
Race	--	.112**	--
Week Submitted	--	-.139***	--
ADHD-PI	-.181***	.120*	.108
ADHD-HI	-.062	.093*	--
GAD-7	.157**	.048	.122*
PHQ-8	-.184***- .189***	.199***	--
SCT	-.022- -.026	-.066	--

*Note.* ADHD-PI = Attention-Deficit/Hyperactivity Disorder, Predominately Inattentive presentation; ADHD-HI = Attention-Deficit/Hyperactivity Disorder, Hyperactive Impulsive presentation; SCT = Sluggish Cognitive Tempo; GAD-7 = Generalized Anxiety Disorder- 7; PHQ-8 = Patient Health Questionnaire- 8. A range of results is reported for standardized beta because a single pooled result is not produced for these statistics by SPSS for imputed data. Dashes indicate that the predictors were not entered into the model, based on results from zero-order correlations.

\*p < .05 \*\*p < .01 \*\*\*p < .001

**Table 10.** Hierarchical Multiple Regression Model Predicting Sexual Risk Survey Scores From Demographic Variables and ADHD, Internalizing, and SCT Symptoms.

Predictor	Uncommitted Partners	Risky Sex Acts	Impulsive Sexual Behaviors
Demographic Variables	--	Marital Status, Week Submitted, & Age	SONA, Week Submitted, & Age
$R^2$	--	.034	.031
$\Delta F$	--	8.48***-11.12***	10***-10.23***
$df(1,2)$	--	3,941	3,942
ADHD Scales	ADHD-PI & HI	ADHD-PI	ADHD-PI & HI
$R^2$	.014	.038	.054
$\Delta F$	6.51**-6.74**	2.21-3.84	11.34***-11.88***
$df(1,2)$	2,943	1,940	2,940
Internalizing Scales	PHQ-8	--	PHQ-8
$R^2$	.024	--	.055
$\Delta F$	9.23**-9.67**	--	.6-.75
$df(1,2)$	1,942	--	1,939
SCT			
$R^2$	.024	.039	.055
$\Delta F$	.02-.03	.87-1.55	.06-.14
$df(1,2)$	1,941	1,939	1,938

*Note.* A range of results is reported for  $\Delta F$  because a single pooled result is not produced for these statistics by SPSS for imputed data. Dashes indicate that the predictors were not entered into the model, based on zero-order correlations.

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

**Table 11.** Standardized Beta Values for Variables in Full Hierarchical Regression Model Predicting Sexual Risk Survey Scores From Demographic Variables and ADHD, Internalizing, and SCT Symptoms.

Predictor	Uncommitted Partners	Risky Sex Acts	Impulsive Sexual Behaviors
Week Submitted	--	.064*-.079*	.081*-.085*
Marital Status	--	.127***-.147***	--
Age	--	.033-.046	-.143***--.146***
SONA	--	--	-.092**
ADHD-PI	.024	.015-.032	.046-.056
ADHD-HI	.053-.057	--	.098**
GAD-7	--	--	--
PHQ-8	.109**	--	.025
SCT	.006	.040-.053	.012-.018

*Note.* A range of results is reported for standardized beta because a single pooled result is not produced for these statistics by SPSS for imputed data. Dashes indicate that the predictors were not entered into the model, based on zero-order correlations.

\*p < .05 \*\*p < .01 \*\*\*p < .001

## **Discussion**

The current study examined SCT's unique contribution to college students' impairment in social functioning and engagement in risky behavior, while controlling for frequently co-occurring ADHD and internalizing symptoms. Results of hierarchical multiple regression analyses indicated that, as hypothesized, SCT independently predicted social impairment among college students. However, the data demonstrated that only specific aspects of social functioning were predicted by SCT symptoms, including the ability to initiate relationships and the ability to assert influence over others, and that the incremental predictive power was modest at best. It was also hypothesized that SCT would independently predict elevated alcohol and cannabis use, risky sex, and risky driving among college students. Regression results, however, indicated that SCT did not independently predict these risky behaviors. Instead, the ADHD and internalizing scales most frequently predicted the abovementioned high-risk behaviors among college students.

### **Interpersonal Competence**

Results of the current study related to interpersonal competence are congruent with and further expand upon existing studies of SCT and social functioning across development. Specific to college students, Flannery and colleagues (2017) indicated that SCT independently impaired participants' ability to interact in social situations with both strangers and friends. In the present study, domains significantly affected by SCT were the ability to initiate relationships and the ability to assert influence over others (e.g., express displeasure toward others' actions and say "no" when asked to do something that causes discomfort). Results from Flannery et al. (2017) and the current study seem to complement one another, as difficulty in initiating relationships could lead to a decreased ability to interact with strangers. Additionally, difficulty in asserting

influence might affect one's ability to skillfully interact with friends and maintain healthy friendships. Given the importance of social functioning to college student success (O'Keeffe, 2013; Turner, 2016), it is critical that students have access to services on campus that address social skill deficits in these domains.

Social difficulty seems to begin early in life for individuals with SCT. Becker and colleagues (2017) found that SCT symptoms were differentially associated with greater withdrawal and lower social engagement (e.g., starting conversations, joining activities) in children, as rated by parents and teachers. Children with SCT were also reported as being more frequently excluded by peers. Further, Marshall et al. (2014) discovered that children with high SCT symptoms exhibited more social withdrawal and less peer-directed aggression than those with primarily ADHD symptoms, while controlling for internalizing symptoms.

Given the abovementioned research related to social functioning in children with SCT, the domains of social functioning affected by SCT in the current study (e.g., asserting influence, initiating relationships) make sense. Difficulty initiating relationships, in particular, seems to be closely related to social withdrawal and lower social engagement. SCT was not predictive of impairment in other domains of social functioning, including providing emotional support, self-disclosure, and conflict resolution. It would be interesting to know if individuals with SCT are able to function well in these areas overall, or only with individuals to whom they are close, such as family members or significant others. Perhaps individuals with SCT have difficulty initiating relationships, however, once they feel comfortable with someone, are able to provide emotional support, self-disclose personal information, and resolve conflict more readily.

It should be noted that the amount of variance in social functioning explained by SCT was relatively small, owing in large part to the association between ADHD-PI, ADHD-HI, and



depression in relation to initiating relationships, and ADHD-PI in relation to asserting influence. ADHD-PI and depression were also found to be predictive of difficulty providing emotional support, while symptoms of anxiety predicted difficulty in conflict resolution. The significant and unique relation found between ADHD and these particular domains of social functioning is not surprising, given previous research. For example, college students with ADHD have been found to struggle with a variety of social challenges at a higher rate than the general college population, including low relationship satisfaction with peers and family (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005). Low relationship satisfaction could be a product of impairment in social functioning across several domains.

Additionally, college students with ADHD tend to score lower on measures of social adjustment, self-esteem, and overall social skills (Shaw-Zirt et al., 2005). Lower self-esteem could be associated with several interpersonal competence domains, particularly initiating relationships and asserting influence. Sibley, Evans, and Serpell (2010) found that young adults with ADHD diagnoses had fewer friends and increased difficulty maintaining friendships. Having fewer friends seems to be congruent with difficulty initiating relationships, whereas difficulty maintaining friendships could be related to impairment in other domains, such as providing emotional support, asserting influence, self-disclosure, or conflict resolution.

The relationship between internalizing symptoms and social functioning is not as well documented in the extant literature. However, several studies have found a significant association between internalizing symptoms and social competence. For instance, internalizing problems have been linked to social isolation, bullying victimization, and the quality of peer relationships (Davidson & Demaray, 2007). Research also suggests that peer and classmate support is associated with lower levels of internalizing problems (Demaray, Malecki, Davidson,

Hodgson & Rebus, 2005; Rueger, Malecki, & Demaray, 2011), and that social support is a protective factor against internalizing issues (Davidson & Demaray, 2007). Obradovic and Hipwell (2010) also found social competence to be significantly related to internalizing problems. Lastly, Oliva and colleagues (2014) found that peer attachment contributed to internalizing problems above and beyond that of parenting style.

## **Driving**

SCT was not found to predict risky driving, which was unexpected, as driving demands SCT-relevant skills, such as alertness and fast reactivity. Further, SCT has been shown to be uniquely positively associated with driving violations on the Driving Behavior Questionnaire (Reason et al., 1990) in adolescents (Garner et al., 2017). Perhaps college students with SCT are better able to compensate for driving difficulties, as they have typically been driving for a longer amount of time than adolescents. Additionally, Garner et al. (2017) included only adolescents with sleep deprivation, which could play a significant role in driving performance.

Regression analyses indicated a significant negative and unique relationship between driving behavior and both ADHD-PI and depressive symptoms, meaning that higher levels of inattention and depression were associated with riskier driving. Interestingly, anxiety symptoms were found to uniquely relate to driving behavior, in that individuals who exhibited more anxiety endorsed driving more carefully. Results of previous studies also indicate a significant association between ADHD and risky driving, including increased vehicle collisions, citations, and related injuries (Barkley & Cox, 2007; Cox & Taylor-Davis, 2009). Specific to college students, Oliver, Han, Bos, and Backs (2015) found significant associations among ADHD symptoms, negative emotions, the ability to control emotions, and driving anger. Additionally, the authors found inattention symptoms to be significantly associated with safe driving behavior,

whereas hyperactivity/impulsivity symptoms were significantly associated with driving anger. This result is contradictory to results of the present study, which indicated that inattention symptoms were significantly associated with riskier driving, not hyperactivity/impulsivity.

Data suggest that unlike patterns found in the general population, accident rates do not decline in adulthood among male drivers with ADHD (Kay, Michaels, & Pakull, 2009). Further, adolescent drivers with ADHD have been found to be at higher risk for receiving traffic citations for reckless driving, driving without a license, and driving with a revoked or suspended license (Barkley & Cox, 2007), indicating an overall higher level of risk taking while driving. Drivers with ADHD have also been found to commit more driving errors than their same-aged peers, including braking too quickly, misreading road signs, or hitting something while reversing (Rosenbloom & Wultz, 2011). Weafer, Camarillo, Fillmore, Milich, & Marczinski (2008) used a driving simulator to measure risky driving in young adult drivers with ADHD versus same-aged peers without the disorder. Results of the study indicated that young adult drivers with ADHD had significantly more deviation in lane position and increased steering rates compared to controls. Lane position deviation and increased steering rate may indicate attentional difficulties, rather than intentional risky behaviors (Weafer et al., 2008).

Depressive symptoms have also been linked to risky driving behavior, although less frequently than ADHD symptoms. Drivers with depression have been found to be at increased risk for collision (Bulmash, et al., 2006). Aduen, Kofler, Cox, Sarver, and Lunsford (2015) compared adult drivers with ADHD to those with depression to measure relative risk. Results of their study indicated that both ADHD and depression were strongly associated with risk for multiple violations and collisions. The authors purported that inattention, a symptom shared by

the two disorders, may be to blame for the higher collision rates. This would be consistent with the findings of the current study.

Few studies have examined anxiety and driving, however, results have been contradictory to those of the current study. For instance, Shahar (2009) found that participants' levels of trait anxiety had a significant direct positive effect on several classes of risky driving behaviors, including errors, lapses, and aggressive violations. Wong, Mahar, and Titchener (2015) produced similar results, stating that anxiety lead to a decay in processing efficiency (i.e., response time), which is a key aspect of safe driving. The authors purported that worry occupies the capacity of participants' working memory while driving, leading to cognitive overload under mentally demanding road conditions.

### **Alcohol and Cannabis Use**

SCT was not found to predict alcohol or cannabis use, which is somewhat surprising, as SCT is potentially related to rumination, which is in turn predictive of alcohol abuse (Becker & Wilcutt, 2018; Woody & Gibb, 2015). The current study provides preliminary evidence that SCT is independent from alcohol and cannabis use, although further research is needed to support this finding. Perhaps college students with SCT do not find depressants, such as alcohol and cannabis reinforcing, as they may already feel sleepy, lethargic, and mentally foggy. It would be interesting to investigate whether college students with SCT are more likely to use stimulants, based on their symptom presentation. Instead, depressive symptoms were the greatest predictor of alcohol use, followed by ADHD inattentive and hyperactive-impulsive symptoms, while anxiety symptoms uniquely predicted cannabis use.

Results indicating a significant association among ADHD, internalizing symptoms, and substance use, are consistent with existing literature on college students and alcohol/cannabis

use. Positive associations between depression and alcohol use have been consistently found among the college student population (Dvorak, Lamis, & Malone, 2013). Alcohol use is thought to be associated with risk for both depression and suicide among college students, and in turn, depression is a well-established risk factor for alcohol use (Lamis & Bagge, 2011).

Researchers have found college students with ADHD to also be at higher risk for alcohol-related problems, such as developing alcohol dependence, being hurt or injured, later regretting behavior performed while intoxicated, and having a hangover as a result of alcohol use (Rooney et al., 2012). Baker et al., (2012) found that students with ADHD reported greater difficulty in stopping drinking once started as well as a higher rate of “blackouts” than their non-ADHD peers.

College students with ADHD are thought to be at higher risk for problems related to alcohol use due to several risk factors, including difficulty adapting to increasing academic demands, interpersonal problems, and higher rates of criminal offending (Smith, Waschbusch, Willoughby, & Evans, 2000). An additional risk factor for problematic alcohol use in college students with ADHD seems to be the decrease in external structure and adult supervision that comes with beginning college, as individuals with ADHD tend to rely on external sources for structure and regulation (Pelham & Fabiano, 2008). Finally, research has found that a significant motivation for cannabis use is anxiety management, particularly among young adults (Zvolensky, Bernstein, Marshall, & Feldner, 2006).

### **Risky Sexual Behavior**

SCT was not found to be a predictor of risky sexual behavior in the current study. Therefore, the current study provides preliminary evidence for independence between SCT and risky sex, although this finding will need to be replicated. College students with SCT may simply

feel too lethargic, underactive or fatigued to engage in frequent or risky sex, as these individuals typically display hypoactivity. Further, individuals with SCT do not experience the hyperactivity or impulsivity of those with ADHD, which seems to be one of the driving factors for risky sexual behavior among individuals with ADHD-HI. Lastly, Sarver, McCart, Sheidow, and Letourneau (2014) found that risky sexual behavior in adolescents with ADHD was mediated by conduct problems and cannabis/alcohol use, which are not characteristic of individuals with SCT.

Instead, depressive symptoms were most predictive of engaging in sexual activity with uncommitted partners, whereas ADHD-HI was predictive of engaging in impulsive sexual behavior. The relationship between depressive and ADHD symptoms to risky sexual behavior has been previously documented in extant literature. First, depression has been associated with high-risk sexual behavior and STI among young adults in the United States (Kahn et al., 2009). Depression has been found to impair cognitive function and memory, decrease impulse control, contribute to psychosocial impairment, and reduce motivation. These depression-related effects are thought to inhibit clear perception of risk and the ability to prevent risky sexual behavior (Kahn et al., 2009).

Marsh and colleagues (2015) examined ADHD symptomatology and sexual behavior in college students, finding that ADHD students with more hyperactive-impulsive symptoms were at a higher risk for risky sexual behavior (e.g., less consistent contraceptive use, more alcohol before sex, more intercourse with uncommitted partners, and more impulsive sex). Flory, Molina, Pelham, Gnagy, and Smith (2006) found striking differences between the young adult ADHD group and controls for several risky sexual behaviors, with the ADHD group indicating a higher level of riskiness.

## **Limitations**

Results of the present study should be considered in the context of a few limitations. First, despite using well-validated instruments, psychopathology, social functioning, and risky behavior were measured by self-report alone, which can lead to biased results (Rosenman, Tennekoon, & Hill, 2011). Secondly, during the course of this study, Becker and colleagues (2017) published a new measure of SCT, named the Adult Concentration Inventory (ACI). The ACI is based on meta-analytic data, which, among other construct validation findings, identified optimal items for distinguishing between SCT and ADHD-PI (Becker et al., 2016). Specifically, Becker and colleagues identified SCT items that demonstrated strong convergent and discriminant validity from anxiety/depression and ADHD-PI symptoms. The present study used the BAARS-IV SCT subscale (Barkley, 2011a) to measure SCT symptoms, based on the measure's factor structure and strong psychometric properties. However, it will be difficult to compare results of the current study to future SCT studies, if most use the ACI moving forward, as separate constructs are potentially being examined. Furthermore, the evaluation of driving behavior may be improved by using more thorough measurement that allows for the identification of specific aspects of driving (e.g., Garner et al, 2017; Graziano et al., 2015; Lawton et al, 1997) using driving simulators (e.g., Key et al., 2009; Weafer et al., 2009).

Next, some results of hierarchical regression analyses did not meet regression assumptions, including those of normality, linearity, and homoscedasticity, even after conducting analyses using transformed data. Because of this, results involving substance use and sexual activity may not be generalizable to the entire college student population, but only to the current sample. The present study was also limited demographically to primarily non-Hispanic White

college students from a public, Southern university. Lastly, the current data are cross-sectional, which prevents causal conclusions from being drawn.

### **Implications/Future Directions**

Despite the abovementioned limitations, the current study adds to the existing literature in critical ways. Specifically, this study is the first to examine SCT and the social functioning of college students in depth, by using a well-validated and comprehensive measure of social functioning. Utilization of the ICQ afforded the opportunity to gather more specific information regarding the domains of social functioning affected by symptoms of SCT. Our data support existing evidence that SCT contributes additional impairment in social functioning, above and beyond what is accounted for by ADHD or internalizing symptoms.

Additionally, the current study is the first to assess the relationship between SCT and risky behavior, particularly in college students—a demographic vulnerable to engaging in a variety of high-risk behaviors. Overall, results of the current study provide support for SCT as a distinct symptom set from associated disorders, such as anxiety, depression, and ADHD-PI, as SCT independently predicted two domains of interpersonal competence. Lastly, the current study confirms several previously documented results, including the associations between ADHD and social competence, ADHD and depressive symptoms to risky driving, internalizing and ADHD symptoms to substance use, and depressive and ADHD symptoms to risky sexual behavior.

It is important for future research to incorporate additional measures and informants to more fully test the hypothesis that SCT independently predicts social functioning in college students. It would also be valuable to consider other predictor variables that might be more closely related to social functioning and the risky behaviors explored in the current study, as they affect college students' health and well-being.



Second, future research on SCT should use carefully validated measures, such as the ACI (Becker et al., 2017), in order to ensure that researchers are examining the same unified set of symptoms across studies. Currently, SCT researchers are using different criteria with which to measure the SCT construct, making results difficult to compare (Becker et al., 2017). The use of a carefully validated measure such as the ACI will increase the likelihood that researchers are adequately capturing the SCT construct and that findings across studies can be compared. This will also help in the process of establishing the external validity of SCT as a construct.

Becker and Wilcutt (2018) aptly point out that we do not yet know “exactly how should SCT be conceptualized” – either as a distinct attention disorder that frequently occurs with, but is separate from ADHD (Barkley, 2014) or as a “psychopathological dimension or a transdiagnostic process that predicts risk and impairment across a range of psychopathologies” (p. 2). Consistent with the lion’s share of the SCT literature, the National Institute of Mental Health (NIMH) Research Domain Criteria (RDoC) initiative (Kozak & Cuthbert, 2016) will assist in advancing the study of SCT.

In order to better generalize results, it will be important for future studies to obtain a more diverse sample that includes participants from a variety of cultures, backgrounds, and geographic areas. Lastly, there is a significant need for longitudinal studies of SCT, in order to draw conclusions regarding development and adjustment over time.

## References

- Acock, A. C. (2005). Working with missing values. *Journal of Marriage and Family*, 67(4), 1012-1028. doi:10.1111/j.1741-3737.2005.00191.x
- Adamson, S. J., Kay-Lambkin, F. J., Baker, A. L., Lewin, T. J., Thornton, L., Kelly, B. J., & Sellman, J. D. (2010). An improved brief measure of cannabis misuse: The cannabis use disorders identification test-revised (CUDIT-R). *Drug and Alcohol Dependence*, 110(12), 137-143. doi:10.1016/j.drugalcdep.2010.02.017
- Adler, L. A., Faraone, S. V., Spencer, T. J., Michelson, D., Reimherr, F. W., Glatt, S. J., ... Biederman, J. (2008). The reliability and validity of self and investigator ratings of ADHD in adults. *Journal of Attention Disorders*, 11, 711–719. doi: 10.1177/1087054707308503
- Aduen, P. A., Kofler, M. J., Cox, D. J., Sarver, D. E., & Lunsford, E. (2015). Motor vehicle driving in high incidence psychiatric disability: comparison of drivers with ADHD, depression, and no known psychopathology. *Journal of psychiatric research*, 64, 59-66.
- Agosti, V., Nunes, E., Levin, F. (2002). Rates of psychiatric comorbidity among U.S. residents with lifetime cannabis dependence. *American Journal of Drug and Alcohol Abuse*, 28, 643–652. doi: 10.1081/ADA-120015873
- American College Health Association. (2013). National College Health Assessment II: Reference Group Data Report Fall 2012. Hanover, MD: American College Health Association.
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

- Baker, L., Prevatt, F., & Proctor, B. (2012). Drug and alcohol use in college students with and without ADHD. *Journal of Attention Disorders, 16*, 255-263. doi: 10.1177/1087054711416314
- Barkley, R. A. (2011a). *Barkley Adult ADHD Rating Scale–IV (BAARS-IV)*. New York, NY: Guilford Press.
- Barkley, R. A. (2011b). *Barkley Functional Impairment Scale (BFIS)*. New York, NY: Guilford Press.
- Barkley, R. A. (2012). Distinguishing sluggish cognitive tempo from attention-deficit/hyperactivity disorder in adults. *Journal of Abnormal Psychology, 121(4)*, 978-990. doi: 10.1037/a0023961
- Barkley, R. A. (2013). Distinguishing sluggish cognitive tempo from ADHD in children and adolescents: Executive functioning, impairment, and comorbidity. *Journal of Clinical Child & Adolescent Psychology, 42(2)*, 161-173. doi: 10.1080/15374416.2012.734259
- Barkley, R. A. (2014). Sluggish cognitive tempo (concentration deficit disorder?): Current status, future directions, and a plea to change the name. *Journal of Abnormal Child Psychology, 42(1)*, 117-125. doi: 10.1007/s10802-013-9824-y
- Barkley, R. A. (2015). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment*. New York, NY: Guilford Publications.
- Barkley, R. A., & Cox, D. (2007). A review of driving risks and impairments associated with attention-deficit/hyperactivity disorder and the effects of stimulant medication on driving performance. *Journal of Safety Research, 38(1)*, 113-128.
- Barkley, R.A. & Murphy, K.R. (2006). *Attention-Deficit Hyperactivity Disorder: A Clinical Workbook* (3<sup>rd</sup> ed.). New York, NY: Guilford Press.

- Barkley, R. A., Murphy, K. R., DuPaul, G. J., & Bush, T. (2002). Driving in young adults with attention deficit hyperactivity disorder: Knowledge, performance, adverse outcomes, and the role of executive functioning. *Journal of the International Neuropsychological Society, 8(05)*, 655-672. doi: 10.1017/S1355617702801345
- Barkley, R. A., Murphy, K. R., & Fischer, M. (2008). *ADHD in Adults: What the Science Says*. New York, NY: Guilford Press.
- Bauermeister, J. J., Barkley, R. A., Bauermeister, J. A., Martínez, J. V., & McBurnett, K. (2012). Validity of the sluggish cognitive tempo, inattention, and hyperactivity symptom dimensions: Neuropsychological and psychosocial correlates. *Journal of Abnormal Child Psychology, 40(5)*, 683-697. doi: 10.1007/s10802-011-9602-7
- Becker, S. P. (2014). Sluggish cognitive tempo and peer functioning in school-aged children: A six-month longitudinal study. *Psychiatry Research, 217(1)*, 72-78.  
doi:10.1016/j.psychres.2014.02.007
- Becker, S. P., Burns, G. L., Garner, A. A., Jarrett, M. A., Luebke, A. M., Epstein, J. N., & Willcutt, E. G. (2017). Sluggish cognitive tempo in adults: Psychometric validation of the Adult Concentration Inventory. *Psychological Assessment*. Advance online publication.  
<http://dx.doi.org/10.1037/pas0000476>
- Becker, S. P., Garner, A. A., Tamm, L., Antonini, T. N., & Epstein, J. N. (2017). Honing in on the social difficulties associated with sluggish cognitive tempo in children: Withdrawal, peer ignoring, and low engagement. *Journal of Clinical Child & Adolescent Psychology*, DOI: 10.1080/15374416.2017.1286595

- Becker, S. P., & Langberg, J. M. (2013). Sluggish cognitive tempo among young adolescents with ADHD relations to mental health, academic, and social functioning. *Journal of Attention Disorders, 17*(8), 681-689. doi:10.1177/1087054711435411
- Becker, S. P., Langberg, J. M., Luebbe, A. M., Dvorsky, M. R., & Flannery, A. J. (2014). Sluggish cognitive tempo is associated with academic functioning and internalizing symptoms in college students with and without attention-deficit/hyperactivity disorder. *Journal of Clinical Psychology, 70*(4), 388-403. doi:10.1002/jclp.22046
- Becker, S. P., Leopold, D. R., Burns, G. L., Jarrett, M. A., Langberg, J. M., Marshall, S. A., & ... Willcutt, E. G. (2016). The internal, external, and diagnostic validity of sluggish cognitive tempo: A meta-analysis and critical review. *Journal of the American Academy of Child & Adolescent Psychiatry, 55*(3), 163-178. doi:10.1016/j.jaac.2015.12.006
- Becker, S. P., Luebbe, A. M., Fite, P. J., Stoppelbein, L., & Greening, L. (2014). Sluggish cognitive tempo in psychiatrically hospitalized children: Factor structure and relations to internalizing symptoms, social problems, and observed behavioral dysregulation. *Journal of Abnormal Child Psychology, 42*(1), 49-62. doi:10.1007/s10802-013-9719-y
- Becker, S. P., Luebbe, A. M., & Langberg, J. M. (2014). Attention-deficit/hyperactivity disorder dimensions and sluggish cognitive tempo symptoms in relation to college students' sleep functioning. *Child Psychiatry & Human Development, 45*(6), 675-685. doi:10.1007/s10578-014-0436-8
- Becker, S. P., & Willcutt, E. G. (2018). Advancing the study of sluggish cognitive tempo via DSM, RDoC, and hierarchical models of psychopathology. *European Child & Adolescent Psychiatry, 1-11*.

- Bjork, J. M., Smith, A. R., Danube, C. L., & Hommer, D. W. (2007). Developmental differences in posterior mesofrontal cortex recruitment by risky rewards. *The Journal of Neuroscience*, *27*(18), 4839-4849. doi:10.1523/JNEUROSCI.5469-06.2007
- Bogle, K. A. (2008). *Hooking up: Sex, dating, and relationships on campus*. New York, NY: New York, University Press.
- Boyce, T. E., & Geller, E. S. (2002). An instrumented vehicle assessment of problem behavior and driving style: Do younger males really take more risks? *Accident Analysis & Prevention*, *34*(1), 51-64. doi:10.1016/S0001-4575(00)00102-0
- Buckner, J. D., Heimberg, R. G., Schneier, F. R., Liu, S. M., Wang, S., & Blanco, C. (2012). The relationship between cannabis use disorders and social anxiety disorder in the National Epidemiological Study of Alcohol and Related Conditions (NESARC). *Drug and Alcohol Dependence*, *124*(1), 128-134. doi:10.1016/j.drugalcdep.2011.12.023
- Buckner, J. D., Schmidt, N. B., Lang, A. R., Small, J. W., Schlauch, R. C., & Lewinsohn, P. M. (2008). Specificity of social anxiety disorder as a risk factor for alcohol and cannabis dependence. *Journal of Psychiatric Research*, *42*(3), 230-239. doi:10.1016/j.jpsychires.2007.01.002
- Buhrmester, D., Furman, W., Wittenberg, M. T., & Reis, H. T. (1988). Five domains of interpersonal competence in peer relationships. *Journal of Personality and Social Psychology*, *55*(6), 991-1008. doi:10.1037/0022-3514.55.6.991
- Bulmash, E. L., Moller, H. J., Kayumov, L., Shen, J., Wang, X., & Shapiro, C. M. (2006). Psychomotor disturbance in depression: assessment using a driving simulator paradigm. *Journal of Affective Disorders*, *93*(1), 213-218.

- Burns, G. L., Servera, M., Bernad, M. D. M., Carrillo, J. M., & Cardo, E. (2013). Distinctions between sluggish cognitive tempo, ADHD-IN, and depression symptom dimensions in Spanish first-grade children. *Journal of Clinical Child & Adolescent Psychology, 42*(6), 796-808. doi:10.1080/15374416.2013.838771
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences* (3rd ed.). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
- Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology, 53*(2), 189-200. doi:10.1037/0022-006X.53.2.189
- Coroiu, A., Meyer, A., Gomez-Garibello, C. A., Brähler, E., Hessel, A., & Körner, A. (2015). Brief form of the Interpersonal Competence Questionnaire (ICQ-15): Development and preliminary validation with a German population sample. *European Journal of Psychological Assessment, 31*(4), 272-279. doi:10.1027/1015-5759/a000234
- Corson, K., Gerrity, M. S., & Dobscha, S. K. (2004). Screening for depression and suicidality in a VA primary care setting: 2 items are better than 1 item. *The American Journal of Managed Care, 10*(11 Pt 2), 839-845.
- Cox, D. J., & Davis, M. T. (2009). Attention deficit/hyperactivity disorder (ADHD) and driving safety. In *Drugs, driving and traffic safety* (pp. 315-330). Birkhäuser Basel.
- Cummings, J. A., Hayes, A. M., Cohen, L. H., Laurenceau, J. P., Saint, D. S., & Gricol, K. (2013). Interpersonal competence and daily stress generation in individuals with avoidant

- personality disorder symptoms. *Journal of Social and Clinical Psychology*, 32(2), 135–158. doi:10.1521/jscp.2013.32.2.135
- Daepfen, J. B., Yersin, B., Landry, U., Pécoud, A., & Decrey, H. (2000). Reliability and validity of the Alcohol Use Disorders Identification Test (AUDIT) imbedded within a general health risk screening questionnaire: results of a survey in 332 primary care patients. *Alcoholism: Clinical and Experimental Research*, 24(5), 659-665.
- Davidson, L. M., & Demaray, M. K. (2007). Social support as a moderator between victimization and internalizing-externalizing distress from bullying. *School Psychology Review*, 36(3), 383.
- Demaray, M. K., Malecki, C. K., Davidson, L. M., Hodgson, K. K., & Rebus, P. J. (2005). The relationship between social support and student adjustment: A longitudinal analysis. *Psychology in the Schools*, 42(7), 691-706.
- DeMartini, K. S., & Carey, K. B. (2012). Optimizing the use of the AUDIT for alcohol screening in college students. *Psychological Assessment*, 24(4), 954.
- Ditomaso, E., Brannen-McNulty, C., Ross, L., & Burgess, M. (2003). Attachment styles, social skills and loneliness in young adults. *Journal of Personality and Individual Differences*, 35, 303–312. doi:10.1016/S0191-8869(02)00190-3.
- DuPaul, G. J., Schaugency, E. A., Weyandt, L. L., Tripp, G., Kiesner, J., Ota, K., & Stanish, H. (2001). Self-report of ADHD symptoms in university students cross-gender and cross-national prevalence. *Journal of Learning Disabilities*, 34(4), 370-379.
- Dvorak, R. D., Lamis, D. A., & Malone, P. S. (2013). Alcohol use, depressive symptoms, and impulsivity as risk factors for suicide proneness among college students. *Journal of Affective Disorders*, 149(1), 326-334.



- Eberhart, N. K., & Hammen, C. L. (2006). Interpersonal predictors of onset of depression during the transition to adulthood. *Personal Relationships, 13*, 195–206. doi:10.1111/j.1475-6811.2006.00113.x
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149-1160. doi:10.3738/BRM.41.4.1149
- Flannery, A. J., Becker, S. P., & Luebbe, A. M. (2016). Does emotion dysregulation mediate the association between sluggish cognitive tempo and college students' social impairment? *Journal of Attention Disorders, 20*(9), 802-812.
- Flannery, A. J., Luebbe, A. M., & Becker, S. P. (2017). Sluggish cognitive tempo is associated with poorer study skills, more executive functioning deficits, and greater impairment in college students. *Journal of Clinical Psychology, 73*(9), 1091-1113.
- Fleming, M. F., Barry, K. L., & Macdonald, R. (1991). The alcohol use disorders identification test (AUDIT) in a college sample. *International Journal of the Addictions, 26*(11), 1173-1185.
- Flory, K., Molina, B. S., Pelham, W. E., Gnagy, E., & Smith, B. (2006). Childhood ADHD predicts risky sexual behavior in young adulthood. *Journal of Clinical Child and Adolescent Psychology, 35*(4), 571-577.
- Frisbie, S. H., Fitzpatrick, H., Feng, D., & Crawford, D. (2000). Women's personality traits, interpersonal competence and affection for dating partners: A test of the contextual model. *Social Behavior and Personality, 28*(6), 585–594. doi:10.2224/sbp.2000.28.6.585

- Ford, J.A., & Arrastia, M.C. (2008). Pill-poppers and dopers: A comparison of non-medical prescription drug use and illicit/street drug use among college students. *Addiction, 33*, 934–941. doi:10.1016/j.addbeh.2008.02.016
- Garner, A. A., Hansen, A., Baxley, C., Becker, S. P., Sidol, C. A., & Beebe, D. W. (2017). Effect of sleep extension on sluggish cognitive tempo symptoms and driving behavior in adolescents with chronic short sleep. *Sleep Medicine, 30*, 93-96.
- Garner, A. A., Marceaux, J. C., Mrug, S., Patterson, C., & Hodgens, B. (2010). Dimensions and correlates of attention deficit/hyperactivity disorder and sluggish cognitive tempo. *Journal of Abnormal Child Psychology, 38*(8), 1097-1107. doi:10.1007/s10802-010-9436-8
- Giromini, L., de Campora, G., Brusadelli, E., D’Onofrio, E., Zennaro, A., Zavattini, G. C., & Lang, M. (2016). Validity and reliability of the interpersonal competence questionnaire: Empirical evidence from an Italian study. *Journal of Psychopathology and Behavioral Assessment, 38*(1), 113-123. doi:10.1007/s10862-015-9499-5
- Górska, M. (2011). Psychometric properties of the polish version of the interpersonal competence questionnaire (ICQ-R). *European Journal of Psychological Assessment, 27*(3), 186–192. doi:10.1027/1015-5759/a000066
- Grant, B.F., Hasin, D.S., Blanco, C., Stinson, F.S., Chou, S.P., Goldstein, R.B., ... Huang, B. (2005). The epidemiology of social anxiety disorder in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry, 66*, 1351–1361. doi:10.4088/JCP.v66n1102
- Graziano, P. A., Reid, A., Slavec, J., Paneto, A., McNamara, J. P., & Geffken, G. R. (2015). ADHD symptomatology and risky health, driving, and financial behaviors in college: The

- mediating role of sensation seeking and effortful control. *Journal of Attention Disorders*, 19(3), 179-190. doi:10.1177/1087054714527792
- Grello, C. M., Welsh, D. P., & Harper, M. S. (2006). No strings attached: The nature of casual sex in college students. *Journal of Sex Research*, 43, 255–267.
- Gullette, D. L., & Lyons, A. (2006). Sensation seeking, self-esteem, and unprotected sex in college students. *Journal of the Association of Nurses in AIDS Care*, 17(5), 23–31. doi:10.1016/j.jana.2006.07.001
- Heisserer, D. L., & Parette, P. (2002). Advising at-risk students in college and university settings. *College Student Journal*, 36(1), 69-84.
- Herzberg, D. S., Hammen, C., Burge, D., Daley, S. E., Davila, J., & Lindberg, N. (1998). Social competence as a predictor of chronic interpersonal stress. *Personal Relationships*, 5, 207–218. doi:10.1111/j.1475-6811.1998.tb00168.x
- Huang, F. Y., Chung, H., Kroenke, K., Delucchi, K. L., & Spitzer, R. L. (2006). Using the patient health questionnaire-9 to measure depression among racially and ethnically diverse primary care patients. *Journal of General Internal Medicine*, 21(6), 547-552. doi:10.1111/j.1525-1497.2006.00409.x
- IBM Corp. (2014). *IBM SPSS Statistics for Windows, Version 23.0*. Armonk, NY: IBM Corp.
- Jackson, K. M., Sher, K. J., & Park, A. (2005). Alcohol problems in adolescents and young adults. In M. Galanter (Ed.), *Recent Developments in Alcoholism: Volume 17* (pp. 85-117). New York, NY: Kluwer Academic/Plenum Publishers.
- Jacobson, L. A., Murphy-Bowman, S. C., Pritchard, A. E., Tart-Zelvin, A., Zabel, T. A., & Mahone, E. M. (2012). Factor structure of a sluggish cognitive tempo scale in clinically-

- referred children. *Journal of Abnormal Child Psychology*, 40(8), 1327-1337.  
doi:10.1007/s10802-012-9643-6
- Jarrett, M. A., Rapport, H. F., Rondon, A. T., & Becker, S. P. (2017). ADHD dimensions and sluggish cognitive tempo symptoms in relation to self-report and laboratory measures of neuropsychological functioning in college students. *Journal of Attention Disorders*, 21(8), 673-683.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2009). Monitoring the Future: National Results on Adolescent Drug Use. Overview of Key Findings, 2008. *National Institute on Drug Abuse (NIDA)*.
- Khan, M. R., Kaufman, J. S., Pence, B. W., Gaynes, B. N., Adimora, A. A., Weir, S. S., & Miller, W. C. (2009). Depression, sexually transmitted infection, and sexual risk behavior among young adults in the United States. *Archives of Pediatrics & Adolescent Medicine*, 163(7), 644-652.
- Kanning, U. P. (2006). Development and validation of a German- language version of the interpersonal competence questionnaire (ICQ). *European Journal of Psychological Assessment*, 22(1), 43– 51. doi:10.1027/1015-5759.22.1.43
- Kay, G. G., Michaels, M. A., & Pakull, B. (2009). Simulated driving changes in young adults with ADHD receiving mixed amphetamine salts extended release and atomoxetine. *Journal of Attention Disorders*, 12(4), 316-329.
- Kiene, S. M., Barta, W. D., Tennen, H., & Armeli, S. (2009). Alcohol helping young adults to have unprotected sex with casual partners: Findings from a daily diary study of alcohol use and sexual behavior. *Journal of Adolescent Health*, 44(1), 73-80.  
doi:10.1016/j.jadohealth.2008.05.008

- Kivlahan, D. R., Marlatt, G. A., Fromme, K., Coppel, D. B., & Williams, E. (1990). Secondary prevention with college drinkers: Evaluation of an alcohol skills training program. *Journal of Consulting and Clinical Psychology, 58*(6), 805. doi:10.1037/0022-006X.58.6.805
- Kozak, M. J., & Cuthbert, B. N. (2016). The NIMH research domain criteria initiative: background, issues, and pragmatics. *Psychophysiology, 53*(3), 286-297.
- Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression diagnostic and severity measure. *Psychiatric Annals, 32*(9), 509-515. doi:10.3928/0048-5713-20020901-06
- Kroenke, K., Spitzer, R. L., Williams, J. W., & Löwe, B. (2010). The patient health questionnaire somatic, anxiety, and depressive symptom scales: A systematic review. *General Hospital Psychiatry, 32*(4), 345-359. doi:10.1016/j.genhosppsych.2010.03.006
- Kroenke, K., Spitzer, R. L., Williams, J. B., Monahan, P. O., & Löwe, B. (2007). Anxiety disorders in primary care: Prevalence, impairment, comorbidity, and detection. *Annals of Internal Medicine, 146*(5), 317-325.
- Kroenke, K., Strine, T. W., Spitzer, R. L., Williams, J. W., Berry, J. T., & Mokdad, A. H. (2009). The PHQ-8 as a measure of current depression in the general population. *Journal of Affective Disorders, 114*(1-3), 163-173. doi:10.1016/j.jad.2008.06.026
- Lamis, D. A., & Bagge, C. L. (2011). Alcohol involvement and suicidality in college students. *Understanding and Preventing College Student Suicide, 119-133.*
- Langberg, J. M., Becker, S. P., & Dvorsky, M. R. (2014). The association between sluggish cognitive tempo and academic functioning in youth with attention-deficit/hyperactivity disorder (ADHD). *Journal of Abnormal Child Psychology, 42*(1), 91-103. doi:10.1007/s10802-013-9722-3

- Langberg, J. M., Becker, S. P., Dvorsky, M. R., & Luebke, A. M. (2014). Are sluggish cognitive tempo and daytime sleepiness distinct constructs? *Psychological Assessment, 26*(2), 586-597. doi:10.1037/a0036276
- Lawton, R. J., Parker, D., Manstead, A. S. R., Stradling, S. G. (1997). The role of affect in predicting social behaviors: The case of road traffic violations. *Journal of Applied Social Psychology, 27*, 1258-1276. doi:10.1111/j.1559-1816.1997.tb01805.x
- Lee, S., Burns, G. L., Snell, J., & McBurnett, K. (2014). Validity of the sluggish cognitive tempo symptom dimension in children: Sluggish cognitive tempo and ADHD-inattention as distinct symptom dimensions. *Journal of Abnormal Child Psychology, 42*(1), 7-19. doi:10.1007/s10802-013-9714-3
- Leopold D. R., Bryan, A. D., Pennington, B. F., & Willcutt, E. G. (2015). Evaluating the construct validity of adult ADHD and SCT among college students: A multitrait-multimethod analysis of convergent and discriminant validity. *Journal of Attention Disorders, 19*(1), 200-210. doi:10.1177/1087054714553051
- Lopez-Quintero, C., de los Cobos, J.P., Hasin, D.S., Okuda, M., Wang, S., Grant, B.F., & Blanco, C. (2011). Probability and predictors of transition from first use to dependence on nicotine, alcohol, cannabis, and cocaine: Results of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). *Drug and Alcohol Dependence, 115*, 120–130. doi:10.1016/j.drugalcdep.2010.11.004
- Löwe, B., Decker, O., Müller, S., Brähler, E., Schellberg, D., Herzog, W., & Herzberg, P. Y. (2008). Validation and standardization of the generalized anxiety disorder screener (GAD-7) in the general population. *Medical Care, 46*(3), 266-274. doi:10.1097/MLR.0b013e318160d093

- Marcus, D. K., Fulton, J. J., & Turchik, J. A. (2011). Is risky sexual behavior continuous or categorical? A taxometric analysis of the sexual risk survey. *Psychological Assessment, 23(1)*, 282-286. doi:10.1037/a0021842
- Marsh, L. E., Norvilitis, J. M., Ingersoll, T. S., & Li, B. (2015). ADHD symptomatology, fear of intimacy, and sexual anxiety and behavior among college students in China and the United States. *Journal of Attention Disorders, 19(3)*, 211-221. doi:10.1177/1087054712453483
- Marshall, S. A., Evans, S. W., Eiraldi, R. B., Becker, S. P., & Power, T. J. (2014). Social and academic impairment in youth with ADHD, predominately inattentive type and sluggish cognitive tempo. *Journal of Abnormal Child Psychology, 42(1)*, 77-90. doi:10.1007/s10802-013-9758-4
- McGuinness, T. M., & Ahern, N. R. (2009). Risky behavior of adolescent college students. *Journal of Psychosocial Nursing and Mental Health Services, 47(4)*, 21-25.
- Meade, A. W., & Craig, S. B. (2012). Identifying careless responses in survey data. *Psychological Methods, 17(3)*, 437-455. doi:10.1037/a0028085
- Mikami, A. Y., Huang-Pollock, C. L., Pfiffner, L. J., McBurnett, K., & Hangai, D. (2007). Social skills differences among attention-deficit/hyperactivity disorder types in a chat room assessment task. *Journal of Abnormal Child Psychology, 35(4)*, 509-521. doi:10.1007/s10802-007-9108-5
- Moore, A. A., Overstreet, C., Kendler, K. S., Dick, D. M., Adkins, A., & Amstadter, A. B. (2017). Potentially traumatic events, personality, and risky sexual behavior in undergraduate college students. *Psychological Trauma: Theory, Research, Practice, and Policy, 9(1)*, 105.

- National Highway Traffic Safety Administration (2009). Traffic Safety Facts (Report DOT-HS-810-985). Washington, DC: U.S. Department of Transportation.
- Neal, D. J., Corbin, W. R., & Fromme, K. (2006). Measurement of alcohol-related consequences among high school and college students: Application of item response models to the Rutgers alcohol problem index. *Psychological Assessment, 18*(4), 402-414.  
doi:10.1037/1040-3590.18.4.402
- Obradović, J., & Hipwell, A. (2010). Psychopathology and social competence during the transition to adolescence: The role of family adversity and pubertal development. *Development and Psychopathology, 22*(3), 621-634.
- O'Keeffe, P. (2013). A sense of belonging: Improving student retention. *College Student Journal, 47*(4), 605-613.
- Oliva, A., Parra, Á., & Reina, M. C. (2014, August). Personal and contextual factors related to internalizing problems during adolescence. In *Child & Youth Care Forum* (Vol. 43, No. 4, pp. 505-520). Springer US.
- Oliver, M. L., Han, K., Bos, A. J., & Backs, R. W. (2015). The relationship between ADHD symptoms and driving behavior in college students: The mediating effects of negative emotions and emotion control. *Transportation Research Part F: Traffic Psychology and Behaviour, 30*, 14-21.
- Pelham Jr, W. E., & Fabiano, G. A. (2008). Evidence-based psychosocial treatments for attention-deficit/hyperactivity disorder. *Journal of Clinical Child & Adolescent Psychology, 37*(1), 184-214.



- Peng, C. Y. J., Harwell, M., Liou, S. M., & Ehman, L. H. (2006). Advances in missing data methods and implications for educational research. In S. S. Sawilowsky (ed.) *Real data analysis* (31-78). North Carolina: Information Age Publishing.
- Penny, A. M., Waschbusch, D. A., Klein, R. M., Corkum, P., & Eskes, G. (2009). Developing a measure of sluggish cognitive tempo for children: Content validity, factor structure, and reliability. *Psychological Assessment, 21*(3), 380. doi:10.1037/a0016600
- Pope, D., Whiteley, H., Smith, C., Lever, R., Wakelin, D., Dudiak, H., & Dewart, H. (2007). Relationships between ADHD and dyslexia screening scores and academic performance in undergraduate psychology students: Implications for teaching, learning and assessment. *Psychology Learning & Teaching, 6*(2), 114-120.  
doi:10.2304/plat.2007.6.2.114
- Read, J. P., Wood, M. D., Kahler, C. W., Maddock, J. E., & Palfai, T. P. (2003). Examining the role of drinking motives in college student alcohol use and problems. *Psychology of Addictive Behaviors, 17*(1), 13. doi:10.1037/0893-164X.17.1.13
- Reason, J., Manstead, A., Stradling, S., Baxter, J., & Campbell, K. (1990). Errors and violations on the roads: a real distinction? *Ergonomics, 33*(10-11), 1315-1332.
- Riggio, R. E., & Taylor, S. J. (2000). Personality and communication skills as predictors of hospice nurse performance. *Journal of Business and Psychology, 15*, 347-355.
- Robbins, S. B., Allen, J., Casillas, A., Peterson, C. H., & Le, H. (2006). Unraveling the differential effects of motivational and skills, social, and self-management measures from traditional predictors of college outcomes. *Journal of Educational Psychology, 98*(3), 598-616. doi:10.1037/0022-0663.98.3.598

- Rondon, A. T., Hilton, D. C., Jarrett, M. A., & Ollendick, T. H. (2018). Sleep, internalizing problems, and social withdrawal: Unique associations in clinic-referred youth with elevated sluggish cognitive tempo symptoms. *Journal of Attention Disorders*, 1087054718756197.
- Rosenbloom, T., & Wultz, B. (2011). Thirty-day self-reported risky driving behaviors of ADHD and non-ADHD drivers. *Accident Analysis & Prevention*, 43(1), 128-133.
- Rosenman, R., Tennekoon, V., & Hill, L. G. (2011). Measuring bias in self-reported data. *International Journal of Behavioural and Healthcare Research*, 2(4), 320-332.
- Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York: Wiley.
- Rueger, S. Y., Malecki, C. K., & Demaray, M. K. (2011). Stability of peer victimization in early adolescence: Effects of timing and duration. *Journal of School Psychology*, 49(4), 443-464.
- Rooney, M., Chronis-Tuscano, A. M., & Yoon, Y. (2012). Substance use in college students with ADHD. *Journal of Attention Disorders*, 16, 221-234. doi:10.1177/1087054710392536
- Sarver, D. E., McCart, M. R., Sheidow, A. J., & Letourneau, E. J. (2014). ADHD and risky sexual behavior in adolescents: Conduct problems and substance use as mediators of risk. *Journal of Child Psychology and Psychiatry*, 55(12), 1345-1353.
- Saunders, J. B., Aasland, O. G., Babor, T. F., De la Fuente, J. R., & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction*, 88(6), 791-804.
- Schafer, J. L., & Graham, J. W. (2002). Missing data: our view of the state of the art. *Psychological Methods*, 7(2), 147.

- Schlegel, K., Grandjean, D., & Scherer, K. R. (2013). Constructs of social and emotional effectiveness: Different labels, same content? *Journal of Research in Personality, 47*, 249–253. doi:10.1016/j.jrp.2013.02.005
- Schneider, M. (2010). Finishing the first lap: The cost of first-year student attrition in America's four-year colleges and universities. Washington, DC: *American Institutes for Research*.
- Schwinn, T.M., Schinke, S.P., & Trent, D.N. (2010). Substance use among late adolescent urban youths: Mental health and gender influences. *Addictive Behavior, 35*, 30-34. doi:10.1016/j.addbeh.2009.08.005
- Shahar, A. (2009). Self-reported driving behaviors as a function of trait anxiety. *Accident Analysis & Prevention, 41*(2), 241-245.
- Shaw-Zirt, B., Popali-Lehane, L., Chaplin, W., & Bergman, A. (2005). Adjustment, social skills, and self-esteem in college students with symptoms of ADHD. *Journal of Attention Disorders, 8*(3), 109-120.
- Sibley, M. H., Evans, S. W., & Serpell, Z. N. (2010). Social cognition and interpersonal impairment in young adolescents with ADHD. *Journal of Psychopathology and Behavioral Assessment, 32*(2), 193-202.
- Skodol, A. E., Pagano, M. E., Bender, D. S., Shea, M. T., Gunderson, J. G., Yen, S., ... & Zanarini, M. C. (2005). Stability of functional impairment in patients with schizotypal, borderline, avoidant, or obsessive-compulsive personality disorder over two years. *Psychological Medicine, 35*(03), 443-451. doi:10.1017/S003329170400354X
- Smith, B. H., Waschbusch, D. A., Willoughby, M. T., & Evans, S. (2000). The efficacy, safety, and practicality of treatments for adolescents with attention-deficit/hyperactivity disorder (ADHD). *Clinical Child and Family Psychology Review, 3*(4), 243-267.

- Spitzer, R. L., Kroenke, K., Williams, J. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives Of Internal Medicine, 166*(10), 1092-1097. doi:10.1001/archinte.166.10.1092
- Stinson, F.S., Ruan, W.J., Pickering, R., & Grant, B.F. (2006). Cannabis use disorders in the USA: Prevalence, correlates and co-morbidity. *Psychological Medicine, 36*, 1447– 1460. doi:10.1017/S0033291706008361
- Substance Abuse Mental Health Services Administration (2013). *Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings*. Retrieved August 12, 2016 from <http://www.samhsa.gov/data/NSDUH/2012SummNatFindDetTables/NationalFindings/NSDUHresults2012.htm#ch3.1>
- Turchik, J. A., & Garske, J. P. (2009). Measurement of sexual risk taking among college students. *Archives Of Sexual Behavior, 38*(6), 936-948. doi:10.1007/s10508-008-9388-z
- Turner, P. (2016). Supporting freshman males during their first-year of college. *College Student Journal, 50*(1), 86-94.
- Wählstedt, C., & Bohlin, G. (2010). DSM-IV-defined inattention and sluggish cognitive tempo: Independent and interactive relations to neuropsychological factors and comorbidity. *Child Neuropsychology, 16*(4), 350-365. doi:10.1080/09297041003671176
- Weafer, J., Camarillo, D., Fillmore, M. T., Milich, R., & Marczynski, C. A. (2008). Simulated driving performance of adults with ADHD: Comparisons with alcohol intoxication. *Experimental and Clinical Psychopharmacology, 16*(3), 251.
- Wechsler, H., Lee, J. E., Kuo, M., & Lee, H. (2000). College binge drinking in the 1990s: A continuing problem: Results of the Harvard School of Public Health 1999 College

- Alcohol Study. *Journal Of American College Health*, 48(5), 199-210.  
doi:10.1080/07448480009599305
- Wechsler, H., Lee, J. E., Kuo, M., Seibring, M., Nelson, T. F., & Lee, H. (2002). Trends in college binge drinking during a period of increased prevention efforts: Findings from 4 Harvard school of public health college alcohol study surveys: 1993–2001. *Journal of American College Health*, 50, 203-217.
- White, H. R., & Labouvie, E. W. (1989). Towards the assessment of adolescent problem drinking. *Journal of Studies on Alcohol*, 50(1), 30–37. doi:10.15288/jsa.1989.50.30
- White, H. R., Labouvie, E. W., & Papadaratsakis, V. (2005). Changes in substance use during the transition to adulthood: A comparison of college students and their noncollege age peers. *Journal of Drug Issues*, 35(2), 281-305.
- Willcutt, E. G., Chhabildas, N., Kinnear, M., DeFries, J. C., Olson, R. K., Leopold, D. R., ... Pennington, B. F. (2014). The internal and external validity of sluggish cognitive tempo and its relation with DSM–IV ADHD. *Journal of Abnormal Child Psychology*, 42(1), 21-35. doi:10.1007/s10802-013-9800-6
- Wolf, L. E. (2001). College students with ADHD and other hidden disabilities. *Annals of the New York Academy of Sciences*, 931(1), 385-395.
- Wolf, L. E., Simkowitz, P., & Carlson, H. (2009). College students with attention-deficit/hyperactivity disorder. *Current Psychiatry Reports*, 11(5), 415-421.
- Wong, I. Y., Mahar, D., & Titchener, K. (2015). Driven by distraction: Investigating the effects of anxiety on driving performance using the Attentional Control Theory. *Journal of Risk Research*, 18(10), 1293-1306.

- Wood, W. L., Lewandowski, L. J., Lovett, B. J., & Antshel, K. M. (2017). Executive dysfunction and functional impairment associated with sluggish cognitive tempo in emerging adulthood. *Journal of Attention Disorders, 21*(8), 691-700.
- Woody, M. L., & Gibb, B. E. (2015). Integrating NIMH research domain criteria (RDoC) into depression research. *Current Opinion in Psychology, 4*, 6-12.
- Yang, C. C., & Brown, B. B. (2015). Factors involved in associations between Facebook use and college adjustment: Social competence, perceived usefulness, and use patterns. *Computers in Human Behavior, 46*, 245-253. doi:10.1016/j.chb.2015.01.015
- Zvolensky, M. J., Bernstein, A., Marshall, E. C., & Feldner, M. T. (2006). Panic attacks, panic disorder, and agoraphobia: Associations with substance use, abuse, and dependence. *Current Psychiatry Reports, 8*(4), 279-285.