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The purpose of this study was to determine whether alcohol misuse is more likely among college students with AD/HD as compared with their non-AD/HD college peers. Forty-two students with well-defined AD/HD were recruited from an AD/HD Clinic and compared on a variety of alcohol use and misuse indices to a demographically-equivalent group of 42 college students without AD/HD. Groups were found to have equivalent rates of alcohol use, as predicted, and equivalent rates of alcohol misuse, contrary to prediction. Such findings suggest that college students with and without AD/HD do not use and misuse alcohol at different rates.

In terms of potential for alcohol misuse, college students with AD/HD had lower perceived risk about alcohol use than non-AD/HD college peers, as predicted. However, they were also found to have lower positive expectancies about alcohol use, which was opposite the direction predicted. Post hoc analyses revealed that non-medicated students with AD/HD had lower perceived risk and lower positive expectancies about alcohol use than medicated students with AD/HD and non-AD/HD college students. These findings indicate that non-medicated students with AD/HD are at differential risk for alcohol misuse in college. Implications for future research and clinical implications are discussed.

COLLEGE STUDENTS WITH AD/HD: RISK FOR ALCOHOL-RELATED CONSEQUENCES AND IMPAIRMENT

by

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CHAPTER I

INTRODUCTION

It is now well-established that attention-deficit/hyperactivity disorder (AD/HD), a disorder that originates in childhood, can persist over the course of adolescence and into adulthood (Barkley, Murphy, & Fischer, 2008; Faraone et al., 2000; Weiss & Hechtman, 1993). AD/HD impacts multiple domains of functioning across the lifespan, including academic performance, social relationships, and family life (Barkley, 2006; Faraone et al., 2000). Although it has been reported that up to 80% of children with AD/HD do not attend college (Barkley et al., 2008), due to advances in treatment and educational policies, it is likely that the rates of students with AD/HD now matriculating to college is increasing (DuPaul, Weyandt, O'Dell, & Varejao, 2009). Unfortunately, the population of college students with AD/HD is understudied and poorly understood (DuPaul et al., 2009; Weyandt & DuPaul, 2008). What literature exists suggests that students with AD/HD may suffer from more impairment in college compared with their peers, including lower GPAs, more academic problems, poorer time management, lower levels of social adjustment and social skills, higher rates of comorbid diagnoses, and greater rates of dropout (DuPaul et al., 2009).

Literature has also suggested that these students are more at risk for substance use, including alcohol use, although research outcomes from studies investigating the link between AD/HD and alcohol use and misuse in college students have demonstrated

mixed findings (e.g., Baker, Prevatt, & Proctor, 2012; Blasé et al., 2009; Glass & Flory, 2012; Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2008; Rooney, Chronis-Tuscano, & Yoon, 2011; Upadhyaya et al., 2005). This is likely in part due to difficulties defining AD/HD in adults coupled with a lack of diagnostic clarity in research studies investigating college students and AD/HD (Green & Rabiner, 2012). Inconsistencies in assessment of alcohol use outcomes may also have contributed to inconsistencies in findings. Furthermore, little theoretical attention has been paid to addressing factors coupled with AD/HD that may help explain alcohol use and misuse among college students with AD/HD (Rooney et al., 2011).

The purpose of this study was to answer the following overarching question while addressing methodological limitations of previous studies: Is alcohol misuse more likely among college students with AD/HD as compared with their non-AD/HD college peers? What is currently known about college students with AD/HD and their alcohol use and misuse will be discussed. However, in order to formulate an understanding of the potential impact of AD/HD on college students' alcohol use, it is first important to understand the normative college experience.

CHAPTER II

REVIEW OF THE LITERATURE

The Normative College Experience

In current American society, the period from late adolescence to the mid-twenties has come to be considered a unique developmental period known as *emerging adulthood* (Arnett, 2000). Many emerging adults are now postponing marriage and parenthood, typical hallmarks of adulthood, in favor of exploring several potential life directions. One common way of exploring possibilities during this period is to finish high school and enter college in order to extend one's education and training. According to the most recent Digest of Education Statistics, nearly 70% of young people receiving their high school diploma or GED in 2010 enrolled in college the following fall and 41% of all 18- to 24-year-olds in the U.S. are currently enrolled in degree-granting institutions (Snyder & Dillow, 2011). While many degree programs are designed to be completed within two or four years, students typically take more time and others ultimately never receive a degree despite initially pursuing higher education (Snyder & Dillow, 2011).

Discerning why certain students go on to receive a degree while others do not requires an understanding of the typical stressors faced by the college student. College often represents a transition to increased academic demands and self-structured activities. A college student's living environment typically changes from the family household, where life activities are more structured, to the college environment, where the burden is

placed on the student to regulate academic and self-care needs. New demands are also placed on the student to use appropriate social skills to mingle with a new group of people at their undergraduate institution. The opportunity to engage in more varied social activities away from parents, including ones that involve risk-taking, is also prevalent. Successful negotiation of college thus requires a student to adapt well to the new demands for academic and self-care needs while also facing the choice to engage in multiple risky behaviors.

Negotiating transitions successfully, such as the transition from high school to college, is thus part of the challenge as adolescents evolve into adults (Schulenberg, Maggs, & Hurrlmann, 1997). When opportunities for increased responsibility and freedom match a young person's desire and readiness for such a transition, this is theorized to result in a *developmental match*, or good fit, and it is more likely that the health and well-being of the person will be enhanced (Eccles, Lord, Roeser, Barber, & Jozefowicz, 1997). Alternatively, developmental transitions can lessen the match between an individual and the environment, resulting in a *developmental mismatch* and greater opportunity for health risks (Eccles et al., 1997).

Alcohol Use and Misuse in College

Excessive alcohol use in college represents one such health risk. Despite the fact that it is illegal for most college students to purchase alcoholic beverages, familiarity with alcohol in this population is nonetheless widespread. Data from the ongoing Monitoring the Future (MTF) study (Johnston, O'Malley, Bachman, & Schulenberg, 2011) indicate

that 82% of full-time college students[1] have tried alcohol at least once. College is also a peak time for young adults to engage in heavy and excessive alcohol use. Data from MTF on prevalence of *heavy episodic* or *binge drinking*[2] also demonstrate this fact. Of college students surveyed in 2010, 37% of students nationwide had engaged in this practice and 63% reported having been drunk. College students have consistently stood out over the past several decades as a population with high rates of heavy drinking. Although college-bound 12th grade students are less likely than their non-college-bound peers to report occasions of heavy drinking, the higher rates of heavy drinking among college students compared with non-college peers suggests that college students catch up to and surpass their non-college peers in binge drinking frequency after high school graduation (Johnston et al., 2011).

Heavy drinking in college is associated with multiple negative consequences. According to Hingson, Zha, and Weitzman (2009), 1,825 college students in the United States died in 2005 from alcohol-related unintentional injuries, and an estimated 599,000 students were unintentionally injured under the influence of alcohol. Other reported risky behaviors associated with excessive alcohol use while in college included increased incidents of drunk driving, sexual assault, unsafe or unprotected sex, and difficulty remembering if one consented to sex. Research into heavy episodic drinking and alcohol-related consequences has consistently found that college students are affected by a variety

[1] College students were defined as those respondents one to four years past high school who were actively enrolled full-time in a two- or four-year college during the year of the survey.

[2] MTF defined binging as five or more drinks in a row at least once in the prior two-week period, although NIAAA now defines a "binge" as a pattern of drinking 5 or more drinks (male) or 4 or more drinks (female) in about 2 hours.

of consequences, including physical, legal, academic, interpersonal, and sexual ramifications (Dowdall & Wechsler, 2002).

Experiencing ongoing consequences related to drinking indicates the possible presence of alcohol abuse or dependency. According to the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV-TR*; American Psychiatric Association, 2000), alcohol abuse is defined as a maladaptive pattern of alcohol use marked by persistent and significant negative consequences related to repeated use. Impairment or distress associated with alcohol abuse includes use that interferes with obligations, use that results in social problems, and use in physically hazardous situations. Alcohol dependence is described as a maladaptive pattern of alcohol use leading to tolerance or withdrawal and other cognitive, behavioral, and physiological problems as a result of using alcohol despite these symptoms (APA, 2000). Alcohol abuse and alcohol dependence are classified as the alcohol use disorders (AUDs; APA, 2000).

Research conducted by Knight and colleagues (2002) as part of the 1999 Harvard School of Public Health College Alcohol Study (CAS) found rates of drinking in their college sample nearly identical to those found by MTF, but had also included measures assessing AUDs. Of the 14,115 students included in the final sample of the study, 32% were classifiable with a diagnosis of alcohol abuse and 6% were classifiable as alcohol dependent. Furthermore, 44% of college students reported the presence of at least one symptom of either abuse or dependence. The authors estimated that at least one in every 20 college students meets criteria for a 12-month diagnosis of alcohol dependence, with a higher prevalence rate (one in 10) for college men. These numbers stand in contrast to

national prevalence estimates of alcohol abuse (5.3%) and alcohol dependence (4.4%; Lee et al., 2010), and provide further support that heavy drinking in college is often problematic.

Heavy drinking peaks in the early 20s and recedes with age after that; 32% of 29- to 30-year-olds and only 20% of 40- to 50-year olds reported engaging in heavy episodic drinking. However, there is a wide diversity in patterns of heavy drinking over time. Schulenberg and colleagues (1996) evaluated data from MTF longitudinally and identified six distinct alcohol use trajectory groups they labeled as Chronic, Decrease, Increase, Fling, Rare, and Never. They noted that women are underrepresented in the Chronic and Increase groups and are overrepresented in the Never group, while Caucasians are overrepresented in the heavy episodic drinking groups, suggesting that Caucasian males are at a greater risk for developing problems with alcohol over the course of emerging adulthood. Other known risks for a college student to develop a problem with alcohol include a complex assortment of biopsychosocial factors, including a genetic predisposition to drink, family drinking history, current peer drinking levels, perceptions of peer drinking levels, age at first drink, positive expectancies about use, lower anticipated risk about use, participation in Greek life or college athletics, greater availability of alcohol, and greater exposure to alcohol advertising (e.g., Dowdall & Wechsler, 2002).

One other noted risk factor for heavy drinking in college is the presence of psychopathology (Dowdall & Wechsler, 2002). The next section will outline how AD/HD, one of the most commonly encountered psychological disorders, actually

encompasses myriad risk factors for the college student that go beyond the primary symptoms of the disorder.

Attention-Deficit/Hyperactivity Disorder

AD/HD is defined as a persistent pattern of developmentally-inappropriate inattention and/or hyperactivity-impulsivity (APA, 2000). The *DSM-IV-TR* stipulates that to qualify for a diagnosis the individual must display clinically significant functional impairment related to AD/HD symptoms in at least two domains, such as at school, home, or with peers (APA, 2000). Six or more symptoms of hyperactivity-impulsivity and/or inattention must be present for at least six months, and some impairing symptoms must have been present before seven years of age. The symptoms must not occur exclusively during the course of a pervasive developmental or psychotic disorder and also must not be better accounted for by another disorder, such as a mood or anxiety disorder. The *DSM-IV-TR* lists three major subtypes of AD/HD: the Predominantly Inattentive Type (AD/HD-IA), Predominantly Hyperactive-Impulsive Type (AD/HD-HI), and the Combined Type (AD/HD-C), all of which vary as a function of how many symptoms of hyperactivity-impulsivity and inattention are present. Other AD/HD subtypes included in the *DSM-IV* are AD/HD Not Otherwise Specified, given when impairment related to prominent inattentive and/or hyperactive-impulsive symptoms exists without full criteria being met, and AD/HD In Partial Remission, given when individuals who previously met full criteria no longer meet full criteria for the diagnosis.

Prevalence rates for AD/HD are estimated at 3%-7% for school-aged children (APA, 2000), at 2%-8% for college students (DuPaul et al., 2009; Heilingenstein,

Conyers, Berns, & Smith, 1998; Lee, Oakland, Jackson, & Glutting, 2008), and at 3%-5% for adults (Kessler et al., 2006; Faraone & Biederman, 2005). Boys are more likely to be referred for an evaluation and are four to nine times more likely to receive a diagnosis (APA, 2000). In adults, rates of AD/HD have been shown to be more balanced for males and females (Biederman et al., 1994; Biederman, Faraone, Monuteauz, Bober, & Cadogen, 2004). Adult rates of AD/HD have been estimated to be elevated among Caucasians as compared to African Americans and Hispanics (Kessler et al., 2006). AD/HD is known to occur across cultures (APA, 2000) and across socioeconomic status levels (Barkley, 2006).

Associated Impairment. People with AD/HD face impairment in multiple domains across the lifespan, including in interpersonal, familial, occupational, and psychological functioning (Barkley, 2006; Faraone et al., 2000; Murphy et al., 2002). Academic impairment in particular is a common problem. Studies have demonstrated that adults meeting either broad or narrow criteria for AD/HD were less likely to have graduated high school, less likely to have attended college, and less likely to have completed college (Faraone & Biederman, 2005). Weiss and Hechtman (1993), in their follow-up study tracking a group of hyperactive children over time, found that while approximately 20% of those with AD/HD had attempted a college program, only 5% had completed a university degree as compared with over 41% of the control group. The UMASS study (see Barkley, 2006; Barkley et al., 2008), a study conducted by Barkley and colleagues examining the impact of AD/HD on clinic-referred adults, found that significantly fewer adults with AD/HD had graduated from college than two comparison

groups, even though the AD/HD group averaged at least two years of education beyond high school. Among the group with AD/HD who had attended college, a significantly higher percent had received unsatisfactory grades (Ds or Fs) during college, and their overall GPA was reported to be significantly lower than the two comparison groups. In a separate longitudinal study on the impact of AD/HD from childhood to adulthood, known as the Milwaukee Study (see Barkley, 2006; Barkley et al., 2008), Barkley and colleagues discovered that substantially fewer adults with AD/HD had ever enrolled in college (21% vs. 78%), and that fewer adults with AD/HD were attending college at a follow-up study (15% vs. 66%). Together, these studies suggest that the vast majority of youth with AD/HD will not attend college, and that if they do attend college, they will be less likely to succeed and obtain a degree.

AD/HD also frequently presents with co-occurring diagnoses across the lifespan (Murphy et al., 2002). Studies have consistently demonstrated that people with AD/HD are more likely to have higher lifetime rates of comorbid psychological difficulties compared to controls, including higher rates of depression, dysthymia, ODD, CD, anxiety disorders, and personality disorders (Biederman et al., 2004; Cumyn, French, & Hechtman, 2009; McGough et al., 2005). Adults with AD/HD are also at a greater risk for developing substance use disorders (SUDs). AD/HD status in childhood is associated with elevated risk for subsequent SUDs in adulthood, particularly if an externalizing disorder is present (Winters et al., 2011). By early adulthood, individuals with AD/HD are known to abuse and depend on substances at higher rates than the normative adult population (August et al., 2006; Biederman et al., 2006; Kessler et al., 2005). Research

has found that between 17%-45% of adults with AD/HD will abuse or become dependent on alcohol and between 9%-30% will abuse or become dependent on other drugs (Wilens, 2004; 2006).

Limitations of Current Criteria. It is acknowledged that problems with current AD/HD criteria exist that must be addressed in *DSM-V* (Bell, 2011). For instance, the major subtype distinctions in the adult AD/HD population, while required for a diagnosis based on *DSM-IV* criteria, have drawn criticism. Subtype classifications are not consistent over time (Kessler et al., 2010; Lahey, Pelham, Loney, Lee, & Willcutt, 2005) and it has been recommended that *DSM-V* adopt alternative ways to recognize the heterogeneity of AD/HD (Lahey & Willcutt, 2010). Research by Murphy, Barkley, and Bush (2002) has also shown that adults with AD/HD, regardless of subtype classification, manifest similar types of impairment.

There is also a need to better identify criteria that encompass difficulties related to AD/HD for college students and other adults. Current symptoms were developed with children and do not fully capture the deficits of inattention or hyperactivity-impulsivity manifested by adults, including college students (e.g., Bell, 2011; Faraone et al., 2000; McGough & Barkley, 2004). The required onset of impairing symptoms prior to age seven has also received criticism, particularly for children with inattentive difficulties who often do not demonstrate impairment until later in schooling (e.g., Applegate et al., 1997; Faraone et al., 2006). In addition, researchers examining prevalence rates of AD/HD in adults have found that the cutoff guideline of at least six symptoms sets a threshold of developmental deviance far higher than that required to determine

developmental deviance of symptoms in children (Murphy & Barkley, 1996). Problematic criteria have led some researchers investigating adult AD/HD to suggest using a less strict cutoff of symptoms when making a diagnosis and to move the age of onset criteria up to age 12 to better capture functional impairment (Faraone et al., 2006; McGough & Barkley, 2004; Murphy & Barkley, 1996).

Diagnostic Clarity. Obtaining an accurate AD/HD diagnosis is critical to informing appropriate clinical care. As evidenced by the aforementioned limitations, challenges arise when diagnosing AD/HD in college students and other adults, including child-oriented diagnostic criteria, no definitive single test for diagnosing AD/HD, complicated differential diagnoses, and high rates of comorbidity (Reilley, 2005). Further complicating this, non-AD/HD college students have been shown to on average endorse 4.5 out of the 18 *DSM-IV* AD/HD symptoms, suggesting that most college students report at least some AD/HD symptoms (Lewandowski et al., 2008). It may be that college students are vulnerable to over-reporting symptoms because the difficult transition to college results in more difficulties paying attention, concentrating, and sitting still (McKee, 2008). Alternatively, symptoms of AD/HD overlap with other disorders, such as depression and anxiety (APA, 2000), making it difficult to distinguish from other disorders. In addition, as many as 30% to 60% of college students who complete an AD/HD evaluation qualify for a diagnosis of AD/HD and a comorbid disorder (Heiligenstein, Conyers, Berns, & Smith, 1998), making differential diagnosis and assessment for other disorders crucial during evaluation.

Diagnosis in the college student is also complicated by other factors. As emerging adults, many college students, particularly those recently transitioning from their parents' households, have not yet transitioned fully to taking care of themselves. This can complicate assessment, as an assessment for AD/HD in adults will rely heavily on self-report (Murphy & Gordon, 2006). However, the validity of retrospective report of childhood AD/HD symptoms is often problematic (APA, 2000). Furthermore, one study found that as many as 40% of college students seeking an AD/HD evaluation did not recall childhood hyperactivity symptoms prior to age seven, the age of onset outlined by *DSM-IV* (Heilingenstein et al., 1998). This suggests that while college students are old enough to seek an evaluation for AD/HD on their own, they may be poor reporters of their symptoms and past impairment.

College students may also be vulnerable to feigning AD/HD symptoms because of the potential benefits that can result from a diagnosis, including access to stimulant medication and classroom accommodations (Green & Rabiner, 2012; Sollman, Ranseen, & Berry, 2010). Researchers have demonstrated that self-report AD/HD checklists and computer-based continuous performance tasks are likely of no value for distinguishing students who are faking the disorder, and few studies have addressed the sensitivity of typical AD/HD measures and techniques for detecting students who feign AD/HD symptoms (Sollman et al., 2010). These problems indicate a high need to incorporate collateral report in assessment (Nelson & Galon, 2012).

Accurate clinical diagnosis in this population is also important towards a better empirical understanding of the difficulties faced by college students with AD/HD and the

underlying mechanisms behind these difficulties. Researchers have generally lacked a comprehensive approach to AD/HD diagnosis prior to conducting research investigations, relying primarily instead on self-reported symptoms, medication status, or a self-reported diagnosis (e.g., Blasé et al., 2009; Dooling-Liftin & Rosen, 1997; Rabiner et al., 2008; Upadhyaya et al., 2005) as opposed to the recommended comprehensive, multi-informant and multi-measure approach to AD/HD diagnosis (DuPaul et al., 2009; Reilley, 2005). Without knowledge about an accurate diagnosis, it is difficult to generalize results from studies to knowledge about features of the true college AD/HD population and the efficacy of interventions with this population (Green & Rabiner, 2012).

AD/HD and the College Student

Research involving college students with AD/HD is in its infancy (DuPaul et al., 2009) despite the fact that AD/HD is one of the most common disabilities among college students (Weyandt & DuPaul, 2006). This next section will explore what is currently thought to be known about college students with AD/HD in general as well as in relation to alcohol use and misuse, bearing in mind the aforementioned limitations regarding diagnostic clarity with this population.

Associated Impairment. Cross-sectional studies involving college students suggest that students with AD/HD are at an increased risk for academic problems, including lower GPAs, poorer academic skills, and greater concern about their academic performance (Blasé et al., 2009; Heiligenstein, Guenther, Levy, Savino, & Fulwiler, 1999; Rabiner et al., 2008; Weyandt & DuPaul, 2006). College students with AD/HD also appear to be at greater risk for difficulties with social relationships and poorer

adjustment to college life (DuPaul et al., 2009; Weyandt & DuPaul, 2006). Research has demonstrated that both males and females with AD/HD report lower levels of social skills, self-esteem, and overall college adjustment than non-AD/HD college peers (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005). Several studies have noted that symptoms of inattention may be better predictive of poor academic and social functioning in college students than hyperactive-impulsive symptoms (Canu & Carlson, 2003; Frazier, Youngstom, Glutting, & Watkins, 2007; Glutting, Monaghan, Adams & Sheslow, 2002; Overbey, Snell, & Callis, 2011; Rabiner et al., 2008).

Available research also suggests that college students with AD/HD are at an increased risk for co-occurring internalizing problems, such as depression, as well as externalizing difficulties, such as aggressive behavior (DuPaul et al., 2009; Weyandt & DuPaul, 2006). In a systematic review of 42 charts of college students with AD/HD based on *DSM-III* criteria, Heiligenstein and Keeling (1995) found that over half of the students presented with a comorbid complaint, including mood disorders (21%), substance abuse problems (26%), anxiety disorders (5%), learning disorders, (2%), or eating disorders (2%). Depression appears to be a common co-occurring difficulty. Rabiner and colleagues (2008) found that students with a reported past or current diagnosis of AD/HD reported higher levels of depressive symptoms. As with academic and social functioning, the researchers found that inattentive symptoms contributed more than hyperactive-impulsive symptoms to depressive symptoms, even after controlling for other personality features. Problems with self-esteem and anger may also be more likely to exist in this population (Dooling-Liftin & Rosen, 1997; Richards, Deffenbacher, & Rosen, 2002).

Substance Use. College students with AD/HD may also be more at risk for engaging in substance use, including alcohol use, although research on this subject is considerably limited and findings are mixed (DuPaul et al., 2009; Green & Rabiner, 2012). Some research has found that AD/HD symptomatology is unrelated to alcohol use in college students. Upadhyaya and colleagues (2005) surveyed 334 college students anonymously about alcohol and drug use in relation to AD/HD and found that tobacco, marijuana, and other drug use was higher in students with a history of AD/HD, although there was no difference in reported alcohol use between the two groups. This study did not examine factors of abuse or dependence and AD/HD status was determined by a self-reported history of stimulant treatment. In an updated analysis of this same group of students, Upadhyaya and Carpenter (2008) determined that AD/HD symptom severity was unrelated to age at first use of alcohol, tobacco, or marijuana, and that while AD/HD severity was significantly related to past month and past year tobacco and marijuana use, it was not related to alcohol use. Rabiner and colleagues (2008) also determined during an initial survey of a large group of freshman students that AD/HD status was unrelated to rates or amounts of current alcohol use. Again, AD/HD status was determined only by self-reported AD/HD status. Janusis and Weyandt (2010) examined a group of students with disabilities, including 26 students with AD/HD, and found in post hoc analyses that students with AD/HD rated past month alcohol use as lower than students without AD/HD. This study did not examine factors of abuse or dependence, although AD/HD status was well-documented.

There is new empirical evidence suggesting that students with AD/HD are more likely to misuse alcohol but to still drink at similar rates as their peers. Rooney and colleagues (2011) compared a group of college students diagnosed with AD/HD through rigorous methods and a group without prominent AD/HD symptoms or history of AD/HD. A current AD/HD diagnosis was not associated with an earlier age of alcohol use initiation, likelihood of ever having used alcohol, or with the quantity or frequency of alcohol use in the past six months. Conversely, an AD/HD diagnosis was associated with higher total scores on the alcohol use disorders identification test (AUDIT), higher scores on the dangerous or hazardous use subscale on the AUDIT, and a greater likelihood of endorsing an item indicative of dependence. An AD/HD diagnosis was also associated with a greater frequency of negative consequences of use.

Newer research indicates that treatment with stimulant medication may be associated with differences in alcohol misuse. In a recent examination of college students with and without AD/HD, Baker and colleagues (2012) examined alcohol use and abuse with several measures, including the Michigan Alcohol Screening Test (MAST) and other measures. Groups were similar in terms of age, ethnicity, and gender, but group differences were found in terms of year in college. No significant difference was found between the groups on typical amount of drinks per week. When medicated versus non-medicated AD/HD students were next compared, students with AD/HD on medication reported significantly higher scores on the Total Score, Help-Seeking, and Discord subscales of the MAST, indicating more problematic drinking, with medium to large effect sizes found. Additionally, students with AD/HD on medication also reported a

significantly higher percentage of blacking out, being hospitalized due to drinking, and loss of friends/romantic partners due to drinking.

Research has also indicated that the timing of treatment with stimulant medication may make a difference in SUD outcomes. In a large web-based survey of college students, Kaloyanides and colleagues (2007) found that students who started prescription stimulants in college were significantly more likely to misuse their medication than nonprescription users. These students also reported higher rates of past month illicit drug use, marijuana use, other prescription drug misuse, alcohol and stimulant combined misuse, and drug abuse problems than non-medicated students or students who started prescription stimulant treatment in elementary or middle school.

Theoretical Conceptualization of AD/HD and Alcohol Use and Misuse in College

As previously indicated, a better understanding of alcohol use and misuse in college students with AD/HD would be facilitated by a consistent and comprehensive approach to AD/HD diagnosis prior to research investigations. In addition, it would be helpful to gain a theoretical understanding of what college students with AD/HD experience that would result in alcohol use or misuse. Because no college-specific AD/HD theoretical models currently exist, it becomes necessary to adapt established AD/HD models while also incorporating a developmental perspective to account for the college experience in combination with a biopsychosocial understanding of AD/HD and risky behavior. It is also necessary to consider what has already been learned from the college AD/HD literature.

There are direct risk factors that make the college student with AD/HD more likely to use alcohol. For people with AD/HD, neuropsychological deficits are theorized to result in observable problems in proper motor and behavioral control corresponding to the core domains of AD/HD (Barkley, 1997). Such problems indicate a direct risk for a person with AD/HD to impulsively use substances, such as alcohol, without consideration of potential negative consequences because of the lower inhibition that is the nature of the disorder. They may also be less likely to identify potential negative consequences of alcohol use, such as intoxication, hangovers, and missed class time, when acting on impulse.

Furthermore, many of the life impairments in people with AD/HD, such as problems with procrastination, disorganization, poor time management, frustration intolerance, and academic and occupational underachievement, have been conceptualized as "downstream results" of these deficits. McDermott (2000) outlined an adaptation of Beck's cognitive therapy applicable to adults with ADHD. In this adaptation, the chronic course of ADHD results in the presence of long-held dysfunctional beliefs in adults that are likely to be persistent and powerfully endorsed, leading to continued maladaptive behavior and functional impairment. The negative pattern of interactions among cognitions, emotions, and behavior in an adult with ADHD results in dysfunctional cognitive responses. The person with AD/HD may use attractive and pleasurable "distractors" to avoid these negative thoughts or to break downward cognitive spirals; this might include exercise, computer games, and social interactions, as well as self-destructive or risky behaviors, such as binge eating, impulsive sex, or alcohol use.

Safren and colleagues (Safren, Sprich, Chulvick, & Otto, 2004; Safren, Perlman, Sprich, & Otto, 2005) proposed a model of impairment adapted from this work in which the core neuropsychiatric deficits thought to underlie ADHD lead to a history of failure and chronic underachievement in several areas of life by adulthood, including in social, academic, and occupational settings (Figure 1). This history of failure engenders the development of dysfunctional thoughts and beliefs, which in turn lead to negative emotional states, including depression and anxiety. A failure to rationally respond to problems leads to ongoing functional impairment in multiple domains. Functional impairment, combined with an increased likelihood of continued alcohol use as a distractor or coping strategy, would suggest a greater likelihood of a progression to alcohol abuse and dependence.

To best conceptualize how such models are applicable to the college AD/HD population, aspects of the college environment must be taken into consideration. For any college student, availability of alcohol may represent a direct risk for increased alcohol use, as college students drink alcohol at higher rates than the general adult population (Johnston et al., 2009). Thus, it is possible that college students with AD/HD drink at higher rates than the general population with AD/HD, but not at higher rates than the college student population simply because of social norms and use rates associated with college life.

Regardless of whether college students with AD/HD use more alcohol than their peers, their use is more likely to be problematic for several reasons. The transition to college brings an increased demand for self-regulation both socially and academically for

which self-directed organizational skills are required for success. As these abilities are often impaired in the person with AD/HD, college life represents a particular challenge for this group that may once have been mitigated by parents and the more structured high school environment (Blasé et al., 2009), and previous personal coping mechanisms may not be as effective (Shaw-Zirt et al., 2005).

College students with AD/HD may also represent a unique subpopulation of people with AD/HD. Arguably, college students with AD/HD are likely to have higher ability levels, greater academic success in primary and secondary school, or other useful compensatory skills than people with AD/HD from the general population (Frazier et al., 2007; Glutting et al., 2002). Other protective factors that may propel the student with AD/HD into college could include higher family structure and SES, fewer social and psychological problems, and lower AD/HD severity. College may be the first time that the student with AD/HD experiences a high degree of failure in several areas, as previous protective factors have allowed them to succeed enough academically to be admitted to college. Because the college environment is not able to provide as much structure, resulting academic and social failures may lead to more intense dysfunctional cognitions and beliefs and negative emotions. These in turn could lead to increased failure to use positive compensatory strategies, such as organization and planning appropriately, and negative coping strategies, such as alcohol use. Such responses may perpetuate the cycle of functional impairment through increased cognitive and mood disturbance.

It remains necessary to consider the social environment of college. The transition to college is difficult for many students, not just those with AD/HD. It is likely that other

college students are underprepared and under supported for college life. The transition to college may result in a developmental mismatch for a student for reasons outside of AD/HD, including family or personal stress, lower intellect, or lack of previously-learned positive compensatory strategies. In essence, it is possible that other college students enter a similar cycle when they begin to experience academic failure, dysfunctional beliefs, and develop mood disturbances in college. These problems may also result in negative coping strategies, such as alcohol use and subsequent functional impairment. What makes this pathway more likely for the college student with AD/HD, however, is that their core deficits result in a direct risk to use and continue to use alcohol impulsively even if faced with consequences. They also carry further risk to fail to utilize and have knowledge of positive compensatory strategies that may help a student who is using alcohol at high rates succeed academically. Thus, despite being faced with the same levels of academic and social demands as other college students, the college student with AD/HD is likely to have fewer internal and external resources available, resulting in a developmental mismatch with the college environment. Thus, the presence of more risk factors accumulates may result in a greater chance of subsequent alcohol misuse (Figures 2 and 3).

Summary and Hypotheses

In current American society, the transition from adolescence to adulthood represents a unique developmental phase known as emerging adulthood (Arnett, 2000) that is often accompanied by the transition from high school to college. This transition is often associated with changes in the person's living, academic and social environment

and subsequent increased academic demands and self-structured activities. The opportunity to engage in excessive and unsafe alcohol use also becomes more prevalent in college. Data from national studies on the historical stability in rates of heavy drinking for college students suggest that excessive drinking in college has become a social and cultural phenomenon (Schulenberg & Maggs, 2002).

One noted risk factor for heavy drinking in college is the presence of psychopathology (Dowdall & Wechsler, 2002), such as AD/HD. AD/HD appears to be a risk factor for a variety of difficulties in college, including academic, social, and psychological (DuPaul et al., 2009; Weyandt & DuPaul, 2006). Unfortunately, research examining AD/HD in college students is in its infancy. Researchers thus far have typically examined college students dimensionally based on elevated AD/HD symptomatology or self-reported AD/HD status, and research with students with well-documented AD/HD is limited (Green & Rabiner, 2012).

A focus is also needed on problems these students may develop that could contribute to their difficulties in college, such as problematic alcohol use. Sparse work has been conducted examining college students with AD/HD in relation to alcohol use or misuse. Some research outcomes suggest that students with AD/HD drink similar amounts of alcohol as other college students (Rabiner et al., 2008; Upadhyaya et al., 2005; Upadhyaya & Carpenter, 2008). Researchers have also suggested that higher AD/HD symptomatology represents a greater risk for alcohol use and alcohol-related problems (Glass & Flory, 2012; Rooney et al., 2011), and that students with AD/HD are more at risk for alcohol and drug problems (Grenwald-Mayes, 2002). Mixed findings are

likely due in part to a lack of AD/HD diagnostic clarity and also in part due to inconsistencies in the measurement of alcohol use and misuse.

More research is thus needed with students with rigorously determined AD/HD diagnoses and various alcohol use outcomes that capture the multi-dimensional nature of college drinking in order to best understand levels of alcohol misuse during college in the AD/HD population. To this end, the current study sought to compare a group of college students with well-documented AD/HD to a group of college students with non-clinical levels of AD/HD symptoms on several alcohol outcome measures.

Hypotheses.

Hypothesis 1. Based on high alcohol use rates in college generally, college students with AD/HD will exhibit equivalent rates of alcohol use as non-AD/HD college peers. Alcohol use was operationalized as (a) frequency and (b) quantity of alcohol use in the past 30 days.

Hypothesis 2. College students with AD/HD will exhibit greater risk for alcohol misuse than non-AD/HD college peers. Risk for alcohol misuse was operationalized as:

(a) Greater positive expectancies about alcohol use,

(b) fewer negative expectancies about alcohol use, and

(c) lower perceived risk associated with alcohol use while in college.

Hypothesis 3. College students with AD/HD will exhibit more alcohol misuse than non-AD/HD college peers. Alcohol misuse was operationalized as endorsement of:

(a) Maximum number of drinks consumed in a 24 hour period in the past 30 days,

(b) frequency of consuming this maximum number of drinks in the past 30 days,

(c) frequency of binge drinking in the past 30 days,

(d) maximum drinks in a 24 hour period in the respondent's lifetime, and

(e) more negative consequences associated with alcohol use in the past year.

CHAPTER III

METHOD

Participants

The initial pool of participants for this study included 43 undergraduate students with AD/HD and 193 undergraduate students without AD/HD recruited from the same university. All participants were age 18 and older. The minimum age requirement of 18 ensured that students were able to provide consent for the study. Students over age 30 (n = 4) were ultimately eliminated from consideration from inclusion in analyses, as they were age outliers. This included one student, age 34, who was eliminated from the AD/HD clinical sample, reducing the final clinical sample to 42 participants. Multiple steps were taken to obtain a final non-clinical sample (N = 42) equivalent to the final clinical sample (N = 42) in terms of age, gender, race/ethnicity, year in school, and membership in Greek or college athletics, as these are factors known to impact levels of drinking in college (e.g., Dowdall & Wechsler, 2002).

Descriptive statistics concerning demographics and rating scales for the final clinical and non-clinical samples appear in Tables 1 and 2. Participants in the total sample (N = 84) ranged in age from 18 to 28 (M = 21.51, SD = 2.18). Sixty-two percent (n = 52) of the sample was female. Racial/ethnic composition was 57% (n = 48) Caucasian, 14% (n = 12) African American, 6% (n = 5) Hispanic, 5% (n = 4) Asian

American, and 3% (*n* = 2) Native American; 7% (*n* = 6) identified as Multiracial and 8% (*n* = 7) identified as "Other." Seven percent of the sample (*n* = 6) were freshman, 25% (*n* = 21) were sophomores, 41% (*n* = 34) were juniors, and 27% (*n* = 23) were seniors. Ninety three percent (*n* = 78) of the final sample reported that they were not in a fraternity or sorority, and 92% (*n* = 77) reported that they were not a college athlete. Twenty-three percent (*n* = 20) reported that they resided in a dorm, 43% (*n* = 36) reported that they resided off campus within 10 minutes, 11% (*n* = 9) resided off campus further away, 16% (*n* = 13) resided with parents, 2% (*n* = 2) resided in a fraternity or sorority house and 5% (*n* = 4) reported that they owned their own home. Nineteen percent (*n* = 16) reported that they carried a current mood disorder diagnosis and 30% (*n* = 25) reported that they carried a current anxiety disorder diagnosis.

AD/HD Group. The final AD/HD group consisted of 42 college undergraduates diagnosed with AD/HD as determined by a previous comprehensive psychological evaluation conducted at the AD/HD Clinic at UNCG. To be in the AD/HD group, students were required to meet *DSM-IV* criteria for AD/HD as shown by endorsement of clinically significant and impairing symptoms on the semi-structured AD/HD interview; accompanied by evidence of developmental deviance, defined as at or above the 90th percentile on AD/HD indices derived from student completed rating scales; corroborated by other report of clinically significant levels of either inattention and/or hyperactivity-impulsivity during childhood and during the past 6 months; and not better accounted for by another psychological disorder. All assessments were conducted by an advanced-level

doctoral student in clinical psychology or a doctoral-level psychologist under the supervision of a licensed psychologist.

Based on current disagreement about the age of onset and symptom counts necessary to make a diagnosis of AD/HD in adults (see Faraone et al., 2006; McGough & Barkley, 2004; Murphy & Barkley, 1996), some students had been diagnosed with AD/HD Not Otherwise Specified to account for full criteria not being met for age of onset or symptom count. Specifically, students who demonstrated impairment in childhood and currently that was best explained by AD/HD, but who reported symptom onset during late childhood (later than age 7) or early adolescence or who demonstrated four or more symptoms of inattention or hyperactivity-impulsivity instead of six or more symptoms were given diagnoses of AD/HD Not Otherwise Specified.

Participants in the final clinical sample ($N = 42$) ranged in age from 18 to 28 ($M = 21.76$, $SD = 2.75$). Sixty percent ($n = 25$) of the sample was female. Racial/ethnic composition was 60% ($n = 25$) Caucasian, 19% ($n = 8$) African American, 7% ($n = 3$) Hispanic, and 2% ($n = 1$) Asian American; 5% ($n = 2$) identified as Multiracial and 7% ($n = 3$) identified as "Other." Five percent of the sample ($n = 2$) were freshman, 33% ($n = 14$) were sophomores, 36% ($n = 15$) were juniors, and 26% ($n = 11$) were seniors. Ninety-five percent ($n = 40$) of the clinical sample reported that they were not in a fraternity or sorority, and 93% ($n = 39$) reported that they were not a college athlete. Nineteen percent ($n = 8$) reported that they resided in a dorm, 45% ($n = 19$) reported that they resided off campus within 10 minutes, 7% ($n = 3$) resided off campus further away, 24% ($n = 10$)

resided with parents, and 5% (*n* = 2) reported that they owned their own home. Fifty-two percent (*n* = 22) reported they were currently being treated with medication for AD/HD.

In terms of AD/HD subtype for the clinical sample, 45% (*n* = 19) had a diagnosis of AD/HD Predominantly Inattentive type, 41% (*n* = 17) carried a diagnosis of AD/HD Combined Type, and 14% (*n* = 6) carried a diagnosis of AD/HD Not Otherwise Specified. No student with AD/HD carried a subtype diagnosis of Predominantly Hyperactive-Impulsive Type or AD/HD In Partial Remission. In addition, 29% (*n* = 12) reported that they carried a current mood disorder diagnosis and 55% (*n* = 23) reported that they carried a current anxiety disorder diagnosis. Eleven percent of the sample also carried a Substance Use Disorder (SUD) diagnosis. In terms of AD/HD symptom counts, the AD/HD group reported an average of 4.19 symptoms of hyperactivity-impulsivity (*SD* = 2.53) on the ADHD-RS and 4.29 symptoms of hyperactivity-impulsivity (*SD* = 2.42) during the ADHD Interview. This group also reported an average of 6.83 symptoms of inattention (*SD* = 1.68) on the ADHD-RS and 7.60 symptoms of inattention (*SD* = 1.35) during the ADHD Interview. CAARS *T* scores for the AD/HD group ranged from 61.21 to 76.07, consistent with their clinical status.

Non-AD/HD Group. The non-clinical sample was taken from an initial sample of 193 college undergraduate students enrolled in an introductory psychology course participating in the study for required research credits for the course. Students were asked to participate only if they did not carry a past or present diagnosis of AD/HD. To be available for selection as part of the final demographic-equivalent non-clinical group, students could not meet criteria for AD/HD. Students who reported a past or current

history of AD/HD, current pharmacological treatment for AD/HD, or who endorsed four or more current symptoms of inattention or hyperactivity-impulsivity on the ADHD-RS were thus eliminated from consideration. Students who endorsed three or more infrequency items in the wrong direction were also excluded from consideration. As with the AD/HD group, students over age 30 (n = 3) were also excluded from the final sample, as they were age outliers.

From this reduced pool of non-AD/HD participants (N = 131), a final sample of 42 non-AD/HD participants was selected. Of the captured demographic factors, it was determined that equivalency in age and gender would be prioritized for group equivalency matching, followed subsequently by class rank, race/ethnicity, and participation in Greek life or college athletics. Initial attempts were made to match the non-AD/HD to the AD/HD sample on age based on random selection from the non-AD/HD pool (N = 131); however, because the age range of the non-AD/HD pool was skewed heavily by participants who were 18, a random selection procedure produced no plausible equivalent age group.

As a second option, because the AD/HD pool was skewed in terms of age by older students, the non-AD/HD pool was rank-ordered based on age, and the top 42 eldest participants were selected for comparison to the final clinical sample (N = 42). This produced a final non-clinical sample equivalent to the clinical sample in age, $t(60.89) = -1.05$, p = n.s., as well as gender, $\chi^2(1, N = 84) = .20$, p = n.s. Because of low numbers in several categories, some demographic categories were collapsed to allow statistical comparison across groups. Race/ethnicity was re-grouped into three categories

(Caucasian, African American, Other) instead of seven. Class rank was re-grouped into three categories with freshman and sophomores together as underclassmen. Living situation was collapsed into on campus or off campus. Participation in Greek life or college athletics was combined into one variable. The final samples were found to be equivalent with respect to race/ethnicity, $\chi^2(2, N = 84) = 2.92$, p = n.s., class rank, $\chi^2(2, N = 84) = 1.44$, p = n.s., living situation, $\chi^2(2, N = 84) = 2.21$, p = n.s., and participation in Greek life/college athletics, $\chi^2(1, N = 84) = 1.56$, p = n.s.

Participants in the final non-clinical sample ranged in age from 19 to 26 (M = 21.26, SD = 1.40). Sixty-four percent (n = 27) of the sample was female. Racial/ethnic composition was 55% (N = 23) Caucasian, 10% (n = 4) African American, 4% (n = 2) Hispanic, 4% (n = 2) Native American, and 7% (n = 3) Asian American; 10% (n = 4) identified as Multiracial and 10% (n = 4) identified as "Other." Ten percent of the sample (n = 4) were freshman, 17% (n = 7) were sophomores, 45% (n = 19) were juniors, and 28% (n = 12) were seniors. Ninety percent (n = 30) of the non-clinical sample reported that they were not in a fraternity or sorority, and 90% (n = 30) reported that they were not a college athlete. Twenty-eight percent (n = 12) reported that they resided in a dorm, 41% (n = 17) reported that they resided off campus within 10 minutes, 14% (n = 6) resided off campus further away, 7% (n = 3) resided with parents, 5% (n = 2) resided in a fraternity or sorority house and 5% (n = 2) reported that they owned their own home. Ten percent (n = 4) reported that they carried a current mood disorder diagnosis and 5% (n = 2) reported that they carried a current anxiety disorder diagnosis. In terms of AD/HD symptom counts, the non-clinical sample reported an average of 1.26 symptoms of

hyperactivity-impulsivity (*SD* = 1.01) and .81 symptoms of inattention (*SD* = .99) on the ADHD-RS, consistent with their non-clinical status.

Measures

Diagnostic Measures.

***ADHD-RS*.** AD/HD symptoms were assessed using the Adult ADHD Rating Scale (ADHD-RS), a version of the ADHD-RS-IV (DuPaul, Power, Anastopoulos, & Reid, 1998) modified for adults. The ADHD-RS contains 18 items corresponding to the nine inattention and nine hyperactive-impulsive symptoms from *DSM-IV* presented in alternating order. Items are rated from 0 (symptom is never or rarely present) to 3 (symptom is present very often) for occurrence in childhood (ages 5 to 12) and currently (in the past six months). The ADHD-RS yields symptom counts and severity scores for inattention and hyperactivity-impulsivity, as well as a total ADHD severity score. Internal consistencies for the subscales and total scale range from .86-.92 and test-retest reliability over four weeks is good at .78-.86 with samples of school-aged children (DuPaul et al., 1998). Reliability for college-age adults has not been previously established, and was thus examined for this study utilizing scores from a separate clinical sample of 136 college students who had completed the measure as part of an AD/HD evaluation. Internal consistency was found to be good for the inattentive symptom total (α = .82) and the hyperactive-impulsive symptom total (α = .81). For this study, the ADHD-RS self- and other-report had been administered to the clinical sample as a routine part of the evaluation process to help determine inattentive and hyperactive-impulsive symptom counts in childhood and currently. The ADHD-RS was administered

to the control sample as the main screening measure of current inattentive and hyperactive-impulsive symptom counts.

CAARS. Developmental deviance of current AD/HD symptoms had been assessed in the clinical sample using the self-report long version of the Conners Adult ADHD Rating Scale (CAARS; Conners, Erhardt, & Sparrow, 2004). The CAARS contains 63 items rated from 0 (Not at all, never) to 3 (Very much, very frequently). Separate norms are available by gender and age-group intervals. The CAARS yields *T*-scores for four factor-derived subscales (Inattention/Memory Problems, Hyperactivity/Restlessness, Impulsivity/Emotional Lability, Problems with Self-Concept) as well as four *DSM-IV* AD/HD subscales (DSM-IV Inattentive Symptoms, DSM-IV Hyperactive-Impulsive Symptoms, DSM-IV Total ADHD Symptoms, and ADHD Index). These factors have been confirmed with a normative and clinical sample (Conners et al., 1999). The CAARS has demonstrated good test-retest reliability, good criterion validity (diagnostic efficiency rate = 85%), and internal consistencies for the subscales are also good, ranging from .86-.92 (Erhardt, Epstein, Conners, Parker, & Sitarenios, 1999). The four *DSM-IV* AD/HD subscales were used to establish developmental deviance of AD/HD symptoms.

ADHD Semi-Structured Interview. A modified version of the AD/HD module from the *Diagnostic Interview Schedule for Children, Version IV* (DISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) had been administered to adults in the clinical sample as part of the AD/HD evaluation process. The DISC-IV has well-established reliability for the diagnosis of AD/HD in children (Shaffer et al., 2000). The

AD/HD module yields information about current AD/HD symptom count, age of onset, and areas of impairment. Reliability and validity of this modified interview for adults has not been previously established, and was thus examined for this study utilizing scores from a separate clinical sample of 136 college students who had completed the interview and measures as part of an AD/HD evaluation. Internal consistency was found to be adequate to good for the inattentive symptom total ($\alpha = .72$) and the hyperactive-impulsive symptom total ($\alpha = .76$). Concurrent validity of the interview was examined with the responses from the separate clinical sample of 136 college students on related CAARS DSM-IV and ADHD-RS scales. Total inattentive symptoms from the interview correlated significantly with the CAARS DSM-IV Inattentive Symptoms subscale, $r(135) = .50$, $p < .001$, as well as with the inattentive symptom count total from the ADHD-RS, $r(136) = .54$, $p < .001$. Similarly, total hyperactive-impulsive symptom from the interview correlated significantly with the CAARS DSM-IV Hyperactive-Impulsive Symptoms subscale $r(134) = .69$, $p < .001$, as well as with the hyperactive-impulsive symptom count total from the ADHD-RS, $r(135) = .63$, $p < .001$.

SCID-CV. The clinician-administered *Structured Clinical Interview for DSM Disorders – Clinician Version* (SCID-CV; First, Spitzer, Gibbon, & Williams, 1996) is a commonly used, semi-structured diagnostic interview that assesses Axis I disorders per DSM-IV criteria. The SCID-CV had been administered to the clinical sample as a routine part of evaluation to identify exclusionary and comorbid Axis I psychological disorders.

Alcohol Use Measures.

Drinking Severity. Quantity and frequency of alcohol use was assessed via a series of questions recommended by the National Association on Alcohol Abuse and Alcoholism (NIAAA, 2004) to assess average levels and patterns of alcohol consumption. These six items include (1) frequency of drinking, (2) number of drinks consumed on a typical drinking day, (3) maximum number of drinks consumed in a 24-hour period, (4) frequency of consuming this maximum number of drinks, (5) frequency of binge drinking[3], and (6) maximum drinks in a 24-hour period in the respondent's lifetime. Respondents were asked to provide answers for questions (1) through (5) based on the past 30 days and over the past 12 months. Past 30 days was used as the time frame for main analyses based on NIAAA (2004) consensus that a 30-day time window be used for college and underage subjects because it is a frequently used time frame for this age group. Questions regarding past 12 month use were asked for post hoc analytical purposes based on additional recommendations that asking about alcohol consumption over the past 12 months accounts for infrequent drinkers who may otherwise be missed. Total scores for frequency and quantity of drinking in the past 30 days and the maximum drinks in a 24-hour period were used in primary analyses.

Frequency in the past 30 days was assessed on the following scale: 0 days, 1 or 2 days, 3 to 5 days, 6 to 9 days, 10 to 19 days, 20 to 29 days, All 30 days. Responses were coded as ratings ranging from 0 to 6 and treated as continuous variables in analyses.

[3] The most widely used pattern measure of heavy consumption is "binge," defined by a Working Group of NIAAA's Council as a pattern of drinking alcohol that brings blood alcohol concentration (BAC) to 0.08 grams percent or above. For the typical adult this pattern corresponds to consuming 5 or more drinks (male) or 4 or more drinks (female) over the course of approximately two hours.

Number of drinks was assessed on the following scale: no drinks, 1 drink, 2 drinks, 3 to 4 drinks, 5 to 6 drinks, 7 to 8 drinks, 9 to 11 drinks, 12 to 15 drinks, 16 to 18 drinks, 19 to 24 drinks, 25 or more drinks. Responses were coded as ratings from 0 to 10 and treated as continuous variables in analyses. Internal consistency for these items was shown to be good ($\alpha = .87$) with the current overall sample. Frequency in the past 12 months was assessed on the following scale: 0 times, 1 or 2 times in the past year, 3 to 11 times in the past year, once a month, 2 to 3 times a month, once a week, twice a week, 3 to 4 times a week, 5 to 6 times a week, Every day. Responses were coded as ratings ranging from 0 to 9 and treated as continuous variables in analyses. Internal consistency for these items was also shown to be good ($\alpha = .89$) with the current sample.

Drinking Consequences. Consequences associated with heavy drinking in college were assessed with the 48-item Young Adult Alcohol Consequences Questionnaire (YAACQ; Read, Kahler, Strong, & Colder, 2006). This measure was designed to capture a broad range of alcohol-related consequences experienced by male and female college students. Respondents are asked to indicate whether they have (Yes) or have not (No) experienced the particular negative consequence in the past year as a result of drinking. Responses of "Yes" are scored as 1 and responses of "No" are scored as 0. Response totals are then summed. Several symptoms of alcohol abuse and dependence as defined by *DSM-IV* are assessed. The measure yields a total score representing a broad spectrum of consequences and contains eight subscales focused on particular domains of consequences. These specific domains are (1) Social-Interpersonal Consequences; (2) Impaired Control; (3) Self-Perception; (4) Self-Care; (5) Risky Behaviors; (6)

Academic/Occupational Consequences; (7) Physical Dependence consistent with *DSM-IV* criteria; and (8) Blackout Drinking. Internal reliabilities for the subscales have been shown to be adequate to good (α = .70-.91) and the scale has demonstrated good concurrent validity with other alcohol use measures (Read et al., 2006). The total score was used in primary analyses.

Drinking Expectancies. Drinking expectancies, the beliefs that people have about the effect of alcohol on their behavior, mood, and emotions, was assessed with the 34-item Alcohol Outcome Expectancies Scale (AOES; Leigh & Stacy, 1993). Respondents are asked to choose along a six-point scale ranging from 1 (no chance) to 6 (certain to happen) how likely a particular outcome would be to occur when they drink. Items include both desirable (positive) and undesirable (negative) consequences of alcohol drinking (e.g. "I am more accepted socially," or "I get into fights"). A positive and negative expectancies subscale score is then calculated. Internal reliabilities for the subscales have been shown to be adequate to good (α = .73-.90) and the scale has demonstrated good convergent and discriminant validity (Leigh & Stacy, 1993). The positive and negative expectancies subscales were used in primary and post hoc analyses.

Perceived Risk. Perceived risk of consequences from drinking was assessed with 13 items previously used with a normative college sample named the Perceived Risk Scale (PRS; Lewis, 2007). Respondents are asked to rate on a scale of 0 (No risk) to 3 (Great risk) how likely it is that they would experience several consequences as a result of alcohol use, such as being dismissed from the university or needing to seek legal assistance. The scale has demonstrated good reliability (α = .83) in a previous study with

college students (Lewis, 2007). The total score from the scale was used in primary and post hoc analyses.

Other Psychological Symptoms.

BDI. Symptoms of depression were examined dimensionally with the total score from the Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996) as opposed to categorical mood disorder diagnoses. The BDI is a 21-item multiple-choice self-report measure of depressive symptomology. Respondents are asked to rate to what degree they have experienced each symptom during the past two weeks, with higher ratings indicating more severe depressive symptoms. The BDI has well-established validity and has demonstrated excellent reliability (α = .91-.93) in outpatient samples (Beck et al., 1996; Dozois, Dobson, & Ahnberg, 1998). The BDI was administered for total score consideration in post hoc analyses.

BAI. Symptoms of anxiety were examined dimensionally with the total score from the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) as opposed to categorical anxiety disorder diagnoses. The BAI is a 21-item self-report measure of anxiety symptomatology. Respondents are asked to rate how often they have been bothered by a particular symptom in the past week on a scale of 0 (not at all) to 3 (severely) The BAI has demonstrated high internal reliability (α = .92) and a one-week test-retest reliability of 0.75 (Beck et al., 1998). The BAI was administered for total score consideration in post hoc analyses.

Other Measures.

General Information Form. Basic information was collected from all participants regarding age, race/ethnicity, gender, overall GPA, year in college, current living situation, and association with Greek life or college athletics. The form also requested clinically relevant information, including self-reported past or current diagnosis of AD/HD, current mood or anxiety disorder diagnosis, as well as current status of accessing pharmacotherapy for AD/HD.

Infrequency Scale. The Infrequency Scale (Chapman & Chapman, 1986) is a 13-item measure designed to detect careless and random response styles. Items are self-descriptive and are rated as true/false. Items of this scale are designed to have a very low probability of being endorsed in a certain direction. For example, the item "there have been a number of occasions when people I know have said hello to me," being endorsed as false would be an indicator of random or careless responding. Participants endorsing three or more of these items in the unexpected direction were not included in statistical analyses.

Procedure

The clinical sample was recruited via one of the following three ways. First, after undergoing evaluation procedures and receiving feedback from their respective clinician at the AD/HD Clinic, some students with AD/HD were alerted by their clinician that they were eligible for the project and asked if they would like to be contacted about the study. If they agreed, they were contacted by the researcher and provided with information about the study and the opportunity to participate. Other students with AD/HD who had

recently (i.e., within the past year) completed an AD/HD evaluation were contacted about the project directly by the researcher and offered the chance to participate. Lastly, students with AD/HD who had recently completed a grant-funded pilot project at the AD/HD Clinic and whose AD/HD clinical status had been confirmed by AD/HD Clinic staff were alerted by research staff about the project and then contacted by the researcher. Students from this pilot project shared a summary of their clinical scores, which were used to confirm eligibility for the current project.

Clinical participants completed the General Information Form, BDI, BAI, and all of the alcohol measures after consenting. Each clinical participant was also asked to sign an Authorization to Release PHI form (see Appendix G), which outlined how information already completed by the student as part of the evaluation process (i.e., ADHD-RS, final diagnoses) would be accessed and used as part of the current study. Before leaving, the researcher checked the BDI. No participant endorsed suicidal ideation on the BDI, defined as a score of 2 or higher on the suicidality question. Clinical participants were provided with a small gift card incentive ($10) in addition to a list of referrals to local mental health services after completing measures. Questionnaires included a unique ID number for de-identification purposes. The researcher entered all data from the clinical group for analysis. All 42 students with AD/HD scored two or less on the Infrequency scale.

Non-clinical participants were recruited through participation in the study for course credit as part of an introductory psychology course. Packets of questionnaires that included the General Information Form, ADHD-RS, BDI, BAI, and all of the alcohol

measures were administered by the researcher to groups of students after they consented to the study. Questionnaires included a unique ID number for de-identification purposes. The General Information Form appeared first, and then the order of the measures matched the order given to the clinical group, with clinical measures presented first in random order and alcohol measures presented second in random order. Participants were provided with a list of referrals to local mental health services after completing the measures and were awarded course research credit for participation. Before leaving, the researcher checked the BDI for each student. No participant endorsed suicidality on the BDI. Data from the full non-AD/HD group (N = 193) were entered into a database by supervised advanced-level undergraduate students. Data from the selected final non-AD/HD group (N = 42) were double-entered by the researcher prior to analyses. All 42 non-AD/HD students scored two or less on the Infrequency scale.

CHAPTER IV

RESULTS

Preliminary Inspection of Dependent Variables

All analyses were conducted using SPSS Version 20.0 (IBM, 2011). A univariate examination of data indicated that four dependent variables violated assumptions of normality: past 30 day frequency of consuming maximum number of drinks (NIAAA #4), past 30 day frequency of binge drinking (NIAAA #5), positive alcohol expectancies from the AOES, and total perceived risk from the PRS. The PRS total score and NIAAA questions #4 and #5 were log transformed, resulting in normally distributed variables. The positive alcohol expectancies subscale was not able to be transformed to produce a subscale with better kurtosis, and thus was not transformed for analyses. Next, a multivariate examination of data utilizing Mahalanobis' distance (D^2) scores and a p-value of .05 indicated that the variables from the planned third MANOVA violated assumptions of multivariate normality. Closer inspection of these five variables utilizing z-scores indicated that outliers existed for the YAACQ total score; thus, the total YAACQ score was also log transformed, resulting in acceptable D^2 scores at the .05 alpha level for all three planned MANOVAs.

Final skew statistics for all main analysis variables ranged from -.73 to .94; final kurtosis statistics for all main analysis variables ranged from -1.17 to .61; the positive

alcohol expectancies subscale had kurtosis of 2.14. Thus, all data, except for positive alcohol expectancies, fulfilled univariate and multivariate normality assumptions. Descriptive statistics of all dependent variables are found in Table 3.

Beyond examining univariate and multivariate normality, assumptions for MANOVA include requirements that linear relationships exist among all pairs of dependent variables, although strong multicollinear relationships (i.e., correlations above .70) decrease statistical efficiency and are reason for concern because of statistical redundancy (French, Macedo, Poulsen, Waterson, & Yu, 2006). Relevant correlations among dependent variables for each of the three planned MANOVAs were all significant and fell between .26 and .68 (see Table 4); thus, the assumptions of linearity and non-multicollinearity were met and MANOVA was deemed an appropriate statistical technique. Furthermore, Box's *M* was found to be non-significant for all MANOVA analyses run, indicating a lack of evidence that the homogeneity of the variance-covariance matrix assumption was violated for these analyses. Alpha was set at .05 to determine significance for all tests.

Main Analyses

To test the first hypothesis that college students with AD/HD would exhibit equivalent rates of alcohol use as non-AD/HD college peers, a MANOVA was run with two dependent variables: frequency and quantity of alcohol use in the past 30 days (i.e., NIAAA questions #1 and #2). A one-way MANOVA revealed a non-significant main effect, Wilks' $\lambda = .99$, $F(2, 81) = .15$, p = n.s., partial $\varepsilon^2 = .004$. Power to detect the effect was .07. Because power to detect effects was notably low, effect sizes were examined per

Cohen (1992). Cohen's *d* for variables was calculated by subtracting the group means of each variable and dividing the result by the overall variable standard deviation to determine whether the mean differences between groups was meaningful without regard to sample size (Table 5). Effect size estimates for variables utilized for hypothesis one were all non-meaningful.

To test the second hypothesis that college students with AD/HD would exhibit greater risk for alcohol misuse than non-AD/HD college peers, a second MANOVA was run with three dependent variables: the AOES positive expectancies subscale score, the AOES negative expectancies subscale score, and the total score from the PRS. A one-way MANOVA revealed a significant main effect, Wilks' $\lambda = .88$, $F(3, 80) = 3.67$, $p = .02$, partial $\varepsilon^2 = .12$. Power to detect the effect was adequate at .78. Levene's test was non-significant for all three variables, indicating a lack of evidence against homogeneity of error variances and appropriateness of univariate follow-up tests.

Three follow-up ANOVAs were conducted to further examine main effects. A significant univariate effect was found for positive alcohol expectancies, $F(1, 83) = 8.53$, $p = .004$, $\eta^2 = .09$. The effect was opposite the direction predicted, as students with AD/HD reported significantly lower positive alcohol expectancies ($M = 68.93$, $SD = 15.90$) than students without AD/HD ($M = 78.07$, $SD = 12.59$). Power to detect the effect was adequate at .82. The effect size estimate for positive alcohol expectancies was medium (Cohen's $d = .61$). The second follow-up univariate test indicated no significant differences in negative alcohol expectancies between groups, $F(1, 83) = .24$, $p =$ n.s., $\eta^2 = .003$. Power to detect this effect was weak at .08. The third follow-up univariate test

indicated a significant difference in perceived risk, $F(1, 83) = 4.44$, $p = .04$, $\eta^2 = .05$. Students with AD/HD reported lower perceived risk ($M = .95$, $SD = 1.12$) than non-AD/HD students ($M = 1.48$, $SD = 1.16$), as was predicted. Power to detect the effect was weak at .55. The effect size estimate for perceived risk was medium (Cohen's $d = .46$).

To test the final hypothesis that college students with AD/HD would exhibit greater alcohol misuse than non-AD/HD college peers, a final MANOVA was run with five dependent variables: maximum number of drinks consumed in a 24 hour period in the past 30 days (NIAAA Question #3), frequency of consuming this maximum number of drinks in the past 30 days (NIAAA Question #4), frequency of binge drinking in the past 30 days (NIAAA Question #5), maximum drinks in a 24 hour period in the respondent's lifetime (NIAAA Question #6), and the total score from the YAACQ. A one-way MANOVA revealed a non-significant main effect, Wilks' $\lambda = .97$, $F(5, 78) = .83$, $p =$ n.s., partial $\varepsilon^2 = .12$. Power to detect the effect was weak at .16. Effect size estimates for variables utilized for hypothesis three were all non-meaningful.

Post-hoc Analyses

In order to further explore non-significant findings from hypotheses one and three, five separate NIAAA questions were substituted that reported on alcohol use and misuse over the past 12 months as opposed to over the past 30 days. Examining past 12-month use of substances is another common way to assess substance use, as it accounts for infrequent drinkers who may otherwise be missed (NIAAA, 2004). MANOVA analyses for hypotheses one and three were then re-run.

To re-examine the first hypothesis that college students with AD/HD would exhibit equivalent rates of alcohol use as non-AD/HD college peers, a new MANOVA was run utilizing frequency and quantity of alcohol use in the past 12 months (NIAAA Questions #7 and #8). Variables fulfilled assumptions of multivariate normality, linearity and non-multicollinearity. A one-way MANOVA revealed a non-significant main effect, Wilks' $\lambda = .98$, $F(2, 81) = .99$, $p = .38$, partial $\varepsilon^2 = .02$. Power to detect the effect was weak at .22. Effect size estimates for related variables were all non-meaningful.

To re-examine the third hypothesis that college students with AD/HD would exhibit greater alcohol misuse than non-AD/HD college peers, another MANOVA was planned with five dependent variables: the three new past 12-month use variables (maximum number of drinks consumed in a 24-hour period in the past 12 months (NIAAA Question #9), frequency of consuming this maximum number of drinks in the past 12 months (NIAAA Question #10), and frequency of binge drinking in the past 12 months (NIAAA Question #11)), in addition to lifetime maximum drinks in a 24 hour period (NIAAA Question #6) and the total score from the YAACQ. Skew and kurtosis values of the variables fell within normal limits; however, NIAAA Question #6 was highly correlated with NIAAA Question #9 and was therefore dropped, leaving four variables for the analysis. A one-way MANOVA revealed a non-significant main effect, Wilks' $\lambda = .99$, $F(4, 79) = .07$, $p = .02$, partial $\varepsilon^2 = .001$. Power to detect the effect was weak at .06. Effect size estimates for variables utilized were all non-meaningful.

In order to further examine hypothesis two and related findings, post hoc analyses were run examining medicated (n = 22) and non-medicated (n = 20) students with

AD/HD as separate groups in addition to non-AD/HD students (n = 42). This was done based on recent findings that medication status in addition to AD/HD status may be associated with differences in alcohol misuse in college (Baker et al., 2012; Datillo, Murphy, Van Eck & Flory, 2013). A one-way ANOVA utilizing the three groups indicated that there was a significant group difference in positive expectancies, $F(2, 81) = 7.74$, $p = .001$, $\eta^2 = .16$. Follow-up *t*-tests revealed that non-medicated students with AD/HD reported significantly lower positive expectancies about alcohol use ($M = 63.25$) than medicated students with AD/HD, $t(40) = 2.32$, $p = .025$, and non-ADHD students, $t(60) = 4.09$, $p < .001$. On the other hand, medicated students with AD/HD ($M = 74.09$) reported similar levels of positive expectancies about alcohol use as non-AD/HD students ($M = 78.07$), $t(62) = 1.11$, p = n.s. Effect size estimates were medium when comparing non-medicated students with AD/HD to medicated students with AD/HD (Cohen's $d = .72$) and large when comparing non-medicated students with AD/HD to non-AD/HD students (Cohen's $d = .98$).

This analysis set was continued examining the three groups utilizing the transformed perceived risk scale. A one-way ANOVA indicated that there was a significant group difference in perceived risk, $F(2, 81) = 5.74$, $p = .005$, $\eta^2 = .12$. Follow-up *t*-tests revealed that non-medicated students with AD/HD reported significantly lower perceived risk about alcohol use ($M = .49$) than medicated students with AD/HD, $t(37.68) = 2.79$, $p = .008$, and non-ADHD students, $t(60) = 3.40$, $p < .001$. On the other hand, medicated students with AD/HD reported similar levels of perceived risk about alcohol use ($M = 1.38$) as non-AD/HD students ($M = 1.48$), $t(62) = .34$, p =

n.s. Effect size estimates (Cohen, 1992) were medium when comparing non-medicated students with AD/HD to medicated students with AD/HD (Cohen's $d = .77$) and large when comparing non-medicated students with AD/HD to non-AD/HD students (Cohen's $d = .85$).

CHAPTER V

DISCUSSION

Although AD/HD is one of the most common disabilities among college students, research involving college students with AD/HD is limited (DuPaul et al., 2009). Literature that does exist has not typically investigated substance use, and literature involving college students, AD/HD and substance use has demonstrated conflicting results. Potential problems with past literature include lack of true consideration of AD/HD diagnostic status as well as inconsistency in assessing substance use. In order to build on previous literature in the area of AD/HD and alcohol use in college students, the current study involved comparison of a group of college students with well-documented AD/HD and a group of college students who clearly did not meet criteria for AD/HD on several measures of alcohol use and misuse. This study is unique in that it is one of the first studies where college students underwent a rigorous AD/HD evaluation prior to research participation. Additional methodological strengths of the present study are the good reliability demonstrated with utilized measures and the equivalency matching procedure used to procure the non-AD/HD group that allowed for control over the potential confounding effects of demographic factors (e.g., age, gender, race/ethnicity, class rank, living situation, and participation in Greek organizations or college athletics) known to be related to alcohol use and misuse differences in college students.

Because college is a time when young adults are drinking at high rates generally, it was first hypothesized that the group of college students with AD/HD would exhibit equivalent rates of alcohol use as non-AD/HD college peers. Although not typical to predict the null hypothesis, as Kazdin (1998) discusses, predicting the null hypothesis within the context of several hypotheses can be informative for demonstrating whether particular relations do or do not hold across a set of circumstances or measures, such as alcohol use versus misuse. As hypothesized, frequency and quantity of alcohol use in the past 30 days was not found to be significantly different between the AD/HD and non-AD/HD groups. Similarly, as demonstrated in post hoc analyses, frequency and quantity of alcohol use over the past 12 months was also comparable between these two groups. Such findings are consistent with previously reported research (Datillo et al., 2013; Rabiner et a., 2008; Upadhyaya et al., 2005; Upadhyaya and Carpenter, 2008) and suggest that college students with AD/HD are not more likely to use alcohol than students without AD/HD. However, it is important to note that power was low for all of these analyses, and so it is unclear whether these results were based on a true lack of group differences.

It was secondarily hypothesized that college students with AD/HD would exhibit greater risk for alcohol misuse than non-AD/HD college peers. This hypothesis was based on empirical evidence indicating that while students with AD/HD drink at similar rates as their peers, they are more likely to misuse alcohol (Baker et al., 2012; Rooney et al., 2011). This is also consistent with theoretical notions of direct (e.g., Barkley, 1997) and indirect (e.g., Safren et al., 2005) risk for impulsive and risky behaviors in people

with AD/HD. As predicted for hypothesis two, students with AD/HD reported lower perceived risk than non-AD/HD students. In other words, students with AD/HD reported that they would be less likely to get into trouble as a result of alcohol use in college. Such a finding suggests that students with AD/HD may be at higher risk for alcohol misuse. A medium effect size was demonstrated with involved variables.

Contrary to expectations, AD/HD students reported lower positive expectancies about alcohol use. Stated differently, students with AD/HD reported fewer expected positive benefits from using alcohol than students without AD/HD. This finding suggests that students with AD/HD in this study may be at lower risk for alcohol misuse, contrary to the findings regarding positive expectancies. Power for these results was adequate, and a large effect size was demonstrated with the involved variables. No differences were found between the groups on negative expectancies regarding alcohol use.

To further examine these findings, post hoc analyses were run examining medicated and non-medicated students with AD/HD separately in comparison to non-AD/HD students. These analyses revealed a significant group difference in perceived risk. Non-medicated students with AD/HD reported significantly lower perceived risk about alcohol use than both of the other groups. In other words, non-medicated students with AD/HD reported that alcohol use would be less risky for them in college than medicated students with AD/HD and non-AD/HD students. Effect size estimates were medium when comparing non-medicated students with AD/HD to medicated students with AD/HD and large when comparing non-medicated students with AD/HD to non-AD/HD students.

When the three groups were also compared on positive expectancies for post hoc analyses, once again medicated students with AD/HD appeared similar to non-AD/HD students. Non-medicated students with AD/HD reported significantly lower positive expectancies about alcohol use than both medicated students with AD/HD and non-ADHD students, although medicated students with AD/HD reported similar levels of positive expectancies about alcohol use as non-AD/HD students. In essence, non-medicated students with AD/HD expected that alcohol use would result in fewer positive associated benefits than medicated students with AD/HD and non-AD/HD students. Effect size estimates were medium when comparing non-medicated students with AD/HD to medicated students with AD/HD and large when comparing non-medicated students with AD/HD to non-AD/HD students.

It was lastly hypothesized that college students with AD/HD would exhibit greater actual alcohol misuse than non-AD/HD peers, consistent with the theoretical notions and empirical evidence that was used to justify examining risk for alcohol misuse for hypothesis two. Contrary to expectations, alcohol misuse, defined utilizing variables assessing alcohol misuse over the past 30 days, was not significantly different between the two groups. Similarly, a post hoc analysis utilizing variables assessing alcohol misuse over the past 12 months revealed no significant differences between the two groups. This finding suggests that there are no differences in actual alcohol misuse between college students with and without AD/HD. As with hypothesis one, it was of note that power was low for the analyses, so again it was unclear whether results were based on a true lack of group differences.

Potential Explanations for Findings

Overall, results indicate that college students with AD/HD are not more likely to use or misuse alcohol than students without AD/HD. Other studies have found that there are potentially differences in alcohol misuse, but not use, between these two groups, as was predicted for this study. However, the methodological strengths of this study (e.g., rigorous diagnosis of AD/HD in the clinical group, a demographically-equivalent non-AD/HD group, and good reliability of the alcohol measures) indicate that lack of comprehensive consideration of these issues may have contributed to mixed findings in this population in the past.

Lack of consideration of whether students with AD/HD were or were not on medication may also have contributed to past mixed results. Post hoc findings from this study found that non-medicated students with AD/HD reported that alcohol use in college is less risky but also associated with less expected fun than medicated students with AD/HD and non-AD/HD students. The results for perceived risk are generally consistent with hypothesized predictions. However, the results for positive expectancies are opposite the direction predicted. These results are puzzling and contradict prediction based in several theoretical ideas. As summarized by Datillo and colleagues (2013) and consistent with theoretical notions discussed for this study, college students with AD/HD would be theoretically more likely to report higher positive alcohol expectancies than non-AD/HD peers for several reasons. Impulsivity, a core feature of the disorder, may lead people with AD/HD to hastily make positive cognitive appraisals about the effects of alcohol without thinking through their consequences. Indeed, impulsivity and positive

expectancies have both been shown to independently be associated with alcohol use in a group of college students (Carlson & Johnson, 2012). People with AD/HD have also been shown to exhibit greater reward sensitivity, and may thus be more strongly influenced by potential positive outcomes associated with alcohol. Additionally, individuals with AD/HD, who tend to have poorer social and interpersonal skills, may view engaging in the widely accepted behavior of alcohol use in college as a more immediate route to better peer relationships.

Furthermore, as noted from post hoc analyses, non-medicated college students with AD/HD looked less similar to medicated AD/HD students. Relatedly, medicated students with AD/HD appeared more similar to non-AD/HD college peers. Several potential explanations for such findings are offered. As stimulant medication remains the main treatment for AD/HD (e.g., Safren et al., 2010), it could be expected that medicated students with AD/HD would look similar to college students without AD/HD; in effect, medication "normalizes" students with AD/HD so that they are functioning at the level of the typical non-AD/HD student. This could help explain why medicated AD/HD and non-AD/HD students reported similar yet higher levels of perceived risk regarding alcohol use than non-medicated AD/HD students. Stimulant medication is thought to work by stimulating activity in the central nervous system, resulting in blocked reuptake of dopamine and norepinephrine and/or increased release of dopamine. This allows for increased functioning in the frontal lobe and associated executive functions, thereby increasing a person's ability to pay attention, inhibit actions and think through decisions (Connor, 2006). In essence, the medicated student with AD/HD may be better able to

think through the consequences of actions, such as alcohol use, and recognize that alcohol use in college could lead to risks such as academic or legal problems. However, in a similar vein, one would also predict that the medicated college student with AD/HD would be less likely to have positive expectancies about alcohol use, as they are better able to think through the negative consequences of alcohol use, as are their non-AD/HD peers.

So why then would medicated students with AD/HD and non-AD/HD students expect more positive benefits from alcohol use in college than non-medicated AD/HD students? Perhaps the non-medicated students with AD/HD are experiencing more distress about their overall functioning than these other two groups, and are therefore less likely to view alcohol as a positive choice at a time when AD/HD symptoms are not being controlled. Consistent with the Safren model (Safren et al., 2005), non-medicated students with AD/HD could be considering their history of failure in areas such as academic and social situations, and thus do not want to add to impairment by drinking alcohol. While medicated and non-medicated AD/HD students reported similar levels of AD/HD symptoms, a measure assessing perceived functional impairment was not given, and thus this question remains unanswerable at present.

Prescription medication may likewise provide the students with AD/HD more confidence that alcohol use will not interfere with obligations, such as academic work, because AD/HD symptoms can be controlled. If students with AD/HD are on medication that has already been helpful for controlling symptoms, they may be better able to assess that alcohol use is risky, but believe that their medication will allow them to catch up

with academic and other obligations even if they choose to drink excessively. Thus, they endorse more positive expectancies about alcohol use, similar to non-AD/HD peers who do not have to contend with problematic levels of AD/HD symptoms.

Limitations

Although promising, interpretation of these findings must be tempered by a consideration of the limitations inherent in the design of this study. One possible limitation, for example, is sample size. Power calculations prior to the study indicated the need for a total final sample size of 92 participants (46 with AD/HD and 46 without AD/HD) for MANOVA analyses to detect a medium effect size with .80 power at alpha level .05. The current study nearly reached the recruitment goal, with 43 students with AD/HD and 193 students without AD/HD recruited for the study and a final sample size of 84 (42 students with AD/HD and 42 students without AD/HD). Post hoc power calculations for hypotheses one and three indicated low power to detect differences. However, related non-significant effect sizes indicate that given the amount of variability in alcohol use and misuse between the group of students with AD/HD and the group of students without AD/HD, comparison of the two groups in terms of alcohol use and misuse may not have been meaningful. While increased sample size could potentially have helped, it may also be that there are no differences between students with and without AD/HD in terms of alcohol use and actual misuse. Furthermore, the current study sample size did allow for detection of differences in perceived risk and positive alcohol expectancies, with medium to large effect sizes found for a priori and post hoc hypotheses. Ideally, a higher number of medicated and non-medicated students with

AD/HD would have been recruited to allow for a demographically-equivalent, three-group comparison across all of the hypotheses proposed.

Sample size did, however, prevent the ability to parse out the influence of gender; although groups were equivalent in terms of gender, a larger sample size would have allowed for 2 x 2 MANOVA or ANOVA analyses examining the potential differential influence of gender in addition to AD/HD. Both male and female college students have higher rates of binge drinking than their counterparts not in college, but college males report a higher prevalence of getting drunk and binge drinking than college females (Johnston et al., 2011) and are known to be at greater risk for developing problems with alcohol over the course of emerging adulthood (Schulenberg et al., 1996). Males with AD/HD have also been found to have higher rates of alcohol use disorders, other SUDs, and antisocial personality disorder (Biederman et al., 2004). As such, it could have been predicted that males with AD/HD are most at risk for alcohol misuse in college as compared to AD/HD females and non-AD/HD males and females.

Another limitation is that this study only utilized students from one four-year public university in the Southeast, and thus findings cannot be generalized to other college groups. The study was cross-sectional in nature, which does not allow for causal inference, assessment of directionality, or the exploration of potential for change over time. Another limitation is the low numbers of freshman and sophomores recruited for inclusion in the AD/HD group, and hence in the final non-AD/HD group. The AD/HD group was also composed of many older students. This limited examination of alcohol use and misuse in early college students. Students with disabilities, such as AD/HD, are

more likely to pursue a 2- versus a 4-year degree and are more likely to be under qualified for a 4-year program (Horn & Berktold, 1999). They may therefore be more likely to drop out of a 4-year program earlier, which could in part explain why low levels of freshman students with AD/HD were available for the study. Alternately, students may not become aware of the need for AD/HD assessment until further in to college when it is more apparent that they are struggling, and they may thus not have presented for evaluation at the AD/HD Clinic until after their freshman year.

How alcohol use and misuse was assessed for the study is another potential limitation. In particular, the NIAAA questions used for the study, while recommended as questions to assess frequency and quantity of use, had no available reliability or validity data. However, these measures demonstrated good reliability for the current study. Similarly, while the YAACQ and PRS were designed with college students, the AOES scale was not. Particularly in light of significant findings regarding positive expectancies in the current study, a measure well-established as valid for use with the college population, such as the Comprehensive Effects of Alcohol Questionnaire (CEOA; e.g., Datillo et al., 2013), could be used in future studies.

Another limitation is how psychopharmacological treatment was assessed for the current study. Examining medication status was a post hoc idea that resulted in some interesting differences that were not able to be explored further with the current sample. Only one question in the current study asked about medication management for AD/HD in a generic way (see Appendix H): “Are you currently being treated with medication for AD/HD or ADD?” This study did not assess whether medication treatment was stimulant

or non-stimulant treatment, although presumably the majority of pharmacotherapy was with stimulant medication, as this remains the most common treatment for AD/HD (Connor, 2006). Nonmedical stimulant medication use in college has also been shown to be associated with alcohol use disorders (Garnier-Dykstra, Caldeira, Vincent, O'Grady, & Arria, 2012) as well as with increased rates of alcohol, cigarette, and other illicit substance use over the past year (Rabiner et al., 2009) in college populations. Assessment of if and how stimulant medication was being used and whether it was being misused could have been helpful for better understanding why medicated students with AD/HD reported higher positive expectancies.

Future Research

Bearing in mind the aforementioned limitations, the obtained findings suggest several areas for future research. Sparse work has been conducted examining college students with AD/HD in relation to alcohol use or alcohol use problems. Literature remains mixed about whether students with AD/HD are more likely to use and misuse alcohol than their non-AD/HD college peers, and mixed findings are likely due in part to a lack of AD/HD diagnostic clarity and inconsistency in measurement of alcohol use and misuse. The current study is unique in design approach in that a rigorously diagnosed group of AD/HD college students was compared to a well-defined demographically-equivalent sample. Replication of the current study with a different sample is warranted to help determine if findings related to perceived risk and positive expectancies are reproducible. Additionally, more diagnostic tools for assessing alcohol use and misuse in the college population are needed (Devos-Comby & Lange, 2008). More research is

needed with students with rigorously determined AD/HD diagnoses to examine their levels of current alcohol use and misuse in order to determine how their use may change over the course of adolescence and throughout the transition to college. Future research could also involve groups of early college students across different universities assessed over time in order to better capture AD/HD students who struggle more and who drop out sooner, potentially in part due to alcohol misuse.

Current findings also highlight the need for further work to be done examining the multidimensional nature of AD/HD medication users in college and the relation to substance use outcomes. This is particularly true for stimulant medication use, as it remains the standard treatment for AD/HD. Research has consistently shown that although AD/HD status in childhood is associated with elevated risk for development of SUDs in adulthood overall, childhood treatment of AD/HD with stimulant medication does not increase this risk (e.g., Kaloyanides et al., 2007; Winters et al., 2011). However, nonmedical use of stimulant medication in college students with and without AD/HD is a well-documented phenomenon (e.g., Arria et al., 2010; Garnier-Dykstra et al., 2012; Rabiner et al., 2009). The most common reason given for stimulant abuse is the prolonged ability to study and "cram" for academic work; other reasons given include to get high and to prolong the effects of alcohol or other drugs. Such misuse of prescription stimulants is not uncommon even in AD/HD students, and it is associated with greater substance-related problems in college samples (Datillo et al., 2013). For instance, Sepulveda and colleagues (2011) examined 55 past-year prescription stimulant medication users in college and their substance use behaviors. Forty percent of students

reported misuse of medication and 36% reported diversion of their medication. Among medication misusers compared to students who used their medication appropriately, medication misusers reported significantly higher rates of binge drinking; more negative consequences of alcohol use, cocaine use, and other illicit drug use; and they were more likely to screen positive for drug abuse problems. These findings indicate that assessing how college students on stimulants are actually utilizing their medication is likely important for understanding risk for substance use outcomes in research studies. More generally, the current findings, in combination with other related research (e.g., Baker et al., 2012; Kaloyanides et al., 2007), indicate the need to examine medicated and non-medicated college students with AD/HD as separate populations when examining substance use and misuse. In a related manner, the potential impact of other types of treatment, including psychotherapy and use of academic support services, could be examined as factors in relation to substance use and misuse.

A broader understanding of the unique college student AD/HD population is also necessary in combination with a focus on problems they may develop, such as alcohol use disorders. Research thus far has typically examined college students with high AD/HD symptomatology and their related impairments. This work, in combination with some work with college students with diagnosed AD/HD and research that has utilized retrospective reporting by adults with AD/HD, indicates a high probability that college students with AD/HD are at higher-than-average risk for academic impairment and underachievement in college, in addition to greater risk for social, psychological, and substance use problems (e.g., DuPaul et al., 2009). Longitudinal research indicates that

up to 75% of students with AD/HD who enroll in college later drop out (Barkley et al., 2008).

Other researchers have suggested that the majority of college students with AD/HD are functioning well, and that perhaps it is a minority group of college students with AD/HD who are struggling in several areas (Blasé et al., 2009; Wilmshurst et al., 2011). It has been argued (e.g., Frazier et al., 2007; Glutting et al., 2002; Green & Rabiner, 2012) that students with AD/HD who have experienced sufficient academic success to warrant admission to college may be better adjusted or have more useful compensatory skills than the general population of young adults with AD/HD, and they may therefore not show the same pattern of difficulties as the general population of adults with AD/HD. This may translate into fewer problems with substances than the general population of adults with AD/HD. Inclusion of non-college AD/HD peers as a comparison group when examining substance use and misuse and other domains of functioning remains an unexplored possibility.

More research is also needed on the broader college student population with diagnosed AD/HD to determine risk and protective factors during college that may help or hinder progress and completion of higher education. To this end, a better understanding of demographic factors that may impact adjustment in college for the student with AD/HD is needed. The current study utilized students from only one large southeastern public university. College factors, such as availability of resources for students with AD/HD, size of the college, and the amount of structure provided in classes and by professors, may also influence how well a student with AD/HD is able to perform.

Gender, ethnicity, age, and AD/HD severity differences may all also influence the AD/HD student's ability to appropriately adapt to their college environment. Other factors, such as prior experience at another college or in a job, may also limit impairment during college. Longitudinal studies of college students with well-defined AD/HD across college campuses that also examine substance misuse and medication status are clearly needed (DuPaul et al., 2009).

Clinical Implications

The current study demonstrated that, contrary to prediction, students with AD/HD report lower positive expectancies about alcohol use and lower perceived risk about the consequences of alcohol use than their non-AD/HD college peers. Further investigation in post hoc analyses revealed that students with AD/HD not being treated with medication have lower positive expectancies and lower perceived risk associated with drinking than students with AD/HD on medication and non-AD/HD peers. Possible explanations for these findings have been offered. It is possible that while medication may in effect "normalize" students with AD/HD to the point that they are more like their non-AD/HD peers, this "normalization" is also related to similar views and behaviors as non-AD/HD college peers, including more positive expectancies about alcohol use despite higher perceived risk about alcohol use. While it remains unclear what drives these outcomes, the findings have important clinical implications for identifying young adults at high risk for heavy or problematic drinking in college and for working with college students with AD/HD.

Positive alcohol expectancies and low perceived risk related to alcohol use are constructs well linked to increased risk for alcohol use and misuse in the college population and otherwise (e.g., Jones, Corbin, & Fromme, 2001). Lower perceived risk places the AD/HD students, and in particular the non-medicated students with AD/HD in this study, at higher risk for potential alcohol misuse. However, lower positive alcohol expectancies in this group are a protective factor. If an impulsive person, such as a student with AD/HD, does not expect positive benefits from drinking, poorer impulse control will not likely be related to this person's ability to inhibit drinking (Carlson & Johnson, 2012). On the other hand, greater positive alcohol expectancies found for the medicated AD/HD students places them at higher risk for alcohol misuse, potentially more so than non-AD/HD peers. In the only other known study to examine AD/HD symptoms and positive alcohol expectancies in a college sample, Datillo and colleagues (2013) found that AD/HD symptoms moderated the relation between positive alcohol expectancies and overall alcohol-related problems, such that students with high levels of AD/HD symptoms who also held more positive alcohol expectancies reported more alcohol-related problems than students with low levels of AD/HD symptoms.

Consideration of medication management on alcohol use behaviors in the college population is also suggested by the findings. Physicians who work with college students with AD/HD and prescribe stimulants should provide psychoeducation to ensure that students are aware of the risks of stimulant medication misuse, including the risks of using stimulants with alcohol, prior to prescribing. Alternately, because stimulant medication carries a risk for misuse and diversion in the college student population

(Rabiner et al., 2009), prescribing physicians may want to consider non-stimulant medications with low abuse potential as a first line of treatment for young adults, particularly those with substance use or antisocial disorders (Nelson & Galon, 2012; Upadhyaya et al., 2005). Non-stimulant psychotropic medication treatments for AD/HD such as atomoxetine, antidepressants, and antiseizure medications have been recommended in the treatment of college students with AD/HD; however, no controlled studies of these medications have been undertaken for the treatment of college students (DuPaul et al., 2009).

Providing college students with access to alcohol-related psychoeducation, support and services is important for reducing high rates of alcohol use or preventing increasing rates of use during college, regardless of medication status. Educational information about the detrimental effects and problems associated with heavy alcohol use (e.g., legal consequences, health problems, risky sexual behavior) could be provided through a university's Office of Disability Services, where students with AD/HD often seek services, or the university's Counseling Center. In addition, intervention and educational programming targeting students with AD/HD could be included in general required substance use programming for incoming freshmen students. Students could be screened regarding perceived risk and substance use expectancies as part of this incoming experience to better identify students most at risk for problematic drinking. Similarly, if students have already experienced and been identified as having alcohol-related problems, assessment of expectancies and perceived risk in addition to broader assessment of alcohol and other substance use patterns could be completed. Students

could then receive alcohol expectancy challenge interventions if indicated (Scott-Sheldon et al., 2012).

Early identification and intervention, including symptom control, with college students with a history of AD/HD may be beneficial for improving social skills and self-esteem and preventing academic problems (Dooling-Liftin & Rosen, 1997). From a developmental perspective, improving the match between the developmental needs of the person and the context in which they are housed during a transition should translate to diminished health risks associated with the transition (Schulenberg et al., 1997). Work remains to be done at the individual college level to ensure that students with AD/HD are aware of and have appropriate access to services at their college (Meaux, Green, & Broussard, 2009). It may be beneficial for colleges to provide mental health screenings for students with a history of AD/HD or other psychological disorders prior to beginning college and after their first or second semester in order to assess their adjustment to college life. This could improve students' knowledge of and access to appropriate university resources, such as academic accommodations and counseling services, which could in turn prevent academic failure and pervasive functional impairment.

Psychosocial options are an underutilized and understudied treatment modality for adults with AD/HD (Knouse & Safren, 2010). Brief, structured, and short-term psychosocial treatments for adults with AD/HD, including cognitive behavioral therapy, dialectical behavior therapy, and metacognitive strategies have garnered some empirical support (Knouse & Safren, 2010; Weiss et al., 2008), although no empirical studies have investigated psychosocial interventions on the symptoms or associated impairment of

college students with AD/HD (DuPaul et al., 2009). AD/HD coaching is another behavioral intervention that has demonstrated benefits with college students with AD/HD (Field et al., 2010); however, this intervention lacks targeted cognitive restructuring components (Prevatt et al., 2011) that may provide broader benefits for students with AD/HD. Other common interventions for AD/HD include academic accommodations, such as books on tape, note taking services, distraction-free rooms, and extra time for tests. While these accommodations appear to make intuitive sense, they lack empirical studies investigating their actual effectiveness (Weyandt & DuPaul, 2008), and one study has suggested that extended time is of no benefit to students with AD/HD (Lindstrom & Gregg, 2007). Research investigating the benefits of academic accommodations, alone or in combination with other interventions such as tutoring, is needed. Obviously very little is known about the effects of typically recommended treatment for college students with AD/HD, and more controlled investigations of pharmacotherapy, psychosocial, and educational interventions and the degree to which they impact multiple areas, not just AD/HD symptomatology, is necessary (DuPaul et al., 2009).

Conclusion

The current investigation is one of the first studies to compare a rigorously-defined AD/HD sample with a demographically-equivalent non-AD/HD sample on several measures of alcohol use and misuse. Consistent with previous findings (e.g., Baker et al., 2012; Rooney et al., 2011), college students with AD/HD reported similar levels of alcohol use as AD/HD college peers. No differences were found regarding alcohol misuse, which was contrary to expected findings. However, these findings

indicate that college students with and without AD/HD may not use and misuse alcohol at different rates when true AD/HD clinical status and demographic factors are accounted for with regards to research methodology. In terms of risk for alcohol misuse, college students with AD/HD had lower positive expectancies about alcohol use than non-AD/HD college peers, but they were also found to have lower perceived risk about alcohol use. This latter finding is consistent with theoretical notions that people with AD/HD are more at risk for engaging in risky behavior because of problems with behavioral inhibition and assessment of consequences. Post hoc analyses further indicated that non-medicated students with AD/HD reported lower positive expectancies and lower perceived risk about alcohol use than medicated students with AD/HD and non-AD/HD peers. Such findings put non-medicated students with AD/HD at differential risk for problems related to alcohol misuse. Clearly there is a need for more work examining alcohol use and misuse in well-defined AD/HD college samples, and a further need to examine the potential effects of pharmacotherapy and other treatments on alcohol misuse in this population.

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APPENDIX A

NIAAA ITEMS ASSESSING ALCOHOL USE

Primary Analyses Questions

1. During the last 30 days, how often did you have any kind of drink containing alcohol? *By a drink we mean half an ounce of absolute alcohol (e.g. a 12 ounce can or glass of beer or cooler, a 5 ounce glass of wine, or a drink containing 1 shot of liquor).*[a]
2. During the last 30 days, how many alcoholic drinks did you have on a typical day when you drank alcohol?[b]
3. During the last 30 days, what is the largest number of drinks containing alcohol that you drank within a 24-hour period?[b]
4. During the last 30 days, how often did you drink this largest number of drinks?[a]
5. During the last 30 days, how often did you have 5 or more (males) or 4 or more (females) drinks containing any kind of alcohol within a two-hour period? *[That would be the equivalent of at least 5 (4) 12-ounce cans or bottles of beer, 5 (4) five ounce glasses of wine, 5 (4) drinks each containing one shot of liquor or spirits].*[a]
6. During your lifetime, what is the largest number of drinks containing alcohol that you drank within a 24-hour period?[b]

Post hoc Analyses Questions

7. During the last 12 months, how often did you have any kind of drink containing alcohol? *By a drink we mean half an ounce of absolute alcohol (e.g. a 12 ounce can or glass of beer or cooler, a 5 ounce glass of wine, or a drink containing 1 shot of liquor).*[c]
8. During the last 12 months, how many alcoholic drinks did you have on a typical day when you drank alcohol?[b]
9. During the last 12 months, what is the largest number of drinks containing alcohol that you drank within a 24-hour period?[b]
10. During the last 12 months, how often did you drink this largest number of drinks?[c]
11. During the last 12 months, how often did you have 5 or more (males) or 4 or more (females) drinks containing any kind of alcohol within a two-hour period? *[That would be the equivalent of at least 5 (4) 12-ounce cans or bottles of beer, 5 (4) five ounce glasses of wine, 5 (4) drinks each containing one shot of liquor or spirits].*[c]

[a]The following scale was used: 0 days, 1 or 2 days, 3 to 5 days, 6 to 9 days, 10 to 19 days, 20 to 29 days, All 30 days

[b]The following scale was used: No drinks, 1 drink, 2 drinks, 3 to 4 drinks, 5 to 6 drinks, 7 to 8 drinks, 9 to 11 drinks, 12 to 15 drinks, 16 to 18 drinks, 19 to 24 drinks, 25 or more drinks

[c]The following scale was used: 0 times, 1 or 2 times in the past year, 3 to 11 times in the past year, once a month, 2 to 3 times a month, once a week, twice a week, 3 to 4 times a week, 5 to 6 times a week, Every day

APPENDIX B

ALCOHOL OUTCOME EXPECTANCIES SURVEY (AOES)

Here is a list of some effects or consequences that some people experience after drinking alcohol. How likely is it that these things happen to you when you drink alcohol? Please circle the number that best describes how drinking alcohol would affect you.

(If you do not drink at all, you can still fill this out: Just answer it according to what you think would happen to you if you did drink.)

WHEN I DRINK ALCOHOL:

HOW LIKELY IS IT THAT THIS WOULD HAPPEN?

		No chance	Very unlikely	Unlikely	Likely	Very Likely	Certain to Happen
1.	I am more accepted socially	1	2	3	4	5	6
2.	I become aggressive	1	2	3	4	5	6
3.	I am less alert	1	2	3	4	5	6
4.	I feel ashamed of myself	1	2	3	4	5	6
5.	I enjoy the buzz	1	2	3	4	5	6
6.	I become clumsy or uncoordinated	1	2	3	4	5	6
7.	I feel good	1	2	3	4	5	6
8.	I get into fights	1	2	3	4	5	6
9.	I can't concentrate	1	2	3	4	5	6
10.	I have a good time	1	2	3	4	5	6
11.	I have problems driving	1	2	3	4	5	6
12.	I feel guilty	1	2	3	4	5	6
13.	I get a hangover	1	2	3	4	5	6
14.	I feel happy	1	2	3	4	5	6
15.	I get a headache	1	2	3	4	5	6
16.	I am more sexually assertive	1	2	3	4	5	6
17.	It is fun	1	2	3	4	5	6

18.	I get mean	1	2	3	4	5	6
19.	I have problems with memory and concentration	1	2	3	4	5	6
20.	I am more outgoing	1	2	3	4	5	6
21.	It takes away my negative moods and feelings	1	2	3	4	5	6
22.	I have more desire for sex	1	2	3	4	5	6
23.	It is easier for me to socialize	1	2	3	4	5	6
24.	I feel pleasant physical effects	1	2	3	4	5	6
25.	I am more sexually responsive	1	2	3	4	5	6
26.	I feel more social	1	2	3	4	5	6
27.	I feel sad or depressed	1	2	3	4	5	6
28.	I am able to talk more freely	1	2	3	4	5	6
29.	I becomre more sexually active	1	2	3	4	5	6
30.	I feel sick	1	2	3	4	5	6
31.	I feel less stressed	1	2	3	4	5	6
32.	I am friendlier	1	2	3	4	5	6
33.	I experience unpleasant physical effects	1	2	3	4	5	6
34.	I am able to take my mind off my problems	1	2	3	4	5	6

APPENDIX C

PERCEIVED RISK SCALE (PRS)

While a student at your university or college, how likely is it that you personally will experience the following consequences resulting from alcohol use?

1. Lose driver's license?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

2. Lose financial aid?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

3. Blocked from pursuing a particular academic major?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

4. Being dismissed from the university?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

5. Being subjected to monetary fines?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

6. Need to seek legal assistance?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

7. Get in trouble with parents or family?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

8. Have a blackout or forget what you did?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

9. Damage property?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

10. Get hurt or "beat up" physically?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

11. Attending mandatory counseling?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

12. Need emergency assistance from medical staff?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

13. Other university sanctions not mentioned (e.g., probation, community service, prohibited drinking on campus, etc.)?
☐ No risk ☐ Minimal Risk ☐ Moderate Risk ☐ Great Risk

APPENDIX D

YOUNG ADULT ALCOHOL CONSEQUENCES QUESTIONNAIRE (YAACQ)

Below is a list of things that sometimes happen to people either during, or after they have been drinking alcohol. Next to each item below, please circle either the YES or NO to indicate whether that item describes something that has happened to you IN THE PAST YEAR.

In the past year...

1.	While drinking, I have said or done embarrassing things.	NO	YES
2.	The quality of my work or schoolwork has suffered because of my drinking.	NO	YES
3.	I have felt badly about myself because of my drinking.	NO	YES
4.	I have driven a car when I knew I had too much to drink to drive safely.	NO	YES
5.	I have had a hangover (headache, sick stomach) the morning after I had been drinking.	NO	YES
6.	I have passed out from drinking.	NO	YES
7.	I have taken foolish risks when I have been drinking.	NO	YES
8.	I have felt very sick to my stomach or thrown up after drinking.	NO	YES
9.	I have gotten into trouble at work or school because of drinking.	NO	YES
10.	I often drank more than I originally had planned.	NO	YES
11.	My drinking has created problems between myself and my boyfriend/girlfriend/spouse, parents, or other near relatives.	NO	YES
12.	I have been unhappy because of my drinking.	NO	YES
13.	I have gotten into physical fights because of drinking.	NO	YES
14.	I have spent too much time drinking.	NO	YES
15.	I have not gone to work or missed classes at school because of drinking, a hangover, or illness caused by drinking.	NO	YES
16.	I have felt like I needed a drink after I'd gotten up (that is, before breakfast).	NO	YES
17.	I have become very rude, obnoxious or insulting after drinking.	NO	YES
18.	I have felt guilty about my drinking.	NO	YES
19.	I have damaged property, or done something disruptive such as setting off a false fire alarm, or other things like that after I had been drinking.	NO	YES
20.	Because of my drinking, I have not eaten properly.	NO	YES
21.	I have been less physically active because of drinking.	NO	YES
22.	I have had "the shakes" after stopping or cutting down on drinking (eg., hands shake so that coffee cup rattles in the saucer or have trouble lighting a cigarette).	NO	YES
23.	My boyfriend/girlfriend/spouse/parents have complained to me about my drinking.	NO	YES

24.	I have woken up in an unexpected place after heavy drinking.	NO	YES
25.	I have found that I needed larger amounts of alcohol to feel any effect, or that I could no longer get high or drunk on the amount that used to get me high or drunk.	NO	YES
26.	As a result of drinking, I neglected to protect myself or my partner from a sexually transmitted disease (STD) or an unwanted pregnancy.	NO	YES
27.	I have neglected my obligations to family, work, or school because of drinking.	NO	YES
28.	I often have ended up drinking on nights when I had planned not to drink.	NO	YES
29.	When drinking, I have done impulsive things that I regretted later.	NO	YES
30.	I have often found it difficult to limit how much I drink.	NO	YES
31.	My drinking has gotten me into sexual situations I later regretted.	NO	YES
32.	I've not been able to remember large stretches of time while drinking heavily.	NO	YES
33.	While drinking, I have said harsh or cruel things to someone.	NO	YES
34.	Because of my drinking I have not slept properly.	NO	YES
35.	My physical appearance has been harmed by my drinking.	NO	YES
36.	I have said things while drinking that I later regretted.	NO	YES
37.	I have awakened the day after drinking and found that I could not remember a part of the evening before.	NO	YES
38.	I have been overweight because of drinking.	NO	YES
39.	I haven't been as sharp mentally because of my drinking.	NO	YES
40.	I have received a lower grade on an exam or paper than I ordinarily could have because of my drinking.	NO	YES
41.	I have tried to quit drinking because I thought I was drinking too much.	NO	YES
42.	I have felt anxious, agitated, or restless after stopping or cutting down on drinking.	NO	YES
43.	I have not had as much time to pursue activities or recreation because of drinking.	NO	YES
44.	I have injured someone else while drinking or intoxicated.	NO	YES
45.	I often have thought about needing to cut down or stop drinking.	NO	YES
46.	I have had less energy or felt tired because of my drinking.	NO	YES
47.	I have had a blackout after drinking heavily (i.e., could not remember hours at a time).	NO	YES
48.	Drinking has made me feel depressed or sad.	NO	YES

APPENDIX E

INFREQUENCY SCALE (IFS)

Please answer the following True/False questions. Please choose only one.

1. On some mornings, I didn't get out of bed immediately when I first woke up.
☐ True ☐ False

2. There have been a number of occasions when people I know have said hello to me.
☐ True ☐ False

3. There have been times when I have dialed a telephone number only to find that the line was busy.
☐ True ☐ False

4. At times when I was ill or tired, I have felt like going to bed early.
☐ True ☐ False

5. On some occasions I have noticed that some other people are better dressed than myself.
☐ True ☐ False

6. Driving from New York to San Francisco is generally faster than flying between these cities.
☐ True ☐ False

7. I believe that most light bulbs are powered by electricity.
☐ True ☐ False

8. I go at least once every two years to visit either northern Scotland or same part of Scandinavia.
☐ True ☐ False

9. I cannot remember a time when I talked with someone who wore glasses.
☐ True ☐ False

10. Sometimes when walking down the sidewalk, I have seen children playing.
☐ True ☐ False

11. I have never combed my hair before going out in the morning.
☐ True ☐ False

12. I find that I often walk with a limp, which is the result of a skydiving accident.
☐ True ☐ False

13. I cannot remember a single occasion when I have ridden on a bus.
☐ True ☐ False

APPENDIX F

CONSENT FORM

Project Title: Alcohol Use Among College Students with and without AD/HD
Project Director: Arthur D. Anastopoulos, PhD and Jessica Benson, MA

Participant's Name (Please Print): _____

What is the study about?
This is a research project. The purpose of this study is to examine whether AD/HD (attention-deficit/hyperactivity disorder) is related to use and misuse of alcohol during college.

Why are you asking me?
You are being asked to participate because you are an undergraduate student at UNCG. You can participate even if you do not have AD/HD or have never used alcohol before. Some students who participate will have recently completed an evaluation at the AD/HD Clinic at UNCG and will have received a diagnosis of AD/HD. Other students are being asked to participate even if they do not have AD/HD or have not gone through an evaluation. Only students at UNCG and only students who are 18 years old or older are being asked to participate.

What will you ask me to do if I agree to be in the study?
You are being asked to complete a set of questionnaires that ask about your behavior, alcohol use, and beliefs about alcohol use. This set of questionnaires should take between 30 and 45 minutes to complete. You will complete questionnaires either at the AD/HD Clinic at UNCG or in a room reserved for the purpose of administering the questionnaires by the student researcher.

Is there any audio/video recording?
No audio or video recording will be used for this project.

What are the dangers to me?
The Institutional Review Board at the University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants. Some of the questionnaires ask about personal information, such as recent alcohol use, consequences you may have experienced by using alcohol, and depression and anxiety symptoms you may be feeling. These questions may cause you to feel uncomfortable. You may skip any questions that make you feel uncomfortable, and you may call or speak to project staff to have your questions answered. Participation is completely voluntary. You may withdraw from the project at any time without penalty.

If you have any concerns about your rights, how you are being treated or if you have questions, want more information or have suggestions, please contact Eric Allen in the Office of Research Compliance at UNCG at (336) 256-1482. Questions, concerns or complaints about this project or benefits or risks associated with being in this study can be answered by calling project staff at 336-346-3196 to reach the student researcher, Jessica Benson, M.A. (ext. 302) or the principal investigator, Arthur D. Anastopoulos, Ph.D. (ext. 303).

Are there any benefits to me for taking part in this research study?
There are no direct benefits to you.

Are there any benefits to society as a result of me taking part in this research?
This project may help us better understand whether AD/HD puts college students at risk for problems with alcohol. This information could be used to help us to better prevent alcohol use problems in college students.

Will I get paid for being in the study? Will it cost me anything?
If you learned about this project through your involvement with the AD/HD Clinic or via posted flyer, you will receive a gift card ($10) after completing questionnaires. If you signed up for the study through an introductory psychology class, you will receive research credit or extra credit towards the class after completing questionnaires.

How will you keep my information confidential?
All information obtained in this study is strictly confidential unless disclosure is required by law. However, if your answers tell us that you may be at risk for harming yourself or someone else, we will need to speak to you. Names will not be on any of the questionnaires. Each participant will be assigned a special ID number before being given their questionnaires. The only people who will see information about you are the researchers involved in this project. Your name will not be used in any reports from this study. The forms that you complete will be stored in locked file cabinets. Passwords will protect information that has been entered on a computer. All information will be destroyed five years after the conclusion of this project.

What if I want to leave the study?
You have the right to refuse to participate or to withdraw at any time, without penalty. If you do withdraw, it will not affect you in any way. If you choose to withdraw, you may request that any of your data which has been collected be destroyed unless it is in a de-identifiable state.

What about new information/changes in the study?
If significant new information relating to the study becomes available which may relate to your willingness to continue to participate, this information will be provided to you.

Voluntary Consent by Participant:
By signing this consent form you are agreeing that you read, or it has been read to you, and you fully understand the contents of this document and are openly willing consent to take part in this study. All of your questions concerning this study have been answered. By signing this form, you are agreeing that you are 18 years of age or older and are agreeing to participate.

_____ _____

Signature **Date**

APPENDIX G

AUTHORIZATION TO DISCLOSE PHI FORM

Jessica Benson, M.A. at the University of North Carolina at Greensboro is conducting a study investigating the relation between AD/HD and alcohol use and misuse in college students. She is requesting permission to contact college students who have received an AD/HD diagnosis after partaking in a comprehensive evaluation at the AD/HD Clinic at UNCG to see if these students are willing to participate in the study.

By signing below, you are authorizing the AD/HD Clinic at UNCG to release your name, your telephone number, your diagnosis/diagnoses, and questionnaire and interview results from your recently completed AD/HD evaluation to Jessica Benson. This authorization will expire in 1 year, unless you revoke it in writing before that time. (A revocation will not apply to any personal health information that was released under this authorization before the date of revocation.)

If you choose NOT to authorize release of this information, it will not affect your health care at the AD/HD Clinic. The AD/HD Clinic will not receive any money or benefit from releasing this information. You have a right to inspect or copy the information to be disclosed. You also have a right to receive a copy of this authorization.

If you allow release of this information to Jessica Benson, the information will no longer be subject to the Health Information Portability and Accountability Act (HIPAA). Jessica Benson may disclose it without contacting you again for authorization.

I authorize the AD/HD Clinic at UNCG to release the following information to Jessica Benson:

- Name
- Telephone number
- My diagnosis/diagnoses
- Questionnaire and diagnostic interview results from my recently completed AD/HD evaluation

Print Name: _____ Date: _____

Signature: _____

APPENDIX H

BACKGROUND INFORMATION FORM

What is your gender? ☐ Male ☐ Female ☐ Other What is your age in years? _____

How do you identify yourself? (Please check only one)

- ☐ Caucasian/White
- ☐ African American/Black
- ☐ Multiracial
- ☐ Latino-American/Hispanic
- ☐ Asian American
- ☐ Native American
- ☐ Other

Based on completed credit hours, what is your class rank? (Please check only one)

☐ Freshman ☐ Sophomore ☐ Junior ☐ Senior

At this time, what is your overall cumulative grade point average (GPA)? For example, if your overall GPA is "2.3," you would circle "2" in the first row and "3" in the second row.

0 1 2 3 4

0 1 2 3 4 5 6 7 8 9

☐ I don't have a GPA yet

Which situation best describes your current living quarters? (Please check only one)

- ☐ On campus in a residence hall/dorm
- ☐ Off campus apartment or rented house within a 10 minute drive from campus
- ☐ Off campus apartment or rented house more than a 10 minute drive from campus
- ☐ At home with parent(s)
- ☐ Fraternity or sorority house
- ☐ I own my own home

Are you a member of a fraternity or sorority at UNCG? ☐ Yes ☐ No

Are you a member of an athletic team at UNCG?` ☐ Yes ☐ No

Have you ever been diagnosed with Attention-Deficit/Hyperactivity Disorder (AD/HD or ADD?)

☐ Yes ☐ No

If yes, were you diagnosed with Attention-Deficit/Hyperactivity Disorder (AD/HD or ADD) at the AD/HD Clinic at UNCG while in college? ☐ Yes ☐ No

Are you currently being treated with medication for AD/HD or ADD? ☐ Yes ☐ No

Do you currently carry a mood disorder diagnosis (e.g., Depression, Bipolar Disorder)?

☐ Yes ☐ No

Do you currently carry an anxiety disorder diagnosis (e.g., Panic Disorder, Generalized Anxiety Disorder, Obsessive-Compulsive Disorder, Social Phobia)? ☐ Yes ☐ No

APPENDIX I

TABLES

Table 1. Demographic Characteristics of Clinical and Non-Clinical Samples

	Total Sample (N = 84)	AD/HD (n = 42)	Non-AD/HD (n = 42)
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Age	21.51 (2.18)	21.76 (2.75)	21.26 (1.40)
Grade Point Average	2.80 (.61)	2.73 (.59)	2.87 (.64)
	% (n)	% (n)	% (n)
Gender			
Male	38.1% (32)	40% (17)	36% (15)
Female	61.9% (52)	60% (25)	64% (27)
Race/Ethnicity			
Caucasian/White	57.1% (48)	60% (25)	55% (23)
African American/Black	14.3% (12)	19% (8)	10% (4)
Multiracial	7.1% (6)	5% (2)	10% (4)
Latino-American/Hispanic	6.0% (5)	7% (3)	4% (2)
Asian American	4.8% (4)	2% (1)	7% (3)
Native American	2.4% (2)	--	4% (2)
Other	8.3% (7)	7% (3)	10% (4)
Class Rank			
Freshman	7.1% (6)	5% (2)	10% (4)
Sophomore	25% (21)	33% (14)	17% (7)
Junior	40.5% (34)	36% (15)	45% (19)
Senior	27.4% (23)	26% (11)	28% (12)
Extracurricular			
Member of Greek organization	7.1% (6)	5% (2)	10% (4)
Member of college athletic team	8.3% (7)	7% (3)	10% (4)
Current Living Situation			
On campus in a dorm	23.85 (20)	19% (8)	28% (12)
Off campus within a 10 minute drive	42.9% (36)	45% (19)	41% (17)
Off campus more than a 10 minute drive	10.7% (9)	7% (3)	14% (6)
At home with parent(s)	15.5% (13)	24% (10)	7% (3)
Fraternity or sorority house	2.4% (2)	--	5% (2)
I own my own home	4.8% (4)	5% (2)	5% (2)

Table 2. Psychological Characteristics of Clinical and Non-Clinical Samples

	AD/HD (n = 42)	Non-AD/HD (n = 42)
	M (*SD*)	*M* (*SD*)
ADHD-RS		
HI Total Symptom Count**	4.19 (2.53)	1.26 (1.01)
IA Total Symptom Count**	6.83 (1.68)	.81 (.99)
BDI Total Score	10.17 (8.22)	8.00 (6.52)
BAI Total Score	12.05 (8.34)	10.38 (9.01)
CAARS (T-scores)		
Inattention/Memory Problems	72.48 (8.62)	---
Hyperactivity/Restlessness	61.21 (11.38)	---
Impulsivity/Emotional Lability	58.95 (12.87)	---
Problems with Self-Concept	61.81 (10.69)	---
DSM-IV IA Symptoms	82.64 (11.22)	---
DSM-IV HI Symptoms	62.07 (14.29)	---
DSM-IV Total ADHD Symptoms	76.07 (10.81)	---
ADHD Index	66.00 (7.86)	---
ADHD Interview		
HI Total Symptom Count	4.29 (2.42)	---
IA Total Symptom Count	7.60 (1.35)	---
	% (n)	% (n)
Mental Health		
Current AD/HD medication	52% (22)	--
Current mood disorder diagnosis	29% (12)	10% (4)
Current anxiety disorder diagnosis	55% (23)	5% (2)

Note. ADHD-RS = ADHD-Rating Scale Adult Version; HI = Hyperactive-Impulsive; IA = Inattentive; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; CAARS = Conners' Adult ADHD Rating Scale; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, 4th Edition. ** $p < .001$

Table 3. Descriptive Statistics for Outcome Variables for Total Sample (N = 84)

	M	*SD*	Min	Max	Skew	Kurtosis
NIAAA Alcohol Use Questions						
#1	1.83	1.38	0	5	.11	-1.16
#2	2.02	1.61	0	6	.48	-.48
#3	2.82	2.31	0	6	.71	.28
#4 Transformed	.56	.36	0	1.79	-.21	.61
#5 Transformed	.34	.46	0	1.61	.94	-.37
#6	4.88	2.45	0	10	-.21	-.21
#7	3.52	2.26	0	7	-.10	-1.25
#8	2.27	1.51	0	6	.28	.61
#9	3.62	2.36	0	10	.22	-.38
#10	1.83	1.37	0	5	.74	-.26
#11	1.69	1.72	0	7	.92	.06
YAACQ Transformed Total	1.75	1.17	0	3.71	-.38	-1.17
AOES Positive Expectancies	73.50	14.98	19	112	-.73	2.14
AOES Negative Expectancies	41.49	10.43	14	64	-.21	-.06
PRS Transformed Total	1.21	1.16	0	3.69	.48	-1.05

Note. NIAAA = National Association on Alcohol Abuse and Alcoholism; YAACQ = Young Adult Alcohol Consequences Questionnaire; AOES = Alcohol Outcome Expectancies Scale; PRS = Perceived Risk Scale

Table 4. Relevant Correlations Among MANOVA Variables for Final Sample (N = 84)

	Variable	1	2	3	4	5	6	7	8	9	10
1	NIAAA #1	---									
2	NIAAA #2	.67**	---								
3	AOES Positive Expectancy Score			---							
4	AOES Negative Expectancy Score			.26**	---						
5	PRS Total Transformed			.27**	.29**	---					
6	NIAAA #3						---				
7	NIAAA #4 Transformed						.58**	---			
8	NIAAA #5 Transformed						.68**	.31**	---		
9	NIAAA #6						.68**	.36**	.39**	---	
10	YAACQ Total Transformed						.63**	.50**	.43**	.60**	---

Note * $p < .05$. ** $p < .01$.

Table 5. Effect Size Calculations of Variables for Final Sample (N = 84)

	AD/HD (n = 42)		Non-AD/HD (n = 42)		Total (N = 84)	
	M	*SD*	*M*	*SD*	*SD*	*Effect Size (d)*
NIAAA Alcohol Use Questions						
#1	1.78	1.30	1.88	1.47	1.38	.07
#2	1.93	1.40	2.12	1.79	1.61	.11
#3	2.69	1.88	2.95	2.69	2.31	.11
#4 Transformed	.58	.38	.54	.34	.36	.11
#5 Transformed	.33	.42	.36	.50	.46	.07
#6	4.93	2.17	4.83	2.73	1.72	.06
#7	3.71	2.12	3.33	2.41	2.45	.16
#8	2.19	1.17	2.36	1.79	2.26	.08
#9	3.60	1.88	3.64	2.78	1.51	.03
#10	1.81	1.29	1.86	1.46	2.36	.02
#11	1.69	1.62	1.69	1.84	1.37	0
YAACQ Transformed Total	1.72	1.12	1.78	1.23	1.17	.05
AOES Positive Expectancies	68.93	15.90	78.07	12.59	14.98	.61**
AOES Negative Expectancies	40.93	10.90	42.05	10.03	10.43	.11
PRS Transformed Total	.95	1.12	1.48	1.16	1.16	.46**

Note. NIAAA = National Association on Alcohol Abuse and Alcoholism; YAACQ = Young Adult Alcohol Consequences Questionnaire; AOES = Alcohol Outcome Expectancies Scale; PRS = Perceived Risk Scale.
**indicates moderate effect size per Cohen (1992).

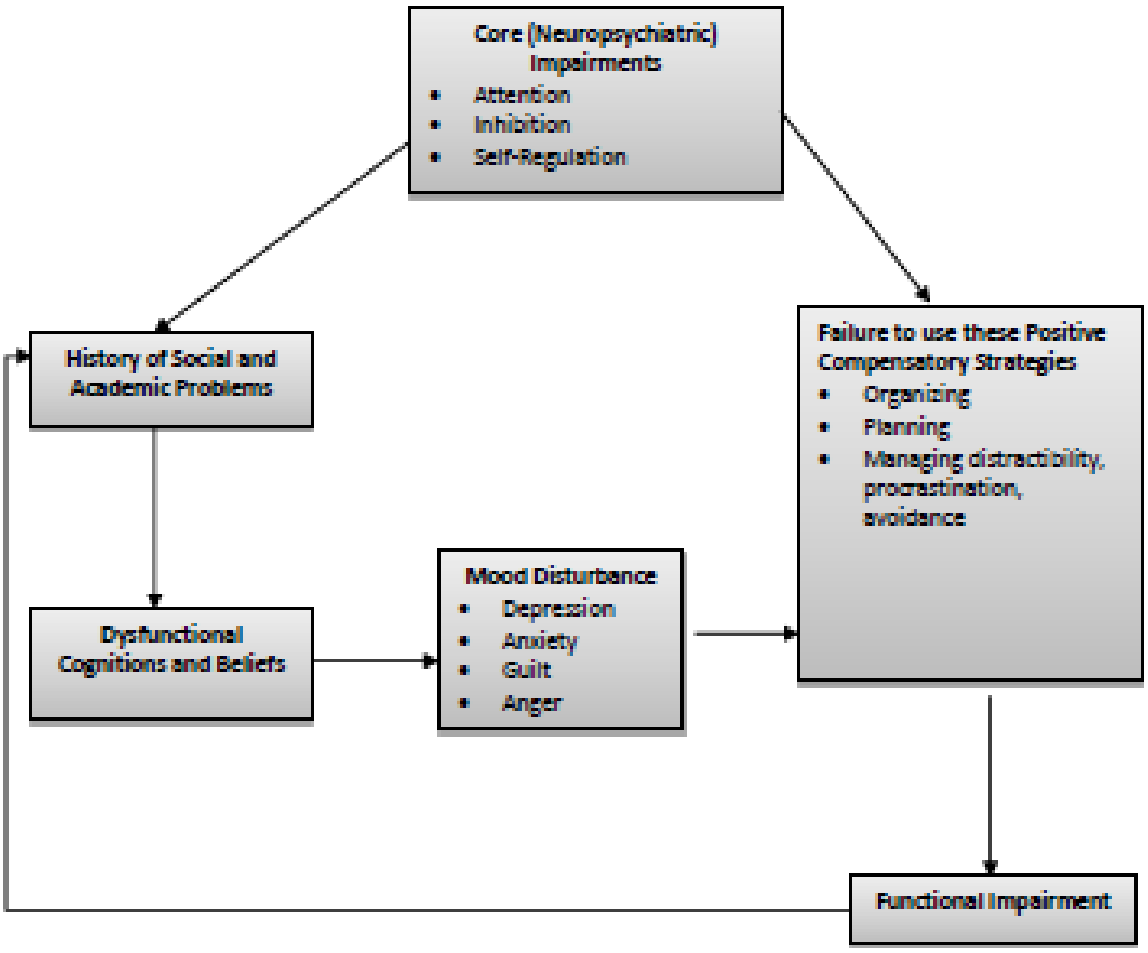

Figure 1. Safren's (2004) cognitive-behavioral model of impairment in adult AD/HD.

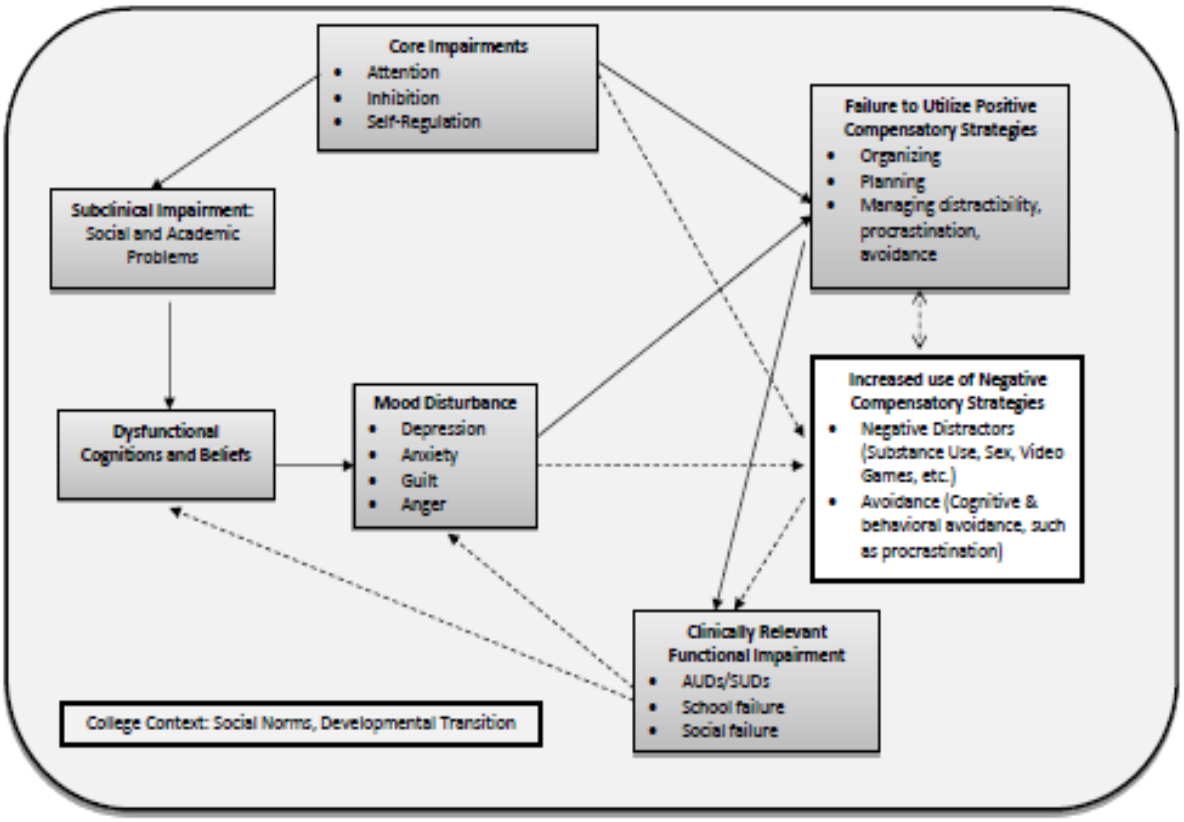

Figure 2. An adaptation of Safren's (2004) adult AD/HD model.

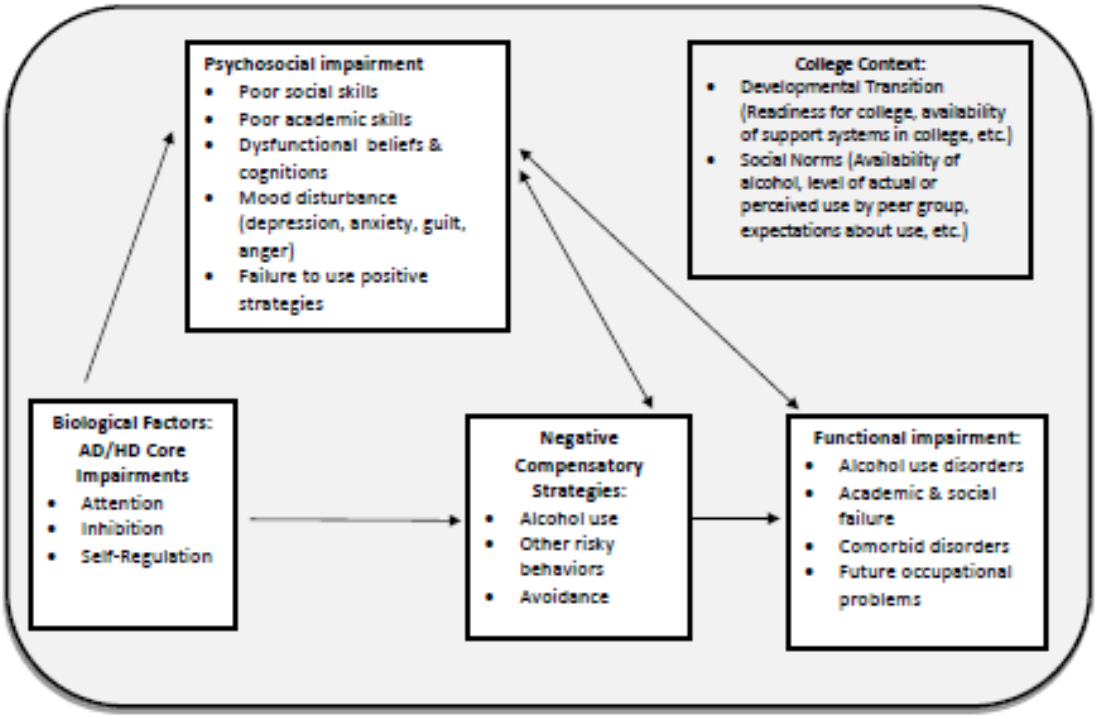

Figure 3. Model of hypothesized risk for alcohol use and alcohol-related impairment