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BROOKE A. GREEN

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THE CONSEQUENCES OF ALCOHOL MIXED WITH ENERGY DRINK (AMED)
USE IN COLLEGE STUDENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY
DISORDER (ADHD)

A dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy at Virginia Commonwealth University

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Abstract

THE CONSEQUENCES OF ALCOHOL MIXED WITH ENERGY DRINK (AMED) USE IN COLLEGE STUDENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD)

By Brooke A. Green, M.S.

A dissertation submitted in partial fulfillment of the requirements for the degree of
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Virginia Commonwealth University, 2016.

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College students with ADHD, but especially those who consume alcohol, may be at jeopardy for experiencing negative educational and occupational outcomes, problematic substance use, criminal offending, and sexual victimization. Alcohol mixed with energy drink (AmED) use is widespread across college campuses and associated with many of these same problematic outcomes. The risk of experiencing these consequences for college students with ADHD may be exacerbated by AmED use given its unique relationship, above and beyond alcohol use, with these variables. This study sought to examine relationships among GPA, lost work performance, hazardous alcohol use, illicit substance use, criminal offending, and sexual victimization in college students with

ADHD who use AmED. The sample comprised students ($N = 248$; 36.3% male, 63.7% female) from the University of Albany's (UAlbany) and Virginia Commonwealth University's (VCU) disability support centers, as well as VCU's SONA psychology subject pool. Hierarchical linear regression analysis and logistic regression analysis were used to test six hypotheses. Results showed that AmED use did not predict GPA, lost work performance, or criminal offending. However, AmED use did predict hazardous alcohol use ($p < .001$), illicit substance use ($p < .05$), and sexual victimization ($p < .05$). These findings provide a baseline rate of AmED use in college students with ADHD, and highlight the importance of further research regarding the potential consequences of AmED use in this population.

Keywords: alcohol mixed with energy drink use; Attention-Deficit/Hyperactivity Disorder

The Consequences of Alcohol Mixed with Energy Drink (AmED) Use in College Students with Attention-Deficit/Hyperactivity Disorder (ADHD)

Attention-deficit/hyperactivity disorder (ADHD), although primarily thought of as a childhood developmental disorder, affects 2 to 10% of college students (DuPaul, Weyandt, O'Dell, & Varejao, 2009; Kalbag & Levin, 2005; Weyandt & DuPaul, 2013). It is estimated that up to 25% of students who receive assistance from on-campus Disability Support Services (DSS) have an ADHD diagnosis (Wolf, 2001). Symptoms of ADHD in adults are often conceptualized in three dimensions: inattention, hyperactivity, and impulsivity (Barkley, 2011). The symptoms of adult ADHD have the potential to negatively impact achievement, as evidenced by poorer educational and occupational outcomes for college students with ADHD (Weyandt & DuPaul, 2013). Additionally, adults with ADHD are more likely to abuse alcohol (Regier et al., 1999), so college students with ADHD seem especially at risk for problems in these contexts.

In addition to more limited academic and occupational outcomes, individuals with ADHD are at greater risk for engaging in problematic substance use behaviors (e.g., illicit substance use, hazardous drinking), criminal offending, and in experiencing victimization, all of which may be intensified in the context of alcohol use (Barkley, Murphy, O'Connell, et al., 2006; Kalbag & Levin, 2005; Pratt et al., 2002; White & Buehler, 2012). Several studies have shown enhanced rates of alcohol use disorders in adults with ADHD (Wood, Wender, & Reimher, 1983; Clure et al., 1999; Regier et al., 1990), and college students with ADHD also appear to be more likely to engage in substance use (Upadhyaya et al., 2005). Meta-analyses have revealed a positive association amongst various illegal behaviors and individuals with ADHD (Pratt et al.,

2002). For example, individuals with ADHD have a greater risk of drinking and driving (Barkley et al., 1993; Nada-Raja et al., 1997). College students with ADHD also may be at increased risk for sexual victimization (White & Buehler, 2012), yet research in this area is more limited. For example, White and Buehler found that women with ADHD were at a greater risk of being sexually victimized during adolescence and were more likely to engage in risky sexual behavior.

Individuals with ADHD also tend to be high users of caffeine (Walker et al., 2010). Researchers have suggested, then, that college students with ADHD may be drawn to consume alcohol mixed with energy drinks (hereafter referred to as AmED) although this has not yet been examined. Energy drinks, one component of AmED, are beverages that are designed to increase energy, alertness and performance through high amounts of caffeine combined with natural stimulants, vitamins, amino acids, sugars and other ingredients (O'Brien, McCoy, Rhodes, Wagoner, & Wolfson, 2008). Many people engage in AmED use by purchasing premade drinks, making their own concoctions of alcohol mixed with energy drinks, or buying a mix of the two at bars. The widespread use of energy drinks in young adults is well documented (e.g., Heckman, Sherry, Mejia, & Gonzalez, 2010; Levy & Tapsell, 2007; Reissig, Strain & Griffiths, 2009), with approximately one quarter of college students endorsing alcohol and AmED use in the past month. (O'Brien et al., 2008).

AmED use has also been associated with poorer educational outcomes (Mallett, Marzell, Scaglione, Hultgren, & Turrisi, 2014), such as lower academic performance and turning in late assignments. Although AmED use and occupational outcomes have yet to be examined, the impact may resemble what has been found with alcohol use and

occupational outcomes: including increased absenteeism, unsatisfactory work performance and job termination (Frone, 2012; McFarlin & Fals-Stewart, 2002).

Outcomes associated with AmED use, including higher risk of problematic substance use, offending, and victimization (Berger, Fenrich, Chen, Arria, & Cisler, 2011; O'Brien et al., 2008; Oteri, Salvo, Caputi, & Calapai, 2007; Price, Hilchey, Darredeau, Fulton, & Barrett, 2010; Thombs et al., 2010; Woolsey, Waigandt, & Beck, 2010), are of significant concern for college students with ADHD as these individuals may be more vulnerable to the problems resulting from substance use (Rooney, Chronis-Tuscano, & Yoon, 2011).

ADHD Plus AmED: A Potentially Problematic Interaction

Individuals with ADHD already are more likely to engage in alcohol abuse and caffeine abuse than their peers (Biederman et al., 2011; Walker et al., 2010). Hence it seems reasonable to speculate that college students with ADHD may be particularly drawn to use of a beverage (AmED) that combines both of these substances. To date, however, no research explicitly has examined the interaction between ADHD diagnostic status and the possible deleterious effects of AmED use.

This study focuses on a sample of college students with ADHD, and especially those who consume alcohol, who are hypothesized to be at increased risk for poor educational and occupational outcomes, problematic substance use, criminal offending, and sexual victimization. These risks may be exacerbated by AmED use given its unique relationship, above and beyond alcohol use, with these variables. Research suggests that the addition of energy drinks to alcohol results in “wide awake drunkenness” and heavier drinking (Arria & O'Brien, 2011) which may ultimately place students at increased risk for alcohol-related consequences (e.g., risky behaviors, assault). This study will examine

these associations in a sample of college students receiving disability support services from their university as a result of their ADHD diagnosis, and students self-reporting an ADHD diagnosis. As college students with ADHD may attempt to use substances as a means of self-medicating (Peterkin et al., 2011), Khantzian's (1985; 1997) self-medication hypothesis will be discussed in further detail as it provides a context to examine the potential use of AmED by college students with ADHD.

Review of the Literature

Attention-Deficit/Hyperactivity Disorder (ADHD) in College Students

Although primarily thought of as a childhood disorder, it is estimated that up to 10% of college students experience clinically significant symptoms of ADHD (DuPaul, et al., 2009). Even more, 10% of adults meet criteria for ADHD despite never having been diagnosed or treated (Barkley, Fisher, Smallish, & Fletcher, 2006). The primary symptoms of ADHD include inattention, hyperactivity, and impulsiveness (Unnever, Cullen & Pratt, 2003). More recent research has identified symptoms of sluggish cognitive tempo (SCT), or drowsiness, reduced daytime energy level, and foginess, as other components of adult ADHD (Willcutt et al., 2012). Students with this set of ADHD symptoms experience academic struggles, increased psychiatric comorbidity (e.g., anxiety, depression) and school-related disciplinary and social difficulties (August, Realmuto, MacDonald, Nugent, & Crosby, 1996; Bagwell, Molina, Pelham, & Hoza, 2001; Biederman et al., 2004; DuPaul & Stoner, 1994; Hinshaw, 1987; Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2008). There is less research on other life areas (e.g., occupational functioning) potentially impacted by ADHD symptoms that may be especially relevant for young adults. In addition, the difficulties of an ADHD

diagnosis do not appear to be time-limited, as many of these difficulties continue into adulthood (Barkley, 2006). Small sample sizes and studies relying entirely on self-reported ADHD status limit what is known about college students with ADHD (Green & Rabiner, 2012). Thus, a combination of self-report and collateral source data is recommended in the college student population.

ADHD and negative educational and occupational outcomes. Deficits in school performance are well documented in individuals with ADHD (Kalbag & Levin, 2005; Murphy & Barkley, 1996), although more research is focused on children and adolescents than on college students and adults. Several studies found that college students with ADHD exhibit lower grades and higher rates of academic probation and college attrition (Frazier, Youngstrom, Glutting, & Watkins, 2007; Heiligenstein, Guenther, Levy, Savino, & Fulwiler, 1999; Weyandt & DuPaul, 2013; Wolf, 2001). In addition, a longitudinal study of boys with ADHD using a blind clinical assessment showed that they completed significantly fewer years of schooling (including post-secondary education) and obtained fewer advanced degrees than their counterparts (Manuzza et al., 1997). Other research, using self-report measures and clinical interviews, showed that symptoms of ADHD can result in detrimental academic outcomes: lack of organization, turning in assignments late, test anxiety and failing a course (Richard, 1995).

In addition to negative impacts on academic performance, ADHD symptoms can impair work performance (National Alliance on Mental Illness; NAMI, n.d.). In a nationally representative sample, Kessler and colleagues (2005) used a semi-structured interview and their Health and Work Performance Questionnaire (HPQ; Kessler et al.,

2003) to show that adult ADHD was associated with 120.8 million days of missed work (i.e., absenteeism) and an overall loss of \$19.6 billion dollars. Some estimates put this loss in a range as high as \$67 billion to \$116 billion (Biederman & Faraone, 2006). Biederman's and Farone's findings regarding lost work days are in line with other research highlighting the association between individuals with ADHD and lower rates of employment and more frequent job changes (Wilens, Faraone, & Biederman, 2004). When Manuzza and colleagues (1997) followed up on their longitudinal sample of white adolescent boys with ADHD, these participants were found to be employed in significantly lower-ranking occupational positions, as assessed using Hollinghead's and Redlich's (1958) Occupation Scale relative to controls. Another longitudinal study of adolescent ADHD patients showed that, as adults, work performance was significantly impaired, with ADHD status predicting work tardiness, unemployment and poor work evaluations (Brook, Brook, Seltzer, & Finch, 2013). Brook and colleagues hypothesized that work may be negatively affected by symptoms of inattention and impulsivity.

Although having ADHD has been positively associated with more work difficulties in adults (Wilens et al., 2004), there is relatively little research examining the effect of ADHD on the work performance of college students. College is not traditionally viewed as a phase of life that is significantly impacted by employment demands; however, according to the American Community Survey, the percentage of college students working more than 20 hours per week is 48% while the percentage of those working less than 20 hours per week is around 72%. Shifrin, Proctor and Prevatt (2010) compared college students with ADHD to their peers without ADHD using several indicators of work performance, including a measure assessing the degree to which

ADHD symptoms were present at work and in their termination history. Students diagnosed with ADHD reported a negative impact on work performance, and this association was stronger for those with more severe symptoms. Results also showed that students with ADHD were significantly more likely to be fired from work. Weyandt and DuPaul (2013) found that college students with ADHD had poorer financial and employment outcomes than their non-ADHD peers. Two major consequences of mental health issues in the workplace are absenteeism and 'presenteeism.' Presenteeism is defined being present at work but not functioning to one's full potential (Kessler et al., 2004). Neither is fully understood in the population of college students with ADHD.

ADHD and problematic substance use. As noted previously, college students with ADHD also may be at an increased risk engaging in problematic substance use, such as illicit drug use and hazardous drinking. Youth with ADHD exhibit higher rates of substance use in general (Richards, Rosén, & Ramirez, 1999; Rooney et al., 2012), including alcohol and caffeine (Biederman et al., 1999; Walker et al., 2010). In addition, adults with a history of ADHD exhibit higher rates of alcohol use disorders than their peers without ADHD (Regier et al., 1990). Given these findings, the use of AmED in individuals with ADHD may be both likely as well as problematic. Individuals with ADHD may be at risk for engaging in problematic behaviors, such as hazardous drinking, as a result of the impulsivity-related symptoms of ADHD (Unnever et al., 2003).

If AmED use is found to be associated with ADHD status in this study, motivations for AmED use in these individuals can be explained by Khantzian's (1985; 1997) self-medication hypothesis. Khantzian theorized that individuals engage in substance use as a means to quell sensations of distress or unpleasant emotional states.

Khantzian and Albanese (2008) theorized that the use of substances is based on the user's affective state. In other words, the specific drug selected is the result of the user's attempt to regulate his or her affective, behavioral, or cognitive state (Khantzian; Suh et al., 2008). The self-medication hypothesis has been supported in the research literature (e.g., Bolton, Cox, Clara & Sareen, 2006; Potvin, Sepehry, & Stip, 2006; Suh, Ruffins, Robins, Albanese, & Khantzian, 2008).

Caffeine, similar to one medication used to treat ADHD (e.g., guanfacine), is thought to exert its effect by blocking A2A adenosine receptors which, in turn, would augment the dopamine (specifically D2 receptor) effect (e.g., Seifert et al., 2011). In short, individuals with ADHD may use stimulants such as caffeine to experience short-term relief of symptoms (Kalbag & Levin, 2005). Thus, based on the self-medication hypothesis, individuals with ADHD may engage in AmED use for the same reasons they engage in caffeine or other stimulant substance use.

Another reason college students with ADHD may use AmED is for increased energy. According to a qualitative study by Judson and Langdon (2009), the second most common reason that individuals with untreated ADHD use stimulants is to increase alertness and to stay awake. Here, the primary motivation would be to increase concentration. Caffeine is the most widely consumed psychoactive drug, with most individuals consuming it for energy, increased concentration and alertness (Gilbert et al., 1976; Nehlig, 1999). Individuals with ADHD may use AmED for similar reasons, as one of the top reasons that individuals cited for using AmED was to increase energy while being intoxicated (O'Brien et al., 2008; Peacock, Bruno & Martin, 2012).

Khantzian (1985; 1997) also suggests that individuals may engage in substance use to assuage negative emotions. Individuals with ADHD may use AmED to reduce painful affective states via its ethanol component. Kalbag and Levin (2005) suggest that as a result of interpersonal, educational and occupational impairments, adults with ADHD may use substances including alcohol, to counteract low self-esteem and symptoms of depression. In addition, Kalbag and Levin hypothesized that adults with ADHD may be motivated to use alcohol as a means to feel calmer—given their difficulty doing so as a result of their ADHD symptoms. Thus, individuals with ADHD may not only use AmED for its stimulative effects, but also to also feel relaxed while still being awake and aware.

ADHD and offending. In addition to being at an increased risk of problematic substance use, college students with ADHD may also engage in criminal behaviors. A meta-analysis revealed individuals with ADHD engage in more illegal behaviors (Pratt et al., 2002), but researchers also have found mixed results as to whether ADHD independently predicted criminal or illegal behavior (De Sanctis, Nomura, Newcorn, & Halper, 2012). Nonetheless, there is a clearly established link between an ADHD diagnosis and criminal behavior (Babinski, Hartsough, & Lambert, 1999; Burke, Loeber, & Lahey, 2001; Pratt et al., 2002). Approximately 70% of juvenile offenders and up to 50% of adult offenders exhibit clinically significant symptoms of ADHD (Abram, Teplin, McClelland, & Dulcan, 2003; Foley, Carlton, & Howell, 1996; Satterfield & Schell, 1997; Shelton & Pearson, 2005; Richardson, 2000; Ulzen & Hamilton, 1998; Vreugdenhil, Doreleijers, Vermeiren, Wouters, & Van Den Brink, 2004).

Individuals with ADHD also may be more likely to engage in sexual aggression than their peers. Some researchers have found higher estimates of ADHD in samples of male juvenile sex offenders (Galli et al., 1999). In an adult male outpatient sample, 50% of individuals with a paraphilia disorder and 16.7% of individuals with a paraphilia-related disorder had ADHD (Kafka & Prentky, 1998). There also is a line of research highlighting learning difficulties and other neuropsychological deficits in sex offender populations (Tarter, Hegedus, Alterman, & Katzgaar, 1983), and ADHD has also been found to be a statistically significant predictor of sex offense recidivism (Langevin & Curnoe, 2010). Research has highlighted the potential role of insufficient executive functioning and impulsivity as explanatory factors for these results (Fago, 2003). Nonetheless, it should be noted that some of these studies did not adequately control for other related comorbidities (e.g., oppositional defiant disorder, conduct disorder). For example, Therault and Holmberg (2001) found that severe ADHD symptomology was associated with physical and sexual aggression towards partners, however they reported that this finding was better explained by the comorbidity of conduct disorder.

Given the exacerbated risks associated with alcohol use for those with ADHD (Barkley, Murphy, O'Connell, et al., 2006), criminal offending in the context of AmED use by college students with ADHD should be further examined. Alcohol in itself increases risk-taking, inattention and impulsivity, and it affects executive functioning in a manner similar to the effects of ADHD (Barkley, Murphy, O'Connell, et al., 2006; Fillmore, 2003; Jerome et al., 2006). Therefore, college students with ADHD who use AmED may have a reduced ability to abstain from offending behaviors in certain contexts.

ADHD and sexual victimization. One type of victimization that is of significant concern for college students, especially females, is sexual victimization. Sexual victimization is another area that has received limited attention in the ADHD research literature. White and Buehler (2012) examined ADHD symptoms, risky sexual behaviors and sexual victimization experiences as measured by a modified version of Koss et al.'s (1987) Sexual Experiences Survey in a sample of 374 college women. Using structural equation modeling, they controlled for history of childhood sexual abuse and showed that the ADHD participants tended to be more at risk for sexual victimization. White and Buehler hypothesized that several classic symptoms of ADHD, including insufficient planning and information-processing skills, may place individuals at risk for adverse sexual outcomes. Past research has linked ADHD with risky sexual behaviors (Flory et al. 2006; Monuteaux et al. 2007; Winters et al. 2009). Although sexual victimization is distinct from risky sexual behavior, there are circumstances in which they may co-occur (Fargo, 2009). Sexual victimization experiences for college students with ADHD who use AmED are of concern, as alcohol use exacerbates the risk for sexual victimization (Testa & Parks, 1996).

Alcohol Mixed with Energy Drinks (AmED)

The study of AmED use in college students with ADHD is warranted because this population exhibits higher rates of caffeine and alcohol use than college students without ADHD (Barkley, Murphy, O'Connell, et al., 2006; Walker, Abraham, & Tercyak, 2010). Although there has been an increased interest in AmED use by adolescents and college students in general, no research examining AmED use in college students with ADHD was identified. National prevalence rates of adolescents' and young adults' (age 13-20

years) usage range from 45.3% to 58.4% over the past 30 days (Kponee et al., 2014). This is not surprising given that teenagers and young adults comprise the demographic most likely to purchase energy drinks (Berger, Fendrich, Chen, Arria, & Cisler, 2011; Simon & Mosher, 2007) and they also are experimenting with alcohol (Ham & Hope, 2003). In addition, results of multiple studies have shown that white males, student athletes, and sorority and fraternity members are overrepresented as AmED users (Levy & Tapsell, 2007; O'Brien et al., 2008; Velazquez et al., 2012).

Most adolescents and college students mix their own alcohol and caffeine drinks (Kponee et al., 2014). In 2010 U.S. Food and Drug Administration (FDA) enacted a ban on premixed or prepackaged AmED drinks, rendering them unavailable. Before the FDA ban, the majority of college-aged AmED users consumed prepackaged concoctions (Cobb, Nasim, Jentik, & Blank, 2015). Many reasons behind AmED use have been cited, including young peoples' wish to feel and look "less drunk," their desire to mask the unpleasant taste of alcohol, and their efforts to consume larger quantities of alcohol (O'Brien et al., 2008). AmED users often underestimate their level of impairment due to the stimulative effects of the combination (O'Brien et al., 2008; Oteri et al., 2007). Individuals also may be attracted to the paradoxical interaction between alcohol and energy drinks, as energy drink use may be thought of as a way to counteract the cognitive and physiological sedative effects of alcohol (Peacock, Bruno & Martin, 2012). Qualitative research in young adults who use AmED labels this state as "wakeful drunkenness" (Pennay & Lubman, 2012), and the notion has been supported by results showing an increased level of alcohol consumption during AmED drinking sessions (Peacock et al., 2012). Additionally, survey and laboratory studies have revealed a

reduced awareness of intoxication in AmED users (Ferreira, Mello, Rossi, & Souza-Formigoni, 2004; Marczinski & Fillmore, 2006).

AmED use and negative educational and occupational outcomes. Researchers are increasingly focusing on the academic consequences of drug and alcohol use for college students (Arria et al., 2013a), with findings bolstering associations between alcohol abuse and decreased performance. Academic performance typically has been measured by student grade point averages (GPAs; Gliksman et al., 1997; Musgrave-Marquart et al., 1997; Pascarella et al., 2007; Singleton, 2007). Alcohol use by college students often is cited as an important factor for poor academic performance (Williams & Wechsler, 2004), as it is thought to decrease hours spent studying and time spent in class (Powell et al., 2004), both of which ultimately affect GPA (Pascarella et al., 2007). Arria and colleagues hypothesized that drug use is associated with poor academic outcomes for the following reasons: (a) drug users have higher rates of class-absenteeism and poorer grades, (b) drug use may result in suspension, and (c) drug use may become a consuming endeavor that leaves little time for academic pursuits and college-life involvement.

In one study that examined AmED use and educational outcomes, Mallett et al. (2014) used three items from the Young Adult Alcohol Problem Screening Test (YAAPT; Hurlbut & Sher, 1992) to assess the academic-related consequences of AmED use, such as obtaining a lower grade on an academic assignment. The results revealed that AmED use was associated with negative academic consequences. However there was no significant difference between low levels of consumption versus high levels of consumption. Additional research is needed to replicate this finding, including its

association with GPA, and provide more information as to how AmED use influences academic performance.

The impact of AmED use on occupational outcomes is especially relevant to college students because postsecondary educational experiences have traditionally served as a primary way to prepare individuals for the working world. In addition, many college students work. According to the U.S. Census Bureau (2010), over half (71%) of college students are employed on at least a part-time basis. Reasons that college students participate in work while also taking classes include the increasing cost of education and the lack of tuition funding (Stern & Nakata, 1991). Arria et al. (2013b) point out that among employed individuals ages 18-25, approximately 15.5% meet criteria for heavy drinking (Substance Abuse and Mental Health Services Administration; SAMHSA, 2002). Alcohol use, as well as the use of other substances, has been associated with negative job-related consequences, such as termination and excessive absences (Frone, 2012; McFarlin & Fals-Stewart, 2002). As pointed out by Arria et al., understanding the relation between substance use and employment in college students is especially important given current economic and employment challenges. In addition to the competitive job market they may face upon graduation, the aforementioned research (see American Community Survey, 2012) regarding employment rates in college students illustrates their need for the income generated by their work. They call for more research examining substance use patterns and job satisfaction, stability and aspirations. Arria et al. also suggested that future research efforts should address possible confounding variables, such as legal troubles, in the relation between substance use and employment-related problems.

AmED use also has been found to have more severe physical repercussions, such as hangovers and vomiting, than alcohol use alone (Mallett et al., 2014). Individuals who experience the physical repercussions of AmED use may exhibit higher rates of absenteeism or decreased educational and occupational performance. Given the associations amongst substance use and academic- and work-related outcomes, AmED use likely impacts students' educational and occupational performance – perhaps even more detrimentally given the potential physical consequences associated with its use. Although there is a well-established and widely accepted literature that points to alcohol's effect on employment, such as increased interpersonal problems in the workplace and tardiness (e.g., Chan et al., 2012), corresponding literature does not exist for AmED use.

AmED use and problematic substance use. Individuals who use AmED also are more likely to engage in problematic drug use and substance abuse. For example, Snipes and Benotsch (2013) found that AmED consumption was associated with higher odds that college students would engage in sex while under the influence of illicit drugs. They also found that AmED users were more likely to report the use of marijuana, cocaine and the drug MDMA (3,4-methylenedioxy-N-methylamphetamine).

Another problematic substance use behavior, hazardous drinking, is also relevant when examining this literature. In particular, several studies show that AmED users tend more towards moderate to heavy drinking (Mallett et al., 2014; Brache & Stockwell, 2011; Price et al., 2010; Woolsey et al., 2010). Moreover, individuals tend to drink more alcohol when they consume AmED as compared to when they consume alcohol alone (Peacock et al., 2012). Using logistic regression, Kponee et al. (2014) found that AmED

use predicted binge drinking after controlling for demographic information and general risk taking propensity. Thombs et al. (2010) gathered data from college-aged bar patrons by visiting campus-area drinking establishments. They found that AmED users were at a three-fold increase in risk for intentions of leaving bars heavily intoxicated as compared to their non-AmED drinking peers.

AmED use and offending. AmED use has also been associated with an increased risk of criminal offending. After controlling for the effects of heavy alcohol consumption, O'Brien and colleagues found that AmED use predicted a high risk of engaging in criminal behaviors, such as drinking while driving and sexually assaulting another person. O'Brien and other researchers have opined that alcohol may contribute to men's difficulties judging women's sexual intentions, as well as with providing men with an excuse for aggression and sexual violence (Abbey, 2002; Abbey, Clinton-Sherrod, McAuslan, Zawacki & Buck, 2003). Similarly, Mallett and colleagues (2014) found that AmED users were at risk for incurring more legal consequences as a result of their behavior while under the influence of AmED.

AmED use and sexual victimization. Finally, AmED use has also been associated with sexual victimization (O'Brien et al., 2008). O'Brien and colleagues were the first to examine AmED use and sexual victimization. Even after controlling for number of drinks consumed, multivariate analyses showed that AmED users were almost twice as likely to report being victimized relative to non-AmED users. The authors attributed this difference to AmED users impaired subjective assessment of intoxication, which may influence their abilities to assess for risks. Kponee et al. (2014) also found that AmED use predicted fighting and alcohol-related injuries. Regarding the latter, the

study did not assess how these injuries occurred; thus, it is plausible that some of them were the result of violence.

The Present Study

One of the main purposes of this study was to assess the associations among AmED use and negative educational and occupational outcomes in college students with ADHD. College students with ADHD are more likely than their peers to experience academic and work-related problems. Because AmED use puts individuals at risk for academic problems above and beyond alcohol use, research is warranted to examine whether college students with ADHD who consume AmED experience poorer performance in these areas. The present study also sought to assess alcohol-related consequences in college students with ADHD who, overall, tend to be at a higher risk for hazardous drinking, illicit substance use, offending and sexual victimization. Due to the risks associated with AmED use, further research is needed to examine if this risk is exacerbated in college students with ADHD who use AmED. Thus, based on the preceding literature review, this study sought to address the following hypotheses:

Hypotheses

Hypothesis 1. AmED use will be associated with negative educational outcomes in college students with ADHD, after accounting for the influence of demographic characteristics and alcohol use.

Results of a hierarchical linear regression analysis will show that AmED use predicts last semester GPA. Demographic factors will be entered on the first step, the total score for past 90 day alcohol use will be entered on the second step, and the total score for past 90 day AmED use will be entered on the final step.

Hypothesis 2. AmED use will be associated with negative occupational outcomes in college students with ADHD, after accounting for the influence of demographic characteristics and alcohol use.

Results of a hierarchical linear regression will show that AmED use predicts work performance. Demographic factors will be entered on the first step, the total score for past 90 day alcohol use will be entered on the second step, and the total score for past 90 day AmED use will be entered on the final step.

Hypothesis 3. AmED use will be associated with hazardous alcohol use in college students with ADHD, after controlling for demographic characteristics.

A logistic regression will show that AmED use predicts hazardous alcohol use. AUDIT scores of 8 or higher will be dummy coded as 1, and AUDIT scores of 7 or lower will be dummy coded as 0. Demographic factors will be entered on the first step, the total score for past 90 day alcohol use will be entered on the second step, and the total score for past 90 day AmED use will be entered on the final step.

Hypothesis 4. AmED use will be associated illicit substance use in college students with ADHD after controlling for demographic factors and alcohol use.

A logistic regression will show that AmED use predicts illicit substance use. Illicit drug use over the past 90 days will be dummy coded as 1, and no past 90-day drug use will be dummy coded as 0. Demographic factors will be entered on the first step, the total score for past 90 day alcohol use will be entered on the second step, and the total score for past 90 day AmED use will be entered on the final step.

Hypothesis 5. AmED use will be associated with criminal offending in college students with ADHD after controlling for demographic characteristics and alcohol use.

A logistic regression will show that AmED use predicts offending. An offending score of 1 or more on the SRO-R will be dummy coded as 1, while non-offending will be dummy coded as 0. Demographic factors will be entered on the first step, the total score for past 90 day alcohol use will be entered on the second step, and the total score for past 90 day AmED use will be entered on the final step.

Hypothesis 6. AmED use will be associated with sexual victimization in college students with ADHD after controlling for demographic characteristics and alcohol use.

A logistic regression will show that AmED use predicts sexual victimization. Sexual victimization as measured by a score of one or more on the SES will be dummy coded as 1, and no sexual victimization will be dummy coded as a 0. Demographic factors will be entered on the first step, the total score for past 90 day alcohol use will be entered on the second step, and the total score for past 90 day AmED use will be entered on the final step.

Method

Participants

This study consisted of 257 participants in total, with nine participants removed due to response outliers that violated the multivariate assumption. This resulted in 248 participants total, represented by 36.3% males and 63.7% females. Participants included 219 Virginia Commonwealth University (VCU) undergraduate students from a psychology subject pool, 20 VCU Disability Support Services (DSS) students, and 9 University of Albany (UAlbany) Disability Resource Center (DRC) students. A between samples MANOVA indicated no significant overall differences among measures based on sample $F(20, 372) = 1.45, p = .095$; thus, data from each respective sample were

combined for data analyses. The participants ranged in age from 18 to 34 ($M = 20.93$, $SD = 3.69$) and mostly identified as single ($n = 97$) and heterosexual ($n = 175$). As for race/ethnicity, 58.9% of the participants self-reported as Caucasian, 18.2% as African American, 12.9% as Asian American, 6.2% as Other, 2.4% as Latino/Hispanic, and 1.4% as Native American. Participants included 87 first-year students, 42 second-year students, 38 third-year students, 34 fourth-year students, and 7 students who identified as Graduate Students or Other. Most participants were enrolled full time (93.8%) and were not engaged in Greek life or student athletics (91.9% and 95.2%, respectively).

Institutional Review Board (IRB) approval was obtained from both Universities and student participation was completely voluntary. Flyers were placed in respective DSS offices, and emails were disseminated by DSS staff advertising the study to students receiving services. The study was then also advertised to VCU SONA students via the online SONA subject pool system as power analyses revealed that a minimum of 147 cases were required for data analyses. To meet inclusion criteria, students must have reported that they received services for an ADHD diagnosis from their University DSS office, or self-reported an ADHD diagnosis, and were aged 18 years or older. This inclusion criterion was highlighted by the flyers advertising the study, as well as in all emails disseminated. Data received from any participants under the age of 18 or from participants who did not endorse “Yes” to report an ADHD diagnosis were removed from the database. Specifically, the study description clarified that students must have an ADHD diagnosis and be aged 18 years or older; thus, if students answered “No” to either of these two criteria in the form of questions attached to the informed consent page then

they were redirected to a webpage with a message informing them that they were ineligible to participate in the study.

Design

The proposed study was a cross-sectional, between-subjects design. Participants completed self-report questionnaires, including several published measures and a set of forced response and open-ended questions, and demographic information via the Research Electronic Data Capture software package (RedCap; Harris et al., 2009), a secure tool for clinical and translational research.

Measures

Demographics. Participants provided demographic information via responses to items on a questionnaire. Specific variables of interest in this study included participants' age, university attended, current grade level, GPA, relationship status, sexual orientation, socioeconomic status, sex, ethnicity and sorority or fraternity membership. Participants also were asked to indicate what type of services they receive from their university's DSS offices. These data allowed for a detailed description of participants.

ADHD. Participants' ADHD status was assessed using the *Barkley Adult ADHD Rating Scale-IV* (BAARS-IV; Barkley, 2011). The BAARS-IV (Appendix A) is a 30-item questionnaire containing four subscales, an Inattention, Hyperactivity, and Impulsivity subscale based on the DSM-IV-TR criteria for ADHD (APA, 2000, 2004), as well as nine-item subscale assessing Slow Cognitive Tempo (SCT; Becker et al., 2013). The 27 items assessing symptoms experienced during the past 6 months are rated on a 4-point scale (1 = *Never or Rarely* to 4 = *Very Often*). There is also one item that requires participants to circle a "Yes" or "No" in response to the following question: "Did you

experience any of these 27 symptoms at least “Often” or more frequently (Did you circle a 3 or a 4 above?)” Next, participants were asked the following question: “If so, in which of these settings did those symptoms impair your functioning?” The last question (“If so, in which of these settings did those symptoms impair your functioning?”) requires participants to check one of the following options: School, Home, Work or Social Relationships. An ADHD total score was calculated totaling the value for each item endorsed on the Inattention, Hyperactivity and Impulsivity subscales. Higher scores indicated higher severity of ADHD symptomology, with scores in the 93rd percentile (or a total score of 36) or higher reflecting the likelihood of an ADHD diagnosis.

This instrument is widely used with college students (e.g., Miller et al., 2013; Becker et al., 2013) and has been associated with deficits across several life areas (Barkley; Miller et al., 2013). The BAARS-IV was standardized on a sample of 1,200 adults (Miller, Lewandowski, & Anshel, 2013), and has been found to have a Cronbach’s alpha of .92. In the present study, observed Cronbach’s alpha coefficient for total ADHD scale score was .96.

Impulsivity. To control for impulsivity, the short version of the SUPPS-P Impulsive Behavior Scale (Whiteside & Lynam, 2001; Cydersa, Littlefield, Coffey, Karyadi, 2014) was used. The SUPPS-P is one of the most widely used scales used to assess impulsivity (Canale, Vieno, Griffiths, Rubaltelli, & Santinello, 2015). Representative items on this 20-item measure include “I tend to act without thinking when I am really excited” and “I usually think carefully before doing anything.” Responses to the items on the scale are gathered on a 4-point scale (1 = Strongly Agree to 4 = Strongly Disagree). The SUPPS-P has demonstrated good test-retest reliability and

validity (Cyders et al., 2014). In the case of this study, however, the SUPPS-P demonstrated an unacceptable Cronbach's alpha ($\alpha = .56$).

To better understand this problem, order effects were investigated via one-way ANOVA, which indicated no significant differences in SUPPS-P scores across those assigned to take it at the start of the questionnaire and those assigned to take it at the end of the questionnaire, $F(1, 245) = 13.35, p = .359$. In addition, reliability analyses did not reveal acceptable alphas for either regularly coded items ($\alpha = .64$) or reverse coded items ($\alpha = .47$). It is noted that other researchers have found similarly unacceptable alphas, such as .53 and .63, on the subscales of the SUPPS-P (Doran & Trim, 2015). Given that the internal reliability of the SUPPS-P in this study was markedly lower than the widely expected minimum of .70, and because data exploration revealed no individual participant outliers on this measure, the scale was not utilized in final data analyses.

AmED and Non-AmED Alcohol use. Participants' AmED usage and non-AmED alcohol usage were assessed using values calculated from two open-ended questions. Participants were provided a definition of what constitutes one drink ("one drink = 12 oz. of beer, or 5 oz. of wine, or 1.5 oz. (shot) of hard liquor such as whiskey or vodka") and were asked to report their drinking habits over the past three months in response to the following questions: "How many alcoholic drinks have you consumed over the past three months?" and "Of those alcoholic drinks consumed over the past three months, how many of them consisted of alcohol mixed with energy drinks (Red Bull, Monster, Rockstar, AMP, etc.)?" An estimate of the number of AmED drinks consumed over the past three months was calculated by subtracting the number of AmED drinks consumed from the overall number of alcoholic drinks consumed. An estimate of the

number of non-AmED alcoholic beverages consumed over the past three months was calculated using the remainder from the aforementioned equation. For example, a participant who reported consuming 10 alcoholic drinks over the past three months, with four of those being AmED, would have a AmED consumption total of four and a non-AmED alcohol consumption total of six. AmED use has been assessed in a similar manner in previous studies (e.g., Snipes & Benotsch, 2013; Arria, Garnier-Dykstra, Cook et al., 2013c). Furthermore, research (Greenfield, Nayak, Bond, Ye & Midanik, 2006; National Council on Alcohol Abuse, Alcoholism – Task Force on Recommended Alcohol Questions, 2003) has supported the practice of assessing alcohol consumption, up to a year, using a recall method.

Educational outcomes. Participants' educational performance was measured using their self-reported previous semester GPA. Participants were asked to report their previous semester GPA on a 4.0 scale (A = 4.0 and above, B = 3.0 – 3.99, C = 2.0 – 2.99, D = 1.0 – 1.99, F = 0.99 or below). Other studies of college students with ADHD have relied on self-reported GPA (e.g., Becker et al., 2013; Schwartz & Beaver, 2014), and research has shown strong correlations between self-reported GPA and official academic performance (Cole & Gonyea, 2010; Kuncel et al., 2005). All but three participants reported their previous semester GPA; thus, high school GPA was imputed for the missing data for these three students only.

Occupational outcomes. Occupational outcomes were measured using a total lost work performance score calculated by summing scores from the 3-item presenteeism and 8-item absenteeism subscales of the World Health Organization Health and Work Performance Questionnaire (HPQ; Kessler et al. 2003). The HPQ also yields basic work-

related demographic information, including salary, full-time or part-time status, and job title. The absenteeism subscale assesses number of workdays missed, and is calculated by multiplying number of days expected to work by 12, and then subtracting numbers of hours worked over the past 3 months. Participants were provided with multiple examples of how to calculate workdays missed. Higher scores indicated more lost workdays. The presenteeism subscale asks employees to rate their performance (on a scale from 1 to 10) compared to their previous performance and the performance of their coworkers. The presenteeism score is contrived using the absolute presenteeism score and the relative presenteeism score. Absolute presenteeism scores range from 0 to 100, with lower scores indicating more lost performance, and are calculated based on the respondent's response to the following question: "Using the same 0-to-10 scale, how would you rate your overall job performance on the days you worked during the past 12 weeks (84 days)?" Relative presenteeism scores were calculated by dividing the performance rating for other employee by the self-reported performance rating. Higher scores indicated better performance.

For the purposes of this study, a continuous total lost work performance score was calculated by adding the Absenteeism score to the value of the remainder of the Absenteeism score subtracted from 100, and multiplied by the remainder of Absolute Presenteeism score subtracted from 100. Higher scores indicated more lost work performance. This method of calculating Presenteeism and Absenteeism scores, as well as to the total lost work performance score, has been used in studies pertaining to adults with ADHD (e.g., Kessler et al., 2009). The practice of using just the two absenteeism and presenteeism subscales has been validated (Kessler et al., 2004), and the HPQ is the

most widely used measure of work performance and has good reliability (Cronbach's $\alpha = .71$; Kessler et al., 2009).

Problematic substance use.

Hazardous alcohol consumption. To assess heavy alcohol consumption as a problematic substance use behavior, a revised version of the World Health Organization's (WHO) Alcohol Use Disorders and Identification Test (AUDIT; Saunders et al., 1993) was used. The AUDIT is a widely-used 10-item measure that assesses general drinking patterns to detect hazardous drinking. Representative items include "How many times during the last three months have you had a feeling of guilt or remorse after drinking?" and "How many times over the last three months were you unable to remember what happened the night before because you had been drinking?" Responses to the first eight items on the scale are gathered on a 4-point scale (0 = *Never* to 4 = *Almost daily*), and responses to the last two items are rated on a 3-point scale (0 = *No*, 1 = *Yes, but not in the last three months*, 2 = *Yes, during the last three months*). Participants were categorized as engaging in hazardous alcohol use if they score 8 or higher, as this is the cut-off most commonly cited in studies using the AUDIT (Babor, Higgins-Biddle, Saunders, Monteiro, 2001). The AUDIT has demonstrated high test-retest reliability ($\alpha = .84$) and has been well-validated in clinical settings (Selin, 2003). For this study, the AUDIT demonstrated a Cronbach's alpha of .88, indicating good test-retest reliability.

Illicit substance use. The use of illicit substances was addressed using questions from past research on substance use (Benotsch, Snipes, Martin & Bull, 2013). First, participants were asked a number of questions pertaining to their use of the following substances in the past 3 months: marijuana, ecstasy, methamphetamine, cocaine,

ketamine, and “poppers” (amyl or butyl nitrate). Participants were given the option to endorse use of another illicit recreational drug not listed, and then were provided with an open-ended response option to name the drug. Responses were scored on a rating scale ranging from 1 (*None*) to 4 (*At least every week*). Participants were categorized following procedures used in prior research (Arria et al., 2013b), such that any participant endorsing a score of 2 (*Once or twice*) or more on any of the illicit drugs was categorized as engaging in illicit substance use.

Offending. The violent and delinquent subscales from the Self-Report of Offending-Revised scale (SRO-R; Elliot, Huizinga, & Mernard, 1989) were used to measure offending. Participants were asked to indicate “Yes” or “No” as to whether they engaged in specific criminal behaviors over the past 3 months. For example, one item requested that participants reflect on whether they “engaged in fist fights.” The five-item violent subscale included items pertaining to violence, such as engaging in fistfights, sexually assaulting someone or carrying a weapon. The eight-item delinquent subscale included questions pertaining to nonviolent crimes, such as breaking and entering or driving while intoxicated. Any participant endorsing “Yes” for any of the items on the aforementioned scales was categorized as engaging in offending behavior. The violence and delinquent subscales have been used individually in prior research (Chauhan, Reppucci, Burnette, & Reiner, 2010). The SRO-R has been validated with college students (Williams, McAndrew, Learn, Harms, & Paulhus, 2001), and has evinced adequate reliability (Cronbach’s $\alpha = .76$; Bauer, Chesin & Jeglic, 2014). For the present study, Cronbach’s alpha was .98.

Victimization. Testa et al.'s (2010) 20-item revised version of the Sexual Experiences Survey (RSES; Testa VanZile-Tamsen, Livingston, & Koss, 2004; Koss et al., 1987) was used as a formal measure of sexual victimization. This scale addresses five types of sexual victimization; including unwanted sexual touching, attempted coercion, coercion, attempted rape and rape within the context of being pressured, threatened, physically forced, or incapacitated. Each item is rated on a 4-point anchored scale (0 = *never* to 4 = *4 or more times*). Representative items from this scale include “Has someone overwhelmed you in the last three months with arguments about sex or continual pressure for sex in order to fondle, kiss or touch you sexually when you indicated that you didn't want to?” and “Has someone threatened to physically harm you or someone close to you in the last three months in order to try to succeed in making you have sexual intercourse when you indicated that you didn't want to?” Participants' experiences with sexual victimization are categorized based on the severity of the experience (Testa et al., 2010), with scores ranging from of 0 (no sexual victimization) to 5 (completed rape). Participants were categorized as having experienced sexual victimization if they have a score of 1 or more. these items have been used with college students (e.g., Fielder, Walsh, Carey & Carey, 2013). Research has highlighted evidence for good temporal stability and internal consistency (Cronbach's $\alpha = .80$) of the original, and widely used RSES (Abbey et al., 2003; Koss et al., 1987). For this current study, test-retest reliability analysis indicated good internal consistency as well (Cronbach's $\alpha = .81$).

Procedure

All data were collected throughout the 2015-2016 academic years (fall and spring) though the RedCap software system. Recruitment took place at both the University at

Albany and Virginia Commonwealth University. The Director of VCU's DSS office identified students receiving services for an ADHD diagnosis and sent them notification of this study via email. In addition, flyers were posted throughout the DSS office. Regarding UAlbany, both the Associate Director of the University Counseling Center and the Director of the DRC assisted with this study. Students receiving services through the DRC for a diagnosis of ADHD were emailed the study information, and flyers were posted throughout the DRC office. Due to the low response rate that followed, the study was then advertised to VCU psychology students through SONA, an online data collection tool.

After students replied either to the flyer or to the email sent out from their University's DSS/DRC offices, or selected into the study via SONA, they were presented with information as to what participation would entail prior to beginning the questionnaire. Introduction to the study consisted of the following: a) detailed information about the study, b) written informed consent, and c) contact information for the investigator. Students who wished to participate read the online consent form and then clicked "Agree" to enter the online survey that took approximately 15 to 30 minutes to complete in RedCap. Prior to accessing the "Agree" option, participants must have selected that they were 18 years or older and that they had received a diagnosis of ADHD or they were redirected to a page informing them of their ineligibility. Participants completed the survey at their discretion over the fall and spring semesters.

Counterbalancing of the survey (two forms) was implemented to prevent order effects.

Incentive to complete the survey included entry into a raffle for the choice of a \$200 gift card or an iPad mini for DSS/DRC students, and one research credit for SONA

participants. Once the survey was completed, students entered their contact information into a link to a separate website. There, DSS/DRC participants entered their contact information in order to gain entry to the raffle while SONA participants provided their contact information to be awarded research participation credit.

Results

Preliminary analyses

Prior to conducting data analyses for the main hypotheses proposed in this study, preliminary analyses were conducted to assess for potential order effects between the two alternate questionnaire forms as well as the relations amongst relevant demographic variables and the variables of interest in this study, including GPA, occupational performance, hazardous alcohol use, illicit substance use, sexual victimization, and offending. Regarding the continuous variables, all were normally distributed with the exception of HPQ lost work performance. After adjusting three low outliers, this scale remained kurtotic but skewness improved.

Only data collected from participants who responded to a minimum of 80% of the survey were used for data analyses, and of these individuals, the average response was imputed for blank items. In order to reduce family-wise error, Bonferroni corrections were used for preliminary data analyses unless otherwise noted. As a reminder, this study's sample size of 248 exceeded that required by power analyses ($N = 147$).

Effects of demographic variables. The effects of demographic variables, including race, age, and sex, are explicated in the results of hypothesis testing. The effects of the demographic variable of origin of sample (VCU DSS vs. UAlbany DRC vs. VCU SONA) were examined. A MANOVA was run to examine the effects of sample on

the variables of interest in this study. No significant overall differences among measures based on sample $F(20, 372) = 1.45, p = .095$; however, Univariate ANOVA revealed significant differences between samples on the BAARS, $F(2, 194) = 4.12, p = .018$. Specifically, VCU DSS students were significantly higher on the BAARS than VCU SONA students ($p = .006$).

Intercorrelation matrix and descriptive statistics. Bivariate correlational analyses were conducted to illustrate the associations between all primary variables of interest. Pearson correlation coefficients are displayed in Table 1, and Table 2 provides Spearman correlation coefficients for nominal variables as compared to octiles of continuous variables. These results will be discussed further in the context of hypotheses testing.

Table 1

Intercorrelations for Continuous Variables, N = 248

	AMED	Non-AmED	BAARS	GPA	HPQ
AMED	--				
Non-AmED	.32*	--			
BAARS	.03	.01	--		
GPA	-.08	-.13	-.01	--	
HPQ	-.01	.10	-.01	.03	--

Note. AMED = alcohol mixed with energy drink use total score; Non-AmED = Non-AmED Alcoholic Beverages; BAARS = ADHD total score; GPA = GPA Last Semester; HPQ = HPQ Lost Work Performance

*Bonferroni corrected $p < .003$

Table 2

Spearman Correlations for Nominal Variables vs. Octiles of Continuous Variables, N = 248

	SRO	ISU	AUDIT	RSES
AMED	.22*	.14	.40*	.21*
Non-AmED	.32*	.40*	.58*	.17
BAARS	.15	.08	.05	.21*
GPA	-.14	-.12	-.01	-.03
HPQ	.00	.13	.13	-.01

Note. AMED = alcohol mixed with energy drink use total score; Non-AmED = Non-AmED alcoholic beverages; BAARS = ADHD total score; RSES = Sexual Victimization; SRO = Offending; ISU = Illicit Substance Use; AUDIT = Hazardous Alcohol Consumption; GPA = GPA Last Semester; HPQ = HPQ Lost Work Performance
*Bonferroni corrected $p < .002$

Descriptive statistics. Table 3 provides demographic data. Table 4 provides the means and standard deviations for the primary variables. Table 5 provides frequencies for categorical variables. Of particular interest for this current study, the mean score on the BAARS-IV was 34.77 and the average age at diagnosis was 13 years old. While this is slightly below the cut-off of 36 proposed for a diagnosis of ADHD on the BAARS-IV, it is above the 76th percentile (or a total score of 28), which is the cut-off to be considered marginally symptomatic (Barkley, 2011). Approximately 42.3% (105 participants) scored 36 or higher on the BAARS-IV. In this sample, 79.4% (197) of students were employed in hourly positions while 11.3% (28) were employed in salaried positions. AmED use (n

= 95; 38.3%) ranged from zero AmED beverages over the last three months to 15 (with an average of almost two beverages). Almost half (42.3%) of students engaged in illicit substance use, with the most commonly used substance being marijuana (25.3%), followed by cocaine (1.9%) and ecstasy (1.6%). As Table 5 indicates, the majority of students did not engage in hazardous alcohol consumption, offend, or experience sexual victimization.

Table 3

Demographic Data, N = 248

<i>Sample</i>	<i>n</i>	<i>%</i>	<i>Disability Accommodations</i>	<i>n</i>	<i>%</i>
VCU SONA	219	88.3	Yes	39	15.7
VCU DSS	20	8.1	No	205	82.7
UA	9	3.6	No Response	4	1.6
<i>Sex</i>			<i>Participates in Greek Life</i>		
Male	90	36.3	Yes	27	10.9
Female	158	63.7	No	221	89.1
Other	0	0			
<i>Race</i>			<i>Relationship Status</i>		
African American	42	16.9	Single	115	46.4
Asian American	30	12.1	Dating	9	3.6
Caucasian/White	149	60.1	New Relationship	47	19.0
Hispanic/Latino ^a	8	3.2	Long-Term Relationship	74	29.8
Native American ^b	3	1.2	No Response	3	1.2
Other ^c	16	6.5			
<i>Year in School</i>			<i>Sexual Orientation</i>		
Freshman	102	41.1	Bisexual	19	7.7
Sophomore	52	21.0	Gay/Lesbian	14	5.6
Junior	49	19.8	Heterosexual	212	85.5
Senior	36	14.5	Queer	1	.4
Graduate	3	1.2	No Response	2	.8
Other	5	2.0			
No Response	1	.4			
<i>Enrollment Status</i>			<i>Active in Student Athletics</i>		
Full-Time	231	93.1	Yes	13	5.2
Part-Time	15	6.0	No	234	94.4
No Response	2	.8	No Response	1	.4

Note. Dating = Dating/In a Relationship with Multiple Others; New Relationship = In a New Relationship (< 12 months) with One Person; Long-Term Relationship = In a Long-Term Relationship (>12 months) with One Person

^{a, b, c} later all recoded as “other” for final analyses to ensure all cells are > 5

Table 4

Means and Standard Deviations for Continuous Variables, N = 248

	AMED	Non-AmED	Age	GPA	HPQ	BAARS
<i>Range</i>	0-15	0-150	18-34	1.00-4.00	-13745-22150	12-71
<i>M</i>	1.96	26.90	20.69	3.12	1532.54	34.77
<i>SD</i>	3.72	37.19	3.40	.72	5358.68	11.63

Note. AMED = alcohol mixed with energy drink use total score; BAARS = ADHD total score; GPA = GPA Last Semester; HPQ = HPQ Lost Work Performance (Lost Work Performance – higher scores = poorer work performance)

Table 5

Frequencies for Categorical Variables, N = 248

	SRO	%	ISU	%	AUDIT	%	RSES	%
Yes	69	27.8	105	42.3	69	27.8	58	23.4
No	179	72.2	142	57.3	178	71.8	188	75.8
No Response	0		1	.4	1	.4	2	.8

Note. SRO = total number of individuals endorsing offending/illegal behaviors; ISU = total number of individuals endorsing illicit substance use; AUDIT = total number of individuals engaging in hazardous drinking; RSES = total number of individuals endorsing sexual victimization.

Hypothesis 1

A hierarchical linear regression analysis assessed whether AmED use significantly predicted GPA. Hypothesis 1 was not supported; AmED use did not predict

total GPA after controlling for age, sex, race, and non-AmED alcoholic beverages consumed $F(5, 229) = 1.44, p = .211$. No coefficients were significant in the full model.

Hypothesis 2

A hierarchical linear regression analysis assessed whether AmED use significantly predicted lost work performance. Hypothesis 2 was not supported; AmED use did not predict lost work performance after controlling for age, sex, race, and non-AmED alcoholic beverages consumed $F(5, 202) = .987, p = .427$. No individual coefficients were significant in the full model.

Hypothesis 3

A standard logistic regression analysis assessed whether sex, age, race, non-AmED alcoholic beverages consumed, and AmED use significantly predicted whether or not a participant engaged in hazardous alcohol use. When all predictor variables were considered together, they did significantly predict whether or not a participant had engaged in hazardous alcohol use, $\chi^2(5) = 102.46, N = 246, p < .001$. The addition of AmED significantly improved the predictive power of the model, $\chi^2(1) = 15.35, N = 246, p < .001$ as did non-AmED alcoholic beverages, $\chi^2(1) = 84.50, N = 246, p < .001$. The overall model effect size was moderate, with Nagelkerke $R^2 = .49$. With all predictors included in the model, 82.1% of cases were correctly predicted. According to the Wald criterion, non-AmED alcoholic beverages consumed and total AmED beverages consumed were significant predictors of hazardous drinking, ($Wald(1) = 34.89, p < .001$. and $Wald(1) = 13.49, p < .001$, respectively). The change in odds associated with a one-unit change in total sum of alcoholic beverages consumed was 1.04 (95% CI 1.03-1.06), indicating that for every one-unit change, the participant was 1.04 times more likely to

have an AUDIT score indicative of hazardous drinking. The change in odds associated with a one-unit change in total sum of AmED beverages consumed was 1.12 (95% CI 1.09-1.32), indicating that for every one-unit change, the participant was 1.12 times more likely to have an AUDIT score indicative of hazardous drinking.

Hypothesis 4

A standard logistic regression analysis assessed whether sex, age, race, non-AmED alcoholic beverages consumed, and AmED use significantly predicted whether or not a participant engaged in illicit substance use. When all predictor variables were considered together, they did significantly predict whether or not a participant had engaged in illicit drug use, $\chi^2(5) = 34.91$, $N = 246$, $p < .001$. The addition of AmED significantly improved the predictive power of the model, $\chi^2(1) = 5.20$, $N = 246$, $p = .02$ as did non-AmED alcoholic beverages, $\chi^2(1) = 29.71$, $N = 246$, $p < .001$. The overall model effect size was small, with Nagelkerke $R^2 = .18$. With all predictors included in the model, 65.4% of cases were correctly predicted. According to the Wald criterion, non-AmED alcoholic beverages consumed and total AmED beverages consumed were significant predictors of illicit substance use, ($Wald(1) = 13.37$, $p < .001$. and $Wald(1) = 4.88$, $p = .03$, respectively). The change in odds associated with a one-unit change in total sum of alcoholic beverages consumed was 1.02 (95% CI 1.01-1.03), indicating that for every one-unit change, the participant was 1.02 times more likely to engage in illicit substance use. The change in odds associated with a one-unit change in total sum of AmED beverages consumed was 1.10 (95% CI 1.01-1.19), indicating that for every one-unit change, the participant was 1.10 times more likely to engage in illicit substance use.

Hypothesis 5

A standard logistic regression analysis assessed whether sex, age, race, non-AmED alcoholic beverages consumed, and AmED use significantly predicted whether or not a participant engaged in criminal offending. When all predictor variables were considered together, they significantly predicted whether or not a participant had engaged in criminal offending, $\chi^2(5) = 23.84$, $N = 247$, $p < .001$; however, hypothesis 5 was not supported as AmED use was not a significant predictor. The overall model effect size was small, with Nagelkerke $R^2 = .13$. With all predictors included in the model, 72.9% of cases were correctly predicted. According to the Wald criterion, sex ($Wald(1) = 3.89$, $p = .05$) and non-AmED alcoholic beverages consumed ($Wald(1) = 7.11$, $p = .01$) were predictors but not significantly so due to confidence intervals ranging from .30 – 1.00 and 1.00 to 1.02, respectively.

Hypothesis 6

A standard logistic regression analysis assessed whether sex, age, race, non-AmED alcoholic beverages consumed, and AmED use significantly predicted whether or not a participant was sexually victimized. When all predictor variables were considered together, they did significantly predict whether or not a participant was sexually victimized, $\chi^2(5) = 20.22$, $N = 245$, $p = .001$. The addition of AmED significantly improved the predictive power of the model, $\chi^2(1) = 4.45$, $N = 245$, $p = .04$, as did non-AmED beverages, $\chi^2(1) = 6.65$, $N = 245$, $p = .01$ and sex, $\chi^2(1) = 9.12$, $N = 192$, $p = .03$. The overall model effect size was small, with Nagelkerke $R^2 = .12$. With all predictors included in the model, 79.2% of cases were correctly predicted. According to the Wald criterion, total AmED beverages consumed, ($Wald(1) = 4.52$, $p = .04$), race ($Wald(1) = 4.63$, $p = .03$), and sex ($Wald(1) = 6.47$, $p = .01$) were significant predictors. The change

in odds associated with a one-unit change in total sum of AmED beverages consumed was 1.09 (95% CI 1.01-1.18), indicating that for every one-unit change, the participant was 1.09 times more likely to be sexually victimized. According to the Wald criterion, non-AmED alcoholic beverages consumed ($Wald(l) = 3.89, p = .05$) was also a predictor but not significantly so due to confidence interval ranging from 1.00 to 1.02.

Discussion

The purpose of this study was to explore the associations among AmED use, negative educational and occupational outcomes, hazardous alcohol use, illicit substance use, offending, and sexual victimization in college students with ADHD. Health psychology research shows that AmED users, in general, experience more negative alcohol-related consequences than those who do not consume AmED (Berger, Fendrich, Chen, Arria, & Cisler, 2011; Snipes & Benotsch, 2013; Thombs et al., 2010). There also is mounting evidence that college students with ADHD experience more problematic drinking outcomes than their counterparts (Barkley, Murphy, O'Connell, et al., 2006). Thus, it was hypothesized that this increased risk would be exacerbated by the use of AmED. The research questions addressed in this study are important because of the lack of research examining AmED use in general, but especially AmED use in the at-risk population of college students with ADHD. The need to better understand AmED's unique impact across different populations is clear, particularly in light of research showing that energy drinks are mixed with alcohol more often than any other non-alcoholic beverage by college students (Johnson et al., 2016). This study, then, sought to find support for a relationship between AmED use and educational consequences, occupational consequences, problematic substance use, criminal offending, and sexual

victimization in college students with ADHD. AmED use was found to predict hazardous alcohol use, illicit substance use, and sexual victimization. The following sections of this paper will compare and contrast these findings with past research, and finally, outline implications for practice and research.

AmED use and its relation to educational and occupational outcomes

For the first and second hypotheses, hierarchical linear regression methods were used to examine whether AmED use would predict poorer academic performance as measured by GPA, and lost work performance as measured by the HPQ (Kessler et al. 2003). Analyses showed no significant associations amongst AmED use, GPA, and lost work hours. In addition, the relationship between AmED use and GPA was investigated and found not to be statistically significant. This differs from the results of Mallett et al.'s (2013) study, which found AmED use to be associated with poorer grades on academic assignments. These differential findings may be related to the temporal nature of the variables of interest, as this current study assessed previous semester GPA whereas Mallet et al. asked students to report academic-related consequences over the past year.

As mentioned previously, males involved in Greek life (Patrick et al., 2016) and student athletics (Woolsley et al., 2009) tend to exhibit higher rates of AmED use. All of these characteristics are underrepresented in this sample, with a minority of the sample being male (a little over 30%) or involved in Greek life or student athletics (10.9% and 5.2%, respectively). Overall, this current study's lack of results supporting a relation between AmED use and academic outcomes could be explained, at least in part, by the notably low number of participants in the study who tend to be the more frequent utilizers of AmED. It is noted that the average GPA for students in this sample was a B, with only

22 students reporting a GPA below a 2.0, and which also could have potentially factored in to the null findings resulting from this hypothesis.

To date, only this study and the research presented by Mallett and colleagues investigated the relationships among AmED use and educational outcomes. The lack of research in this area is problematic given that the functional consequences of alcohol use for college students with ADHD can be severe (Langberg, Dvorsky, Kipperman, Molitor, & Eddy, 2015), and there are even fewer studies that examine the functional consequences, such as impact on grades, for college students with ADHD who engage in AmED use. Langberg et al. suggest that alcohol use in college students with ADHD negatively influences executive function and, ultimately, motivation to reject short-term rewards for long-term gains. Further examination of how AmED use may result in similar outcomes may fill in some of the gaps regarding what is known about consequences related to alcohol use in college students with ADHD.

Just as this is the first study to examine the relation between GPA and AmED use in college students with ADHD, it is also the first to explore the work-related associations of AmED use for this population. Nonetheless, the results of this study do not support an association between AmED use and lost work performance after controlling for non-AmED alcoholic beverage consumption. This may be due to the fact that over three-fourths of the sample were employed on an hourly basis. Because the HPQ (Kessler et al. 2003) instructs responders to estimate the number of hours their employers expect them to work in a typical work week, students with hourly employment may have experienced difficulty estimating this number given the variability in their work schedule. In addition,

although the HPQ (Kessler et al. 2003) has been widely used with adults, and even with adults with ADHD (Kessler et al., 2009), few studies have used it with college students.

A review of the research literature regarding AmED use and occupational outcomes revealed only one relevant study by Cheng, Huang, Cheng, Chen, and Chen (2015). These authors examined work-related injuries and AmED use in Taiwanese workers and found that AmED use was associated with more work-related injuries and other medical issues as compared to non-AmED users. The Taiwanese manual workers who consumed higher levels of AmED were less accomplished in regards to occupational attainment (e.g., fewer promotions, fewer self-reported job titles that involve skilled tasks) as compared to their counterparts.

This current study may not have resulted in findings similar to Cheng and colleagues for a number of reasons. Students in this study were asked to report AmED use in the past three months, whereas workers in Cheng et al.'s study were asked to report their average weekly AmED use. General employee characteristics were assessed, such as number of promotions and job titles, as compared to the actual lost work performance assessed in this current study. In addition, these differential findings may be a function of the type of work— as students may be less likely to be employed in jobs where minor mistakes involve injury.

AmED use and its relation to alcohol-related consequences

For the third, fourth, fifth, and sixth hypotheses, logistic regressions were conducted to examine the relations amongst AmED use and scores on the AUDIT, illicit substance use, SRO and the RSES.

Among participants, 84.2% reported alcohol consumption over the last three months. Of those who drank alcohol, 38.3% reported consuming AmED (5.3% did not answer this question). Snipes and Benotsch found slightly lower rates in their study of AmED use in college students, with 29.7% of college students endorsing alcohol consumption also reporting AmED consumption; however, it is important to note that these authors assessed average monthly AmED use as compared to the past three month AmED use rates reporting in this current study. Snipes and Benotsch also did not specifically recruit for individuals with ADHD, as was the case with this current study. The average number of AmED beverages consumed by participants in this sample was a little over two AmED beverages over a three-month period. The rates of AmED use in this study provide evidence that a considerable minority of college students with ADHD consume AmED; however, this association should be further explored with a larger, representative sample allowing for a comparison between both groups of college students with and without ADHD.

Consistent with this study's hypotheses, AmED use significantly predicted hazardous drinking as assessed by AUDIT scores. This study, then, adds to previous research showing that AmED users are at a greater risk of hazardous alcohol consumption (Patrick & Maggs, 2014; Price et al., 2010) by replicating this finding in a sample of students with ADHD. Miller, Quigley, Eliseo-Arras, and Ball (2016) suggest that AmED use may facilitate heavier drinking due to the psychopharmacological effects of caffeine, such that the stimulant effect of the caffeine combined with its ability to counteract the sedative effect of alcohol may result in longer drinking sessions and higher intake during these drinking sessions (Attwood et al., 2012). Conversely, some authors

(e.g., Peacock et al., 2015) showed that AmED use was actually a protective factor in excessive alcohol consumption as compared to alcohol use only. Their notion is that problematic outcomes, such as binge drinking during and after AmED drinking sessions, may reflect pre-existing personality traits and not necessarily the influence of adding energy drinks to alcohol (Johnson et al., 2016). Miller et al., among others researchers in the AmED literature, argue that AmED use is still associated with increased alcohol-related consequences even when controlling for pre-existing personality traits.

The reported quantities of alcohol use by students in this study raise concern. Of the students who consumed alcohol over the last three months, 27.8% engaged in hazardous alcohol consumption. The patterns of use exhibited in this study are similar to those of other investigations that suggest 35% of college students report binge drinking within a 30 day time interval (SAMHSA, 2012). Although hazardous drinking is risky for any college student, it may be particularly problematic for college students with ADHD. They may experience more negative consequences as a result of heavy drinking as compared to their counterparts (Rooney, Chronis-Tuscano, & Yoon, 2012), perhaps due to the problematic interaction of impulsivity (secondary to ADHD) and the impaired decision-making abilities that can accompany intoxication.

The rates of illicit substance use by students with ADHD were also concerning, with 42.3% reporting illicit substance use in the last three months. The most commonly used substance was marijuana, followed by cocaine and ecstasy. This study provided partial support for the most commonly used illicit substances for AmED users, as Snipes and Benotsch (2013) previously reported that marijuana, ecstasy, and cocaine were the most commonly used illicit substances by college students who consumed AmED in their

sample. The rates of cocaine use in this current study may be lower than Snipes and Benotsch reported, given that college students with ADHD are often prescribed stimulants— which potentially are life threatening when used in combination with stimulants such as cocaine.

This study revealed that AmED use predicted illicit substance use, which consequently provides more support for past research suggesting that AmED use is associated with illicit substance use (Snipes & Benotsch; Miller, 2008). Moreover, Snipes and Benotsch point out that college students' interest in the stimulating properties of combining energy drinks with alcohol may be similar to their motivations for mixing cocaine and amphetamine with alcohol (van der Poel, Rodenburg, Dijkstra, Madelon, & van de Mheen, 2009; Boys, Marsden, & Strang, 2001). As noted previously, college students with ADHD are at a greater risk for illicit substance use (Upadhyaya et al., 2005), and caffeine use (Walker et al., 2010); hence, and for reasons already described, AmED may be particularly appealing for them. In this regard, the linkage between AmED and illicit substance use are consistent with Khantzian's (1985; 1997) self-medication hypothesis, in that college students with ADHD may be drawn to AmED use in order to reduce symptoms of inattention and hyperactivity while imbibing.

In general, illicit substance use by college students who drink AmED is an area of concern given the increased risk of side effects that could result from mixing energy drinks with stimulants (Peacock, Sindicich, Dunn, et al., 2015). Beyond the concern resulting from the added risk of stimulants (the most common medications used to treat ADHD), headaches, heart palpitations, nausea and vomiting are all potential side effects of mixing energy drinks with alcohol or other psychoactive substances (Peacock, et al.).

Thus, it may be beneficial to examine covariates associated with AmED use and illicit substance use in college students. For example, in a sample of regular ecstasy users, approximately 84% had consumed energy drinks with either alcohol or another psychoactive substance (Peacock, et al.).

In this study AmED use was not significantly associated with higher scores on the SRO, a measure of criminal offending. This may be because illegal behaviors, at least the behaviors assessed in this study, are relatively uncommon in the college student population. In their examination of AmED use and illegal behavior, Miller et al. (2016) suggested that a sample size of 175 taken from the general adult population was not large enough to accurately sample for illegal behaviors. This is also likely the case with this current study. Nonetheless, understanding the rates of illicit behaviors are relevant for the college student population given that over one quarter of participants endorsed engaging in at least one illegal behavior over the last three months. The most commonly reported behaviors included driving while intoxicated (6.8%), engaging in fist fights (6.8%), carrying a weapon (4.5%), and stealing money or other items (3.4%).

The reported rates of physical aggression, or fist fights, by students in this study are notable given the higher rates of physical and sexual aggression found in individuals with ADHD (Therault & Holmberg, 2001). Physical aggression also may be associated with AmED use (Miller, Quigley, Eliseo-Arras, & Ball, 2016), due to the synergistic interaction of alcohol and energy drinks on impulse control and other cognitive processes involved in the inhibition of aggression (Marczinski et al., 2011). Miller et al.'s event-level analysis of AmED use and physical aggression in the context of drinking establishments found AmED use to be associated with bar fights. This association

remained significant, even after controlling for alcohol use and sensation seeking, impulsive, and aggressive personality characteristics. Conversely, Peacock et al.'s (2015) study suggested that AmED consumers were less likely to be physically violent. Although their study did not support a link between physical aggression and AmED use, it did reveal findings that raise more questions about the potential for other legal consequences in AmED users. For example, AmED users were more likely to drive intoxicated or engage in risky behavior in response to a dare from peers. Given that the propensity to drink and drive or act on a dare are likely related to the propensity to engage in other risky behaviors, such as physical aggression, it does seem logical to explore the association between AmED use and illegal behaviors such as physical assault.

Finally, this study hypothesized that AmED use would be associated with higher rates of sexual victimization. Fully 23.4% of college students with ADHD reported being sexually victimized in this study and their use of AmED could have placed them at higher risk for this outcome. This finding is supported by Peacock, Droste et al.'s (2015) conclusion that AmED drinking sessions are more likely to result in participants being physically or sexually assaulted than alcohol-use only sessions. Snipes and colleagues (Snipes, Green, Javier, Perrin & Benotsch, 2014) also linked AmED use to an increased risk for sexual victimization in a sample of college students. One explanation for students' increased risk of sexual victimization during AmED sessions is illustrated by the concept of 'wide awake drunkenness' (Arria & O'Brien, 2011). For example, some authors have suggested that the energy drink component of AmED beverages increases the noticeable depressant effects of the alcohol (Ferreira et al., 2006; Weldy, 2010). Following this line of thought, students may be awake and interacting with others late

into the night despite being cognitively impaired, which could place them at increased risk of sexual victimization.

Implications for practice

Perhaps the most important contribution of this study is that it provides baseline data for rates of AmED use in college students with ADHD. This is the first known study to examine AmED use in this population. The results of this study provided support for the escalating concern in the scientific community and the general public regarding AmED-related consequences. Understanding AmED use in general, but especially in high-risk populations (i.e., college students with ADHD), is important because of the numerous consequences that have consistently been found to be associated with AmED use. A direct comparison of college students with and without ADHD may be warranted given that those with ADHD in this study exhibited alarming rates of AmED use, and because college students, especially those diagnosed with ADHD, also may be at risk for hazardous drinking, illicit substance use, and sexual victimization. Thus, college campus disability support services offices may consider specifically tailoring their AmED use awareness campaigns for college students with ADHD. For example, a qualitative review of motivations to consume AmED indicated that using an approach that provides normative information and alternatives to AmED use may be especially beneficial for college students (Pettigrew, Biagioni, Jones, Stafford, Chikritzhs, & Daube, 2016); however, there does not appear to be any research as of yet regarding effective interventions targeting AmED use by college students with disabilities.

University health and wellness centers may also consider targeting AmED use by college students with ADHD due to their use of prescribed stimulants. Energy drink

consumption itself is now considered a potential risk factor for medical complications (Goldfarb, Tellier, & Thanassoulis, 2014). Hence, it is especially important that AmED use in college students who are prescribed stimulants be better understood. AmED use by those prescribed a stimulant is problematic because caffeine (a stimulant) is known to exacerbate the side effects (e.g., anxiety, tachycardia) of other stimulants (Frau, Simola, & Morelli, 2013). Further exploration is needed to establish whether AmED use in college students with ADHD taking prescription stimulants is a health concern. If AmED use does exacerbate physiological risks, such as the cardiac complications (Vitiello et al., 2012) already associated with prescription stimulant use, then University Health Services should educate college students with ADHD about these potential risks.

Mental health providers employed in college health and counseling centers have the potential to play an important preventative role in regards to AmED use. For example, questions targeting AmED use could be added to the substance use screening questions typically asked by counseling and wellness center staff. Interviewers may want to pay special attention to reported AmED use by college students with ADHD, especially if those students are interested in receiving medication management services to treat their symptoms. If students with ADHD who use AmED also are interested in a stimulant, then they may benefit from education regarding the potential risks mixing alcohol and stimulants. Perhaps most importantly, psychiatrists, nurse practitioners, and primary care physicians who prescribe medications for college students with ADHD may want to assess these students' understanding of the potential risks of AmED use and combining stimulants throughout their course of treatment.

Limitations

The sample size of this study was small, which may have made it difficult to achieve statistical significance for the several of proposed analyses (e.g., GPA, HPQ, SRO). Perhaps the most significant limitation of this study resulted from the low number of participants collected from the university support services offices. As a result of the limited number of eligible participants from these sources, the majority of participant data used for statistical analyses were from students self-reporting an ADHD diagnosis. Although only data from participants reporting a diagnosis procured from a medical or mental health professional were analyzed, the possibility of false positives is of concern as students may have been motivated to report a diagnosis for the purposes of completing the study to receive course credit. Post hoc analyses showed that DSS students, as expected, did report more severe ADHD symptomatology. This attests to the quality of data gathered for this study. So, it may be that students who reported ADHD in the SONA sample simply experienced a lesser degree of educational or other functional impairment, as opposed to being motivated to feign an ADHD diagnosis in order to qualify for the study. Obtaining information from knowledgeable informants, such as instructors or family members, would have alleviated some of the concern of over- or under- reporting.

Relatedly, another limitation of this study is that participants were asked to report whether they had ever been diagnosed with ADHD. This raises the possibility that some study participants may have met, but no longer meet, current criteria for ADHD. However, it is important to keep in mind that 35 to 68% of individuals diagnosed as children continue to meet criteria in adulthood, and 78% experience some degree of impairment (Biederman, Petty, Evans, Small, & Faraone, 2010). The latter point is

supported in this study by the finding that over three fourths of the sample endorsed current symptoms indicative of at least marginal ADHD symptomology. Although this study sought to recruit college students with ADHD via the DSS/DRC samples, low response rates resulted in opening the study to the online psychology subject pool. Future efforts exploring AmED in college students will benefit from larger scale efforts (by way of collaborative efforts among numerous Universities and Colleges) and assessing whether students currently are being treated for their symptoms of ADHD. A larger sample size would allow for separate analyses of each component sample (VCU SONA vs. VCU DSS vs. UAlbany DRC). Finally, reliance on retrospective, self-reports of AmED use can be problematic and consequently this study would have benefited from the incorporation of collateral reports from those close to participants. Studies using self-reported of alcohol use data may be less reliable than studies that also include information from knowledgeable informants.

Given the cross-sectional nature of this study, data such as prior history of risky behaviors and educational/occupational consequences were not collected and therefore could not be controlled for statistically. This study did not control for impulsivity when examining the associations amongst ADHD and alcohol-related consequences because the SUPPS-P (Whiteside & Lynam, 2001; Cydersa, Littlefield, Coffeyc, Karyadi, 2014), was revealed to have unacceptably low levels of internal consistency reliability. Despite this limitation, it is noted that other studies have published significant associations between the inattention component of ADHD and alcohol use (Roberts, Peters, Adams, Lynam, & Milich, 2014), which indicates that impulsivity may not explain in full alcohol-related consequences for those with ADHD.

Finally, this study's lack of assessment of lifetime alcohol use is another limitation as past experiences with abuse or dependence of alcohol could influence the consequences of current AmED use. The consequences of alcohol abuse and dependence are often cumulative; thus, it would stand to reason that students with histories of alcohol-related problems would be more likely to report consequences associated with AmED use. For these students, educational and occupational consequences reflected in this study may be better represented by the culmination of repeated drinking episodes over a period of months or years instead of recent AmED use.

Implications for future research

The results of this study suggest potential directions for future research, and confirm the importance of better understanding AmED use in at-risk populations. The prevalence of college students with ADHD engaging in AmED use in this study, similar to the rates presented in other studies (Snipes & Benotsch, 2013), suggest that current prevention and harm reduction strategies should be expanded upon. Future studies should incorporate a larger sample size to allow for a greater degree of generalizability. In addition, students with disabilities, especially college students with ADHD, are a population with unique needs that may not be adequately recognized. College students with ADHD should be given more attention in regards to their problematic alcohol use as a consequence of their increased vulnerability due to their learning disability.

Most of the participants in this sample were from a university where participation in fraternity or sorority life, as well as student athletics (for example, there is no university football team), is less common perhaps due to the fact that many students commute to campus. Given that many AmED users are white, male, involved in

fraternity/sorority life (Patrick, Macaуда, & Maggs, 2016) or student athletics (Woolsey et al., 2010), problematic outcomes associated with AmED use may be better illustrated by a more representative sample than the primary one used for this current study. Future studies assessing AmED use in college students with ADHD may benefit from sampling from larger universities where these demographics are better represented.

In addition to demographic risk factors mentioned in the preceding paragraph, future studies should also examine protective factors against AmED use in individuals with ADHD. Participation in Honors academic programs and having to attend early morning courses have been shown to be protective factors against AmED use in a sample of college students (Patrick, Macuada, & Maggs, 2016). Studies such as Patrick and colleagues' should be replicated with students with ADHD, as it is possible that due to their learning disability some of the protective factors (i.e., Honors programming) indicated in the general college student population may not be relevant for them. Future studies examining protective factors, as well as risk factors, for AmED use in college students in general, and especially those with ADHD, would be a valuable addition to the AmED research literature.

Some of the null findings of this study may be attributed, in part, to this study's conservative measurement of AmED use. Other studies measured AmED use more liberally; such as asking students to report energy drink consumption two hours before and two hours after drinking alcohol (Johnson et al., 2016). Other researchers asked high school students to report their use of alcohol mixed with caffeinated products, not just energy drinks (Kponee, Siegel, & Jernigan, 2014). As this current study simply requested that students report only alcohol mixed directly with energy drinks, the prevalence of

students engaging in AmED use may have been under measured and the potential consequences of mixing caffeine and alcohol may be overlooked. Thus, future studies examining AmED use in college students with ADHD may benefit from relying on less restrictive, more inclusive measures of AmED consumption.

When considering future research directions in the AmED literature, it is important to note Johnson et al.'s (2016) suggestion that some between-subject differences in outcomes when comparing AmED consumers to alcohol-only consumers are reflective of pre-existing differences instead of the addition of energy drinks, per se. For example, Snipes and Benotsch (2013) found that AmED consumers exhibit higher levels of sensation seeking than their counterparts and Peacock et al. (2015) proposed that the differential outcomes resulting from AmED use as compared to alcohol use only may be indicative of pre-existing characteristics of the consumer instead of psychopharmacological interactions. Nonetheless, other researchers have found AmED use to be a predictive variable above and beyond personality characteristics (Brache & Stockwell, 2011). Future research examining AmED use by students with ADHD may yield findings different from this current study's by controlling for sensation seeking or impulsivity in data analysis.

In summary, the potential consequences of AmED use (e.g., hazardous alcohol use, illicit substance use, sexual victimization) should be further explored. This point has been echoed repeatedly in the AmED research literature in recent years (e.g., Berger, Fendrich, Chen, Arria, & Cisler, 2011; Snipes & Benotsch, 2013; Thombs et al., 2010), but college students with disabilities remain a neglected area in studies examining AmED use. As AmED use by college students in this study was associated with detrimental

consequences (i.e., hazardous drinking, illicit substance use, sexual victimization), it is imperative that more experimental and longitudinal studies be conducted to clarify the impact of AmED use by college students with ADHD.

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Appendix A

Demographics

Are you 18 years old or older?

Yes _____ No _____

Have you received a diagnosis of ADD/ADHD from a medical/mental health professional?

Yes _____ No _____

How old were you at the time of the diagnosis? _____

How old are you? _____ years

What is your gender? (Select one): Male Female

Which best describes you?

White African-American Hispanic/Latino Asian-American Native American
Other _____

What year in school are you?

Freshman Sophomore Junior Senior
Graduate Other _____

Which best describes your school enrollment status?

Full-time Part-time

What is your current OVERALL GPA (on a 4.0 scale)? _____

What was your LAST semester GPA (on a 4.0 scale)? _____

What is your OVERALL high school GPA (on a 4.0 scale)? _____

Do you receive disability support services from your University's Disability Support Services (DSS) offices?

Yes No

Select the sexual orientation that *best* describes you?

Straight (heterosexual) Bisexual
Gay (homosexual) Queer

Circle the name of the University you attend:

University of Albany

VCU

Are you in a sorority or fraternity?

Yes

No

Are you a student athlete?

Yes

No

What is your college major?

What are your career plans?

Select the answer that best applies to you:

In a long-term relationship (≥ 12 months) with 1 person

In a new relationship (< 12 months) with 1 person

Dating / in a relationship with more than 1 person

Not currently dating / in a relationship

Appendix B

The SRO-R (Offending)

**Have you done any of the following activities over the last three months?
Circle Yes or No. If yes, please list the number of times you did the activity and the
number of times you were arrested for it.**

Delinquent subscale:

1) Stole money or things from people?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

2) Drove drunk?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

3) Sold marijuana?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

4) Sold hard drugs (e.g., cocaine, crack, heroin, LSD)?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

5) Broke in or tried to break into a building or vehicle to steal something?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

6) Paid to have sexual relations with someone?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

7) Stole or tried to steal a vehicle to keep or sell?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

8) Damaged someone else's property?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

Violent subscale:

9) Carried a weapon?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

10) Engaged in fistfights?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

11) Attacked someone with the intention of seriously hurting or killing them?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

12) Had (or tried to have) sexual relations with someone against their will?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

13) Used a weapon while fighting another person?

Yes No If yes, how many times? _____

If yes, how many times were you arrested for this behavior over the last 90 days? _____

Appendix C

HPQ (Occupational performance)

Please choose the category that best describes your main job. If none of the categories fits you exactly, please respond with the closest category to your experience. (Select only one.)

- a) Executive, administrator, or senior manager (e.g., CEO, sales VP, plant manager)
- b) Professional (e.g., engineer, accountant, systems analyst)
- c) Technical support (e.g., lab technician, legal assistant, computer programmer)
- d) Sales (e.g., sales representative, stockbroker, retail sales)
- e) Clerical and administrative support (e.g., secretary, billing clerk, office supervisor)
- f) Service occupation (e.g., security officer, food service worker, janitor)
- g) Precision production and crafts worker (e.g., mechanic, carpenter, machinist)
- h) Chemical/Production Operator (e.g., shift supervisors and hourly employees)
- i) Laborer (e.g., truck driver, construction worker)

Are you salaried or are you paid hourly? (“Salaried” means that you’re paid the same amount each week or month no matter how many hours you work. “Hourly” means that you’re paid a different amount each week or month depending on how many hours you work.)

- a) Salaried (GO TO C8.1)
- b) Paid hourly (GO TO C8.2)

How much do you make per year before taxes? _____

How many hours does your employer expect you to work in a typical 7-day week?

(If it varies, estimate the average. If more than 97, enter 97.)

Number of hours (00-97) _____

Absenteeism subscale:

Now please think of your work experiences over the past 12 weeks (84 days). In the spaces provided below, write the number of days you spent in each of the following work situations.

In the past 12 weeks (84 days), how many days did you...

___ miss an entire work day because of problems with your physical or mental health? (Please include only days missed for your own health, not someone else's health.)

___ miss an entire work day for any other reason (including vacation)?

___ miss part of a work day because of problems with your physical or mental health? (Please include only days missed for your own health, not someone else's health.)

___ miss part of a work day for any other reason (including vacation)?

___ come in early, go home late, or work on your day off?

About how many hours altogether did you work in the past 12 weeks (84 days)? (See examples below.) _____

Examples for Calculating Hours Worked in the Past 4 Weeks

40 hours per week for 12 weeks = 480 hours

35 hours per week for 12 weeks = 420 hours

40 hours per week for 12 weeks with 2 8-hour days missed = 464 hours

40 hours per week for 12 weeks with 3 4-hour partial days missed = 468 hours

35 hours per week for 4 weeks with 2 8-hour days missed and 3 4-hour partial days missed = 392 hours

Number of hours in the past 12 weeks (84 days): _____

Presenteeism subscale:

On a scale from 0 to 10 where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate the usual performance of most workers in a job similar to yours?

Worst Performance

Top Performance

Appendix D

Illicit Substance Use

Please select how much you have used the following in the past 3 months:

	None	Once or Twice	Several Times	At Least Every Week
	1	2	3	4
1) Marijuana	1	2	3	4
2) Ecstasy	1	2	3	4
3) Methamphetamine	1	2	3	4
4) Cocaine	1	2	3	4
5) Ketamine	1	2	3	4
6) Poppers	1	2	3	4
6) Heroin	1	2	3	4

7) Any other illicit recreational drug (list) _____

How much have you used the "other" drug you listed? Circle one of the following:

None (1) Once or Twice (2) Several Times (3) At least (4)
every week

In the last three months, have you used tobacco products? Check all that apply:

Cigarettes _____ Chewing Tobacco _____
Electronic Cigarettes _____ Cigars _____ Other _____

Have you taken stimulants used to treat ADHD in the last three months?

Yes _____ No _____

If yes, what is the brand and/or generic name for the medication(s) you took: _____

If yes, was the medication prescribed to you?

Yes _____ No _____

If no, how did you access it?

In the last three months, have you (check all that apply):

Sold your prescription stimulant medication _____

Bought stimulant medication prescribed to someone else _____

Traded your prescription stimulant medication for a different type _____

Appendix E

The Alcohol Use Disorders and Identification Test (AUDIT) (Hazardous drinking)

For the following questions, please use the following definitions: 1 drink = 12 oz. of beer, or 5 oz. of wine, or 1.5 oz. (shot) of hard liquor such as whiskey or vodka.

- 1. During the last three months how often did you have a drink containing alcohol?**
(0) Never. (1) Monthly or less. (2) 2 to 4 times a month. (3) 2 to 3 times a week. (4) 4 or more times a week.
- 2. During the last three months, how many drinks containing alcohol did you have on a typical day when you are drinking?**
(0) 1 or 2. (1) 3 or 4. (2) 5 or 6. (3) 7 or 9. (4) 10 or more standard drinks
- 3. During the last three months, how often did you have six or more drinks on one occasion?**
(0) Never. (1) Less than monthly. (2) Monthly. (3) Weekly. (4) Daily or almost daily.
- 4. How often during the three months did you find that you were not able to stop drinking once you had started?**
(0) Never. (1) Less than monthly. (2) Monthly. (3) Weekly. (4) Daily or almost daily.
- 5. How often during the last three months did you fail to do what was normally expected from you because of drinking?**
(0) Never. (1) Less than monthly. (2) Monthly. (3) Weekly. (4) Daily or almost daily.
- 6. How often during the last three months have you needed a first drink in the morning to get yourself going after a heavy drinking session?**
(0) Never. (1) Less than monthly. (2) Monthly. (3) Weekly. (4) Daily or almost daily
- 7. How often during the last three months did you had a feeling of guilt or remorse after drinking?**
(0) Never. (1) Less than monthly. (2) Monthly. (3) Weekly. (4) Daily or almost daily

8. How often during the last three months were you unable to remember what happened the night before because you had been drinking?

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

9. During the past three months, have you or someone else been injured as a result of your drinking?

(0) No. (1) Yes, but not in the last three months. (2) Yes, during the last three months.

10. During the last three months, has a relative or friend or a doctor or another health care worker been concerned about your drinking or suggested you cut down?

(0) No. (1) Yes, but not in the last three months. (2) Yes, during the last three months.

Appendix F

Alcohol and alcohol mixed with energy drink use

Now we would like to ask about your drinking habits over the last 3 months. Please enter the appropriate number in the blank.

Remember, 1 drink = 12 oz. of beer, or 5 oz. of wine, or 1.5 oz. (shot) of hard liquor such as whiskey or vodka.

1. In the past three months, how many alcoholic drinks did you consume?

2. Of those drinks, how many of them were alcohol mixed with energy drinks (Red Bull, Monster, Rockstar, AMP, etc.)? _____

Appendix G

The Revised Sexual Experiences Questionnaire (Sexual Victimization)

Has anyone overwhelmed you in the last three months with arguments about sex or continual pressure for sex in order to:

1. Fondle, kiss or touch you sexually when you indicated that you didn't want to?

0 times----1 time----2 times----3 times---4 or more times

2. Try to have sexual intercourse with you (but it did not happen) when you indicated that you didn't want to?

0 times----1 time----2 times----3 times---4 or more times

3. Succeed in making you have sexual intercourse when you indicated that you didn't want to?

0 times----1 time----2 times----3 times---4 or more times

4. Make you do oral sex or have it done to you when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

5. Make you have anal sex or penetrate you with a finger or objects when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

Has anyone threatened to physically harm you or someone close to you over the last three months in order to:

6. Fondle, kiss or touch you sexually when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

7. Try to have sexual intercourse with you (but it did not happen) when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

8. Succeed in making you have sexual intercourse when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

9. Make you do oral sex or have it done to you when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

10. Make you have anal sex or penetrate you with a finger or objects when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

Has anyone used physical force (such as holding you down) over the last three months in order to:

11. Fondle, kiss or touch you sexually when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

12. Try to have sexual intercourse with you (but it did not happen) when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

13. Succeed in making you have sexual intercourse when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

14. Make you do oral sex or have it done to you when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

15. Make you have anal sex or penetrate you with a finger or objects when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

When you were incapacitated (e.g., by drugs or alcohol) and unable to object or consent over the last three months has anyone ever:

16. Fondle, kiss or touch you sexually when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

17. Try to have sexual intercourse with you (but it did not happen) when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

18. Succeed in making you have sexual intercourse when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

19. Make you do oral sex or have it done to you when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

20. Make you have anal sex or penetrate you with a finger or objects when you indicated that you didn't want to?

0 Times----1 Time----2 Times----3 Times---4 Or More Times

Appendix H

BAARS-IV (ADHD symptomology) – Not available due to copyright

Appendix I

SUPPS-P (Impulsivity)

Section 1: Negative Urgency

1) When I feel bad, I will often do things I later regret in order to make myself feel better now.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

2) Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

3) When I am upset I often act without thinking.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

4) When I feel rejected, I will often say things that I later regret.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

Section 2: Lack of Perseverance

5) I generally like to see things through to the end.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

6) Unfinished tasks really bother me.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

7) Once I get going on something I hate to stop.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

8) I finish what I start.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

Section 3: Lack of Premeditation

9) My thinking is usually careful and purposeful.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

10) I like to stop and think things over before I do them.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

11) I tend to value and follow a rational, sensible approach to things.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

12) I usually think carefully before doing anything.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

Section 3: Sensation Seeking

13) I quite enjoy taking risks.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

14) I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

15) I would like to learn to fly an airplane.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

16) I would enjoy the sensation of skiing very fast down a high mountain slope.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

Section 4: Positive Urgency

17) When I am in a great mood, I tend to get into situations that could cause me problems.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

18) I tend to lose control when I am in a great mood.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

19) Others are shocked and worried about the things I do when I am feeling very excited.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

20) I tend to act without thinking when I am really excited.

(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree

Vita

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