

The Relation Between ADHD Symptoms and Alcohol Use in College Students

Journal of Attention Disorders
XX(X) 1–9
© 2013 SAGE Publications
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/1087054713498931
jad.sagepub.com



Glenn R. Mesman¹

Abstract

Objective: Although there is evidence to suggest an association between ADHD and alcohol use in college students, results are inconclusive primarily because studies have failed to control for related variables. Thus, this study was designed to systematically compare the relative contributions of inattention and hyperactivity/impulsivity to alcohol use and alcohol-related problems in a sample of college students while controlling for effects of antisocial behaviors. **Method:** A total of 192 undergraduate college students from a rural Midwestern university received class credit for participating in the study. They completed measures of alcohol use, ADHD symptoms, and antisocial behavior. **Results:** Hierarchical regressions revealed inattention, but not hyperactivity/impulsivity, was related to alcohol-related problems even when controlling for antisocial behavior. However, neither inattention nor hyperactivity/impulsivity was related to alcohol use regardless of whether current antisocial behavior was controlled. **Conclusion:** Inattention may be an important factor related to alcohol-related problems in college students. (*J. of Att. Dis.* 2013; XX(X) 1-XX)

Keywords

ADHD, alcohol, college students

ADHD is a neurodevelopmental disorder in which symptoms of inattention, hyperactivity, and impulsivity occur. Approximately 3% to 7% of children meet criteria for ADHD (American Psychiatric Association, 2000), though approximately 50% to 75% of children with ADHD continue to display symptoms into adolescence and adulthood (Barkley, Fischer, Smallish, & Fletcher, 2002; Glutting, Youngstrom, & Watkins, 2005). Researchers have found that individuals with ADHD are at risk of experiencing a variety of psychosocial problems during childhood, adolescence, and adulthood (Mannuzza & Klein, 2000). There also is emerging research that suggests that individuals with ADHD during childhood may be a risk for developing substance use disorders, including alcohol use disorders (for a review, see Lee, Humphreys, Flory, Liu, & Glass, 2011). Despite progress in this area, there is little research that has examined whether college students with ADHD are at risk of alcohol use disorders even though there is an increasing number of college students who have ADHD (DuPaul, Weyandt, O'Dell, & Varejao, 2009; Lee, Oakland, Jackson, & Glutting, 2008; Weyandt & DuPaul, 2008). The goal of this study is to explore the relation between ADHD symptoms and alcohol use in a sample of college students, which may be beneficial for developing specific prevention and intervention efforts for college students with ADHD symptoms.

ADHD and College Students

There is an increasing number of individuals with ADHD who are enrolling in college (Thome & Reddy, 2009; Weyandt & DuPaul, 2006), and recent estimates suggest that 2% to 8% of college students report symptoms consistent with ADHD (Weyandt & DuPaul, 2008). Thome and Reddy (2009) suggest that the increase in students with ADHD may be due to better educational support policies for this population, as well as psychotropic medication use and development of coping skills to reduce or manage some of the symptoms that may lead to academic difficulty (e.g., feelings of restlessness, racing thoughts, decreased motivation, forgetfulness, etc.). Given the increase in college students with ADHD, it may be important for college administrators and educators to have a better understanding of the challenges and difficulties that this population encounter in college.

College students with ADHD appear to be a unique subset of the population (Glass & Flory, 2012). Compared with individuals with ADHD who do not attend college, these

¹University of Arkansas for Medical Sciences, Little Rock, USA

Corresponding Author:

Glenn R. Mesman, University of Arkansas for Medical Sciences, 11 Children's Way, Slot 654, Little Rock, AR 72202, USA.
Email: grmesman@uams.edu

students may have less severe symptoms, a better history of academic success, and better compensatory strategies (Frazier, Youngstrom, Glutting, & Watkins, 2007). In addition, research suggests that college students with ADHD are at risk of academic, interpersonal, psychological, and risk-taking behaviors (Blase et al., 2009; DuPaul et al., 2009; Norwalk, Norvilitis, & MacLean, 2009; Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2008). For example, compared with other college students, Weyandt and DuPaul (2008) reported that those with ADHD are at risk of a number of academic (e.g., lower GPA, more likely to be on academic probation, less likely to graduate), social (e.g., social skills weaknesses), and psychological (e.g., psychological distress, depression) stressors. In addition, college students with ADHD may be at risk of alcohol use and alcohol-related problems (Blase et al., 2009; Glass & Flory, 2012; Heiligenstein & Keeling, 1995).

Alcohol Use and College Students

Alcohol use in college students has attained prominence as a major public health problem in the United States. Despite efforts to address the problem of drinking in college students, researchers estimate that alcohol use and alcohol use disorders are still a problem on many college campuses (Ziemelia, Bucknab, & Elfessi, 2002). In a recent study, 73% of college students surveyed had consumed alcohol at some time in the past year, and more than 40% reported having at least one binge-drinking episode (Dawson, Grant, Stinson, & Chou, 2004). In a survey of over 14,000 college students at 119 4-year U.S. colleges and universities, Knight et al. (2002) found that 31% and 6% to 8% of college students met criteria for alcohol abuse and dependence, respectively, during the past year. In addition, approximately 44% of the college students reported at least one symptom of either abuse or dependence. Given the increased risk of adverse consequences for students who consume alcohol (Cooper, 2002; Perkins, 2002), in 2010, the U.S. Surgeon General developed a list of 26 leading health indicators, one of which placed a priority on the reduction of binge drinking in adults 18 and over (including college students) by 10% by the year 2020 (U.S. Department of Health and Human Services, 2010). Previous research also has identified a variety of psychosocial factors related to alcohol use in college students, including demographic variables (e.g., sex, ethnicity), personality factors (e.g., sensation seeking, impulsivity), previous alcohol use, alcohol expectancies, drinking motives, involvement in activities (e.g., athletics, Greek system, religion), and peer and family influences (Ham & Hope, 2003).

ADHD and Alcohol Use in College Students

There is a developing literature base in which researchers have been exploring the relation between ADHD and

alcohol use in college students, although mixed results are being reported. Some researchers have reported a link between ADHD and alcohol use (Blase et al., 2009; Heiligenstein & Keeling, 1995), but others have found no significant difference in alcohol use between college students with and without ADHD (Rabiner et al., 2008). In addition, researchers in at least one study suggested that college students with ADHD reported lower rates of alcohol use than did their peers without ADHD (Janusis & Weyandt, 2010). However, Lee et al. (2011) noted that many studies examining ADHD and alcohol use often fail to control for other more severe behavioral problems (e.g., Oppositional Defiant Disorder, Conduct Disorder), which may co-occur in approximately 30% to 50% of youth with ADHD (Wilens et al., 2002). In addition, these behavioral problems have been found to be robust predictors of later antisocial behavior (Lahey, Loeber, Burke, & Applegate, 2005) and alcohol use and alcohol use disorders in young adulthood (Harford & Parker, 1994; White, Xie, Thompson, Loeber, & Stouthamer-Loeber, 2001) even when controlling for ADHD symptoms (Fergusson, Horwood, & Ritter, 2007). There also is a strong link between current antisocial behavior and alcohol use in college students (Crawford, Moore, & Ahl, 2004). Thus, the relation between ADHD and alcohol use appears to be confounded by coexisting behavioral difficulties and antisocial behavior that frequently are not being accounted for in research. However, in one study of college students, ADHD symptoms were not related to alcohol use when controlling for childhood Conduct Disorder symptoms, but ADHD symptoms, particularly inattention, was related to alcohol-related problems even when accounting for Conduct Disorder symptoms (Glass & Flory, 2012). This study is noteworthy because it was conducted with college students and because the researchers controlled for the effects of childhood Conduct Disorder symptoms. Due to such a small literature base with college students, inconsistent findings, and methodological differences between studies, it is unclear of the role of ADHD and its symptoms in alcohol use in college students, and additional research is needed to clarify whether students with ADHD or those who have its symptoms may be at an increased risk of alcohol use and alcohol use disorders.

Current Study

The goal of this study is to better understand the relation between ADHD symptoms and alcohol use in college students. To address some gaps in the literature, ADHD symptoms were divided into inattention and hyperactivity/impulsivity to determine whether there is a different relation between ADHD symptoms and alcohol use depending on the presentation of ADHD. There is empirical evidence that supports clinically meaningful differences between subtypes of ADHD (Milich, Balatine, & Lynam, 2001). In addition, Glass and Flory (2012) divided ADHD symptoms

into inattention and hyperactivity/impulsivity and found that inattention was related to alcohol-related problems but hyperactivity/impulsivity was not related to alcohol use or alcohol-related problems. This current study also controlled for antisocial behavior, a confounding variable that frequently has been linked to alcohol use in college students (Crawford, Moore, & Ahl, 2004). The hypotheses are that inattention and hyperactivity/impulsivity will be related to alcohol use and alcohol-related problems even when controlling for the effects of antisocial behavior.

Method

Participants

A total of 192 undergraduate college students from a rural Midwestern university participated in this study. They ranged from 18 to 34 years old, the majority of which were 18 (45.3%) or 19 (37.0%). Only a few participants were 21 or over the age of 21 (8.3%). The mean age of the sample was 19.02 ($SD = 1.81$) years old. The largest group of students was freshman (81.3%), followed by sophomores (13.0%), juniors (4.7%), and seniors (1.0%). The sex of the sample was relatively even, with slightly more females (52.6%) than males (47.4%). When examining the ethnicities of the students, most reported either being Caucasian (53.1%) or African American (37.5%). On-campus housing was endorsed by the majority of students as their primary residence (84.4%), and only one person reported living in a sorority or fraternity (0.5%). See Table 1.

Procedure

Participants were recruited in groups of four from several large introductory psychology classes. They were given class credit for their participation. On entering the research room, they completed a packet of questionnaires assessing ADHD, behavioral problems, and alcohol use. Participants also completed several other measures that were used as part of another study. Study procedures were approved by the University's Institutional Review Board.

Measures

ADHD. The Barkley Current Symptoms Scale–Self-Report Form (Barkley & Murphy, 1998) is a widely used, 18-item self-report scale of an individual's level of ADHD symptomatology. There are nine items that assess for inattention and nine items that assess for hyperactivity/impulsivity, all of which directly parallel the 18 symptoms of ADHD in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000). Participants responded to each item on a 4-point scale. The items are anchored in the following

Table 1. Participant Demographics.

| | Frequency | % | M | SD |
|---------------------|-----------|------|-------|------|
| Sex | | | | |
| Male | 91 | 47.4 | | |
| Female | 101 | 52.6 | | |
| Year | | | | |
| Freshman | 156 | 81.2 | | |
| Sophomore | 25 | 13.0 | | |
| Junior | 9 | 4.7 | | |
| Senior | 2 | 1.0 | | |
| Age | | | 19.02 | 1.81 |
| 18 | 87 | 45.3 | | |
| 19 | 71 | 37.0 | | |
| 20 | 18 | 9.4 | | |
| 21 | 7 | 3.6 | | |
| > 22 | 9 | 4.7 | | |
| Ethnicity | | | | |
| Caucasian | 102 | 53.1 | | |
| African American | 72 | 37.5 | | |
| Latino/a | 12 | 6.2 | | |
| Other | 6 | 3.2 | | |
| Living Arrangements | | | | |
| On campus housing | 162 | 84.4 | | |
| Off campus housing | 26 | 13.5 | | |
| Fraternity/sorority | 1 | 0.5 | | |
| Home | 3 | 1.6 | | |

manner: 0 = *never/rarely*, 1 = *sometimes*, 2 = *often*, and 3 = *very often*. The inattention and hyperactivity/impulsivity items were totaled separately to develop individual measures of inattention and hyperactivity/impulsivity. In a sample of college students, the inattention and hyperactivity/impulsivity subscales had Cronbach's alphas of .85 and .80, respectively (Glass & Flory, 2012). The Cronbach's alphas in this sample for the inattention and hyperactivity/impulsivity subscales were .80 and .74, respectively. The measure also has strong convergent validity with other ADHD rating scales (Barkley, Murphy, & Fischer, 2008) and has been validated in a college sample (Ladner, Schulenberg, Smith, & Dunaway, 2011).

Antisocial behavior. The Antisocial Features scale of the Personality Assessment Inventory (Morey, 1991) contains 24 items and was designed to measure the behavioral aspects of antisocial behaviors, egocentricity, and stimulus seeking. Participants responded to each item on a 4-point scale of how accurate each statement was. The items are anchored in the following manner: 0 = *false, not true at all*, 1 = *slightly true*, 2 = *mainly true*, and 3 = *very true*. Responses to all of the items were totaled to yield an overall score of behavioral problems. The Antisocial Features scale had a Cronbach's alpha of .86 and a test–retest reliability coefficient of .87 after 28 days in a sample of college students (Morey,

Table 2. Correlation Matrix.

| | Age | Sex | Ethnicity | Inatten | Hyp/Imp | ASB | Alcohol Use | Alcohol Problems |
|------------------|-----|--------|-----------|---------|---------|--------|-------------|------------------|
| Age | | -.180* | .138 | -.111 | -.121 | -.056 | .031 | .036 |
| Sex | | | -.181* | -.023 | .029 | -.378* | -.332* | -.162* |
| Ethnicity | | | | .017 | .006 | .155* | .438** | .187** |
| Inatten | | | | | .645** | .425** | .145* | .310** |
| Hyp/Imp | | | | | | .416** | .098 | .189** |
| ASB | | | | | | | .470** | .412** |
| Alcohol Use | | | | | | | | .584** |
| Alcohol Problems | | | | | | | | |

Note. Inatten = inattention; Hyp/Imp = hyperactivity/impulsivity; ASB = antisocial behaviors.

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

1991). The Antisocial Features scale had a Cronbach's alpha of .83 in this sample. It also has strong convergent validity with the Antisocial facet of the Minnesota Multiphasic Personality Inventory Personality Disorders Scales (Morey, Waugh, & Blashfield, 1985) and the Hare Psychopathy Checklist-Revised (Hare, 1991). The PAI was normed with large samples of clinical, nonclinical, and college student samples (Morey, 1991).

Alcohol use. The Alcohol Use Disorders Identification Test (AUDIT; Babor, De la Fuente, Saunders, & Grant, 1989) is a brief measure that was developed to identify individuals whose alcohol consumption has become hazardous or harmful. The AUDIT contains 10 items that are designed to assess three domains: the amount and frequency of drinking, alcohol dependence, and problems caused by alcohol use. However, several factor analytic studies suggest that a two-factor solution has the best fit, with Items 1 to 3 assessing alcohol use and Items 4 to 10 assessing alcohol-related problems (Chung, Colby, Barnett, & Monti, 2002; Kelly & Donovan, 2001; Shields, Guttmanova, & Caruso, 2004). Thus, it may be inappropriate to use the AUDIT as a uniform measure and make decisions on the one total score that is traditionally used. Participants respond to each item on a 0-4 scale. Given research supports a two-factor model assessing alcohol use and alcohol-related problems, the responses for Items 1 to 3 were totaled and responses for Items 4 to 10 were totaled to yield two separate alcohol-related variables: alcohol use and alcohol-related problems.

The AUDIT had a median Cronbach's alpha in the .80s in one review of the psychometric properties of the measure when using the total score (Reinert & Allen, 1997). The Cronbach's alpha in this sample was .82 when using the total score. However, the Cronbach's alphas in this sample for Items 1 to 3 (Alcohol Use) and Items 4 to 10 (Alcohol-Related Problems) was .89 and .69, respectively. In a sample of undergraduate students, Lennings (1999) reported that the AUDIT had a test-retest reliability coefficient of .92 over a 2-week period when using the total score. The

measure has strong convergent validity with other measures of alcohol use, such as the Michigan Alcohol Screening Test (Bohn, Baber, & Kranzler, 1995), and it has a mean sensitivity and specificity of .86 and .89, respectively (Reinert & Allen, 1997). The AUDIT also has been validated with college students (Kokotailo et al., 2004).

Results

Preliminary Analyses

A correlational analysis was conducted to determine the relation between the variables. All of the variables except ethnicity were either a true dichotomy or continuous, and therefore could be interpreted through the use of bivariate or point-biserial correlations. Ethnicity, however, was converted into a false dichotomy (Caucasian and ethnic minority) and then was interpreted through a point-biserial correlation. Of note, all of the variables significantly correlated with each other in the expected direction, though age was not significantly correlated with any of the variables of interest. Thus, it was not included in the hierarchical regressions as a control variable. See Table 2.

Primary Analyses

Hierarchical regression was used to examine the relative contribution of inattention and hyperactivity/impulsivity to alcohol use and alcohol-related problems while controlling for the effects of antisocial behavior. This statistical approach was chosen instead of simultaneous regression to examine the variance explained by each variable of interest while controlling for demographic variables and antisocial behavior. Specifically, to first determine if inattention and hyperactivity/impulsivity were related to alcohol use, the demographic variables (i.e., sex, ethnicity) were entered into the first step followed by inattention and hyperactivity/impulsivity in the second step. In the next regression, demographic variables were entered into the first step, antisocial

Table 3. Hierarchical Regression for Alcohol Use.

| Variable | R^2 | ΔR^2 | ΔF | B | SE B | β |
|-------------|-------|--------------|------------|--------|------|----------|
| Step 1 | .250 | .258 | 32.78*** | | | |
| Sex | | | | -1.747 | .426 | -.261*** |
| Ethnicity | | | | 2.631 | .426 | .390*** |
| Step 2 | .276 | .260 | 2.35 | | | |
| Inattention | | | | .088 | .063 | .113 |
| Hyp/Imp | | | | .023 | .060 | .031 |

Note. Hyp/Imp = hyperactivity/impulsivity.

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

Table 4. Hierarchical Regression for Alcohol Related Problems.

| Variable | R^2 | ΔR^2 | ΔF | B | SE B | β |
|-------------|-------|--------------|------------|--------|-------|---------|
| Step 1 | .052 | .042 | 5.18** | | | |
| Sex | | | | -1.098 | .597 | -.132 |
| Ethnicity | | | | 1.354 | .598 | .163* |
| Step 2 | .145 | .127 | 10.16*** | | | |
| Inattention | | | | .300 | .086 | .311** |
| Hyp/Imp | | | | -.008 | -.009 | |
| Step 2 | .186 | .173 | 30.82*** | | | |
| ASB | | | | .157 | .028 | .397*** |
| Step 3 | .216 | .194 | 3.56* | | | |
| Inattention | | | | .222 | .084 | .230** |
| Hyper/Imp | | | | -.009 | .081 | -.099 |

Note. Hyp/Imp = hyperactivity/impulsivity; ASB = antisocial behaviors.

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

behavior was entered into the second step, and inattention and hyperactivity/impulsivity were entered into the third step. This same procedure was replicated with alcohol-related problems as the outcome variable.

In the first set of hierarchical regressions, Step 1 (i.e., demographic variables) accounted for a significant amount of variance in alcohol use, $R^2 = .26$, $F(2, 189) = 32.79$, $p < .001$. Within this step, sex, $\beta = -.261$, $t(189) = -4.01$, $p < .001$, and ethnicity, $\beta = .390$, $t(189) = 6.13$, $p < .001$, were significant predictors. However, Step 2 (i.e., inattention and hyperactivity/impulsivity) failed to account for significant, additional variance in alcohol use, $R^2 = .28$, $F(2, 187) = 2.35$, $p = .10$. As Step 2 with inattention and hyperactivity/impulsivity was not significant, there was not a need to conduct a regression with Step 2 with antisocial behavior and Step 3 with inattention and hyperactivity/impulsivity. See Table 3.

In the second set of hierarchical regressions, Step 1 (i.e., demographic variables) accounted for a significant amount of variance in alcohol-related problems, $R^2 = .05$, $F(2, 189) = 5.18$, $p < .01$. Within this step, only ethnicity was a significant predictor, $\beta = .163$, $t(189) = 2.27$, $p < .05$. Step 2 (i.e., inattention and hyperactivity/impulsivity) also accounted

for significant, additional variance in alcohol-related problems, $R^2 = .15$, $F(2, 187) = 10.16$, $p < .001$, but only inattention was a significant predictor, $\beta = .311$, $t(187) = 3.51$, $p < .01$. Step 2 (antisocial behavior) also was a significant predictor, $R^2 = .19$, $F(1, 188) = 30.82$, $p < .001$, when used in place of inattention and hyperactivity/impulsivity. In addition, Step 3 (i.e., inattention and hyperactivity/impulsivity) also accounted for a significant amount of additional variance, $R^2 = .22$, $F(2, 186) = 3.56$, $p = .05$ beyond that accounted for by the demographic variables and antisocial behavior. Within this step, only inattention was a significant predictor, $\beta = .230$, $t(186) = 2.64$, $p < .01$. See Table 4.

Discussion

Although there is emerging research that suggests that ADHD may be related to alcohol use in a variety of populations (Wilens & Morrison, 2011), there is little research that has explored this issue in college students. In addition, the scarce literature in this area is equivocal and often fails to control for confounding variables. Thus, this study was designed to systematically compare the relative contributions of inattention and hyperactivity/impulsivity with

alcohol use and alcohol-related problems in a sample of college students while controlling for effects of antisocial behavior. The hypotheses of the study were partially supported. Results indicated that inattention was related to alcohol-related problems even when controlling for antisocial behavior, though hyperactivity/impulsivity was not related to alcohol-related problems when controlling for antisocial behavior. This finding is especially noteworthy given the strong relation between antisocial behavior and alcohol use in college students. Thus, the findings suggest that inattention may be an important factor related to alcohol-related problems in college students. However, neither inattention nor hyperactivity/impulsivity was related to alcohol use regardless of whether antisocial behaviors were controlled.

The results from this study extend the findings from a few other studies that also have found a relation between ADHD and alcohol use. For example, Blase et al. (2009) found that self-reported ADHD was predictive of alcohol use, and Heiligenstein and Keeling (2009) reported that ADHD diagnosis was related to alcohol abuse. However, neither of these studies controlled for current behavioral problems, a confounding variable that is related to ADHD and alcohol use. The findings of this study are most consistent with the results of Glass and Flory (2012) who also found that inattention was predictive of alcohol-related problems even while controlling for childhood Conduct Disorder symptoms. Thus, this study provides additional support that a continuous examination of ADHD symptoms, especially inattention, may be important when exploring the relation between ADHD symptoms and alcohol-related problems.

Existing literature exploring the different and overlapping characteristics of ADHD, Predominantly Inattentive Type and ADHD, Combined Type suggests that the subtypes have different comorbid conditions (Milich, Balentine, & Lynam, 2001). Children with ADHD, Predominantly Inattentive, are more likely those with ADHD, Combined to have internalizing disorders such as depression and anxiety (Weiss, Worling, & Wasdell, 2003), and internalizing disorders in college students have been found to be related to alcohol use (Fenzel, 2005; Miller, Miller, Verhegge, Linville, & Pumariega, 2002; Weitzman, 2004). In addition, in a sample of college students, inattention, but neither hyperactivity nor impulsivity, was related to academic difficulty (Frazier et al., 2007). In turn, academic difficulty has been found to be related to alcohol use in college students (Singleton, 2007; Singleton & Wolfson, 2009). Therefore, there could be a stronger relation between inattention and alcohol-related problems than hyperactivity/impulsivity and alcohol-related problems due to the comorbid conditions that are more commonly associated with ADHD, Predominantly Inattentive.

Implications

The findings of this study may have important implications for students, health care professionals, and administrators on college campuses. Because inattention appears to be an important factor related to alcohol-related problems, college students who are struggling with the inattentive symptoms of ADHD may be at risk of developing problems stemming from alcohol use. Therefore, professionals who may be providing academic support services for students with ADHD or ADHD symptoms should help them develop compensatory strategies for their inattention (e.g., organization skills, memory enhancement strategies, study skills), which may lessen their risk of alcohol-related problems. Previous research has suggested that common comorbid psychiatric conditions of ADHD include depression and anxiety, both of which are related to alcohol use in college students. In addition, in this study there was a correlation between ADHD and antisocial behavior, which also was correlated with alcohol use and problems. Thus, mental health professionals on college campus should be aware that their clients who have ADHD or ADHD symptoms, particularly those who present with inattention, may be at risk of developing other mental health difficulties and misuse alcohol. As such, they should screen clients for anxiety, depression, antisocial behavior, and alcohol use problems when they first meet them and routinely assess for their presence throughout the course of counseling to determine if they need to be addressed as well. Finally, college administrators should provide college students with ADHD or ADHD symptoms psychoeducation about their symptoms and other issues that they may be at risk for while they are in college. This material should include resources for them on campus (e.g., academic support services, mental health services) and how to access it. As a preventive measure, this information could be presented to college freshman during orientation so that they may be able to access these services before they begin to develop difficulties with their ADHD or ADHD symptoms and use inappropriate coping mechanisms such as alcohol use.

Strengths and Weaknesses

This study has a variety of strengths that has helped address some of the gaps in the existing literature. A continuous approach was used with ADHD symptoms instead of categorical one (i.e., ADHD diagnosis) to better capture individuals with subclinical levels of ADHD. Moreover, dimensions of ADHD (i.e., inattention and hyperactivity/impulsivity) also were used to better understand potential differences in the presentation of ADHD. In addition, alcohol use and alcohol-related problems were examined, and this study is one of the first to explore the relation between

ADHD symptoms and alcohol use in college students while also controlling for antisocial behavior.

Despite these strengths, several limitations also need to be mentioned. One weakness of this study is related to the generalizability of the sample. Although the sample has a relatively even distribution regarding sex and ethnicity, a convenience sample of undergraduate students participating in an introductory psychology class was used. Moreover, participants were almost exclusively underclass students who were 18 or 19 years old, and all of the students were from a rural Midwestern university. Future researchers should use samples of college students who are more diverse regarding their age, school year, geographic region, urban/rural setting, and college size. Another limitation is that that study is cross-sectional, which makes it impossible to examine the cause and effect relation between ADHD symptoms and alcohol use. Although it is inferred that ADHD symptoms developed before alcohol use, this assertion cannot be confirmed given the design of this study. It is possible that ADHD symptoms developed after an individual began using alcohol. Longitudinal research should be conducted with samples beginning in childhood and following them through college to better understand the relation between ADHD symptoms and alcohol use. It also was not possible to determine whether participants met diagnostic criteria for ADHD because variables regarding age of onset and number of settings in which symptoms are present were not assessed. Thus, this study is unable to comment on relation between ADHD as a diagnosis and alcohol use, though additional research in this area is necessary. In addition, it is possible that participants may have been experiencing inattention due to depression and/or anxiety instead of ADHD. Research controlling for these variables would provide additional support of the relation between ADHD symptoms and alcohol use. Finally, future research also should assess the relation between ADHD symptoms and more serious patterns of alcohol use, such as abuse and dependence, as this study only examined alcohol use and alcohol-related problems.

Conclusion

This study examined the relation of ADHD symptoms with alcohol use in college students while controlling for antisocial behavior. Findings suggest that inattention, but not hyperactivity/impulsivity, was related to alcohol-related problems even while controlling for antisocial behavior. In addition, neither inattention nor hyperactivity/impulsivity was related to alcohol use regardless of whether antisocial behavior was controlled. Future research should use a longitudinal design with more diverse samples to better understand the relation between ADHD symptoms and alcohol use in college students, which may provide additional

information that may be beneficial for prevention and intervention efforts.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article

References

- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed. Text Revision). Washington DC: Author.
- Babor, T. F., De la Fuente, J. R., Saunders, J., & Grant, M. (1989). *AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for use in primary health care*. Geneva: World Health Organization, Division of Mental Health.
- Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2002). The persistence of attention-deficit/hyperactivity disorder into young adulthood as a function of reporting source and definition of disorder. *Journal of Abnormal Psychology, 111*, 279-289. doi:10.1037//0021-843X.111.2.279
- Barkley, R. A., & Murphy, K. R. (1998). *Attention-Deficit Hyperactivity Disorder: A clinical workbook*. (2nd ed.). New York, NY: Guilford Press.
- Barkley, R. A., Murphy, K., & Fischer, M. (2008). *ADHD in adults: What the science says*. New York, NY: Guilford Press.
- Blase, S. L., Gilbert, A. N., Anatopolous, A. D., Costello, E. J., Hoyle, R. H., Swartzwelder, H. S. H., & Rabiner, D. L. (2009). Self-reported ADHD and adjustment in college: Cross-sectional and longitudinal findings. *Journal of Attention Disorders, 13*, 297-309. doi:10.1177/1087054709334446
- Bohn, M. J., Babor, T. F., & Kranzler, H. R. (1995). Alcohol Use Disorders Identification Test (AUDIT): Validation of a screening instrument for use in medical settings. *Journal of Studies on Alcohol, 56*, 423-432.
- Chung, T., Colby, S. M., Barnett, N. P., & Monti, P. M. (2002). Alcohol Use Disorders Identification Test: Factor structure in an adolescent emergency department sample. *Alcoholism: Clinical & Experimental Research, 26*, 223-231.
- Cooper, M. L. (2002). Alcohol use and risky sexual behavior among college students and youth: Evaluating the evidence. *Journal of Studies on Alcohol, 14*, 101-117.
- Crawford, E., Moore, C. F., & Ahl, E. V. (2004). The roles of risk perception and borderline and antisocial personality characteristics in college alcohol use and abuse. *Journal of Applied Social Psychology, 34*, 1371-1394.
- Dawson, D. A., Grant, B. F., Stinson, F. S., & Chou, P. S. (2004). Another look at heavy episodic drinking and alcohol use disorders among college and noncollege youth. *Journal of Studies on Alcohol, 65*, 477-488.
- DuPaul, G. J., Weyandt, L. L., O'Dell, S. M., & Varejao, M. (2009). College students with ADHD: Current status and

- future directions. *Journal of Attention Disorders*, 13, 234-250. doi:10.1177/1087054709340650
- Fenzel, L. M. (2005). Multivariate analyses of predictors of heavy episodic drinking and drinking related problems among college students. *Journal of College Student Development*, 46, 126-140.
- Fergusson, D. M., Horwood, L. J., & Ritter, E. M. (2007). Conduct and attentional problems in childhood and adolescence and later substance use, abuse, and dependence: Results from a 25-year longitudinal study. *Drug and Alcohol Dependence*, 88, 14-26. doi:10.1016/j.drugalcdep.2006.12.011
- Frazier, T. W., Youngstrom, E. A., Glutting, J. J., & Watkins, M. W. (2007). ADHD and achievement: Meta-analysis of the child, adolescent, and adult literatures and a concomitant study with college students. *Journal of Learning Disabilities*, 40, 49-65. doi:10.1177/00222194070400010401.
- Glutting, J. J., Youngstrom, E. A., & Watkins, M. W. (2005). ADHD in college students: Exploratory and confirmatory factor structures using student and parent data. *Psychological Assessment*, 17, 44-55. doi:10.1037/1040-3590.17.1.44
- Ham, L. S., & Hope, D. A. (2003). College students and problematic drinking: A review of the literature. *Clinical Psychology Review*, 23, 719-759. doi:10.1016/S0272-7358(03)00071-0
- Hare, R. D. (1991). *The Hare Psychopathy Checklist-Revised*. Toronto: Multi-Health Systems.
- Harford, T. C., & Parker, D. A. (1994). Antisocial behavior, family history, and alcohol dependence symptoms. *Alcoholism: Clinical and Experimental Research*, 18, 265-268. doi:10.1111/j.1530-0277.1994.tb00012.x
- Heiligenstein, E., & Keeling, R. P. (1995). Presentation of unrecognized attention deficit hyperactivity disorder in college students. *Journal of American College Health*, 43, 226-228. doi:10.1080/07448481.1995.9940481
- Janusis, G. M., & Weyandt, L. L. (2010). An exploratory study of substance use and misuse among college students with and without ADHD and other disabilities. *Journal of Attention Disorders*, 14, 205-215. doi:10.1177/1087054710367600
- Kelly, T. M., & Donovan, J. E. (2001). Confirmatory factor analyses of the Alcohol Use Disorders Identification Test (AUDIT) among adolescents treated in emergency departments. *Journal of Studies on Alcohol*, 62, 838-842.
- Knight, J. R., Weschler, H., Kuo, M., Seibring, M., Weitzman, E. R., & Schuckit, M. A. (2002). Alcohol abuse and dependence among U.S. college students. *Journal of Studies on Alcohol*, 63, 263-270.
- Kokotailo, P. K., Egan, J., Gangnon, R., Brown, D., Munt, M., & Fleming, M. (2004). Validity of the alcohol use disorders identification test in college students. *Alcoholism: Clinical and Experimental Research*, 28, 914-920. doi:10.1097/01.ALC.0000128239.87611.F5
- Ladner, J. M., Schulenberg, S. E., Smith, C. V., & Dunaway, M. H. (2011). Assessing AD/HD in college students: Psychometric properties of the Barkley Self-Report Form. *Measurement and Evaluation in Counseling and Development*, 44, 215-224. doi:10.1177/0748175611417879
- Lahey, B. B., Loeber, R., Burke, J. D., & Applegate, B. (2005). Predicting future antisocial personality disorder in males from a clinical assessment in childhood. *Journal of Consulting and Clinical Psychology*, 73, 389-399. doi:10.1037/0022-006X.73.3.389
- Lee, S. S., Humphreys, K. L., Flory, K., Liu, R., & Glass, K. (2011). Prospective association of childhood attention-deficit/hyperactivity disorder (ADHD) and substance use and abuse/dependence: A meta-analytic review. *Clinical Psychology Review*, 31, 328-341. doi:10.1016/j.cpr.2011.01.006
- Lee, D. H., Oakland, T., Jackson, G., & Glutting, J. (2008). Estimated prevalence of attention-deficit/hyperactivity disorder symptoms among college freshmen. *Journal of Learning Disabilities*, 41, 371-384.
- Lennings, C. J. (1999). Evaluation of the Leeds dependence questionnaire. *Journal of Child and Adolescent Substance Abuse*, 8, 73-87.
- Mannuzza, S., & Klein, R. G. (2000). Long-term prognosis in attention-deficit/hyperactivity disorder. *Child and Adolescent Psychiatry Clinics of North America*, 9, 711-726.
- Milich, R., Balentine, A. C., & Lynam, D. (2001). ADHD Combined Type and ADHD Predominantly Inattentive Type are distinct and unrelated disorders. *Clinical Psychology: Science and Practice*, 8(4), 463-488. doi:10.1093/clipsy.8.4.463.
- Miller, B. E., Miller, M. N., Verhegge, R., Linville, H. H., & Pumariega, A. J. (2002). Alcohol misuse among college athletes: Self-medication for psychiatric symptoms? *Journal of Drug Education*, 32, 41-52.
- Morey, L. C. (1991). *The Personality Assessment Inventory: Professional manual*. Odessa, FL: Psychological Assessment Resources.
- Morey, L. C., Waugh, M. H., & Blashfield, R. K. (1985). MMPI scales for DSM-III: Their derivation and correlates. *Journal of Personality Assessment*, 49, 245-251.
- Norwalk, K., Norvilitis, J. M., & MacLean, M. G. (2009). ADHD symptomatology and its relationship to factors associated with college adjustment. *Journal of Attention Disorders*, 13, 251-258. doi:10.1177/1087054708320441
- Perkins, H. W. (2002). Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol*, 14, 91-100.
- Rabiner, D. L., Anastopoulos, A. D., Costello, J., Hoyle, R. H., & Swartzwelder, H. S. (2008). Adjustment to college in students with ADHD. *Journal of Attention Disorders*, 11, 689-699. doi:10.1177/1087054707305106
- Reinert, D. F., & Allen, J. P. (1997). The Alcohol Use Disorders Identification Test: A review of recent research. *Alcoholism: Clinical and Experimental Research*, 26, 272-279.
- Shields, A. L., Guttmanova, K., & Caruso, J. C. (2004). An examination of the factor structure of the Alcohol Use Disorders Identification Test in two high-risk samples. *Substance Use & Misuse*, 39, 1161-1182.
- Singleton, A. R. (2007). Collegiate alcohol consumption and alcohol performance. *Journal of Studies on Alcohol & Drugs*, 68, 548-555.
- Singleton, A. R., & Wolfson, R. A. (2009). Alcohol consumption, sleep, and academic performance in college students. *Journal of Studies on Alcohol & Drugs*, 70, 355-363.
- Thome, J., & Reddy, D. P. (2009). The current status of research into attention deficit hyperactivity disorder: Proceedings of the 2nd international congress on ADHD: From childhood

- to adult disease. *Attention Deficit Hyperactivity Disorder, 1*, 165-174. doi:10.1007/s12402-009-0016-0
- U.S. Department of Health and Human Services. (2010). *Healthy people 2020*. Washington, DC: U.S. Government Printing Office.
- Weiss, M. D., Worling, D. E., & Wasdell, M. B. (2003). A chart review study of the inattentive and combined types of ADHD. *Journal of Attention Disorders, 7*, 1-9. doi:10.1177/108705470300700101
- Weitzman, E. (2004). Poor mental health, depression, and associations with alcohol use, harm, and abuse in a national sample of young adults in college. *Journal of Nervous and Mental Health Disease, 192*, 269-277.
- Weyandt, L., & DuPaul, G. (2006). ADHD in college students. *Journal of Attention Disorders, 10*, 9-19. doi:10.1177/1087054705286061
- Weyandt, L. L., & DuPaul, G. J. (2008). ADHD in college students: Developmental findings. *Developmental Disabilities, 14*, 311-319. doi:10.1002/ddrr.38
- White, H. R., Xie, M., Thompson, W., Loeber, R., & Stouthamer-Loeber, M. (2001). Psychopathology as a predictor of adolescent drug use trajectories. *Psychology of Addictive Behaviors, 15*, 210-218. doi:10.1037//0893-164X.15.3.210
- Wilens, T., Biederman, J. E., Brown, S., Tanquay, S., Monuteaux, M. C., . . . Spencer, T. J. (2002). Psychiatric comorbidity and functioning in clinically referred preschool children and school-age youths with ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry, 41*, 262-268.
- Wilens, T. E., & Morrison, N. R. (2011). The intersection of attention-deficit/hyperactivity disorder and substance abuse. *Current Opinion in Psychiatry, 24*, 280-285. doi:10.1097/YCO.0b013e328345c956
- Ziemelia, A., Bucknab, R. B., & Elfessi, A. M. (2002). Prevention efforts underlying decreases in binge drinking at institutions of higher education. *Journal of American College Health, 50*, 238-252.

Author Biography

Glenn R. Mesman is a licensed child and adolescent clinical psychologist and is an Assistant Professor in the University of Arkansas for Medical Sciences Department of Psychiatry. He has a variety of research interests related to children and adolescents, ranging from the development and comorbidities of behavioral problems to pediatric health-related conditions.