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Prevalence and Correlates of ADHD in College Students: A Comparison of Diagnostic Methods

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Abstract

Prior research on college students with ADHD has generally employed nonrepresentative samples of students, used different methods to identify students with the disorder, and typically failed to control for comorbid difficulties when examining the psychosocial functioning of identified students. These methodological limitations are likely to have contributed to inconsistent findings across studies. To examine this issue, 197 students rated their experience of ADHD symptoms and their functioning in academic, social, and emotional domains. Participants were classified as having ADHD using four previously used methods: self-reported diagnosis, ADHD symptom counts, symptom scores greater than 1.5 standard deviations above the sample mean, and full DSM-IV-TR criteria. Prevalence of students identified with ADHD varied significantly across methods as did the overlap among students identified by different methods. However, differences in psychosocial functioning between normative peers and students identified by each method were generally consistent; these results were largely unchanged when internalizing and externalizing symptoms were controlled for. Implications of these findings for research on ADHD in college students are discussed.

Keywords: ADHD, college students, diagnosis

1. Introduction

Prior to the 1970s, Attention Deficit Hyperactivity Disorder (ADHD) was widely regarded as a condition that children outgrew as they matured. By the mid- to late-1990s, however, results from several longitudinal studies indicated that ADHD symptoms frequently persisted into adolescence and young adulthood (Resnick, 2005) and that although educational outcomes were generally poorer for youth with ADHD (DuPaul, Weyandt, O'Dell, & Varejao, 2009), many were successfully enrolling in college. In fact, it is estimated that approximately 25% of college students receiving disabilities services are diagnosed with ADHD and this percentage is on the rise (DuPaul et al., 2009). It is thus important to understand how ADHD impacts students' adjustment to college and how to promote positive college outcomes for students with ADHD.

Studies of ADHD in college students first began appearing in the literature in the 1990s. Initial studies focused on estimating the prevalence of ADHD in college populations, (e.g., Weyandt, Linterman, & Rice, 1995) and on describing the adjustment of students with ADHD relative to their peers in various domains, (e.g., Heiligenstein, Guenther, Levy, Savino, & Fulwiler, 1995). Over the past two decades the number of studies on college students with ADHD has grown steadily, to the point that nearly ninety empirical studies were identified in a 2009 review paper on this topic (DuPaul et al., 2009); a number of additional studies have been published since that review.

While knowledge of ADHD in college populations has increased with the developing research base, it is compromised by the frequent use of relatively small convenience samples of students identified at a single institution (DuPaul et al., 2009) as opposed to more representative samples. Furthermore, researchers have used different methods to identify their sample of students with ADHD and have rarely identified subjects using full DSM-IV-TR criteria (Green & Rabiner, 2012). Thus, some researchers have identified students with ADHD based on their self-reported diagnostic status (e.g., Blase, Gilbert, Anastopoulos, Costello, Hoyle, Swartzwelder, & Rabiner, 2009); in other research, students reporting ADHD symptoms sufficiently above the sample mean have constituted the ADHD group (e.g., Weyendt, Linterman, & Rice, 1995). Still other researchers (e.g., DuPaul

et al., 2001) have used symptom counts based on participants' self-reports. It is only recently that more extensive assessments to determine whether students meet full DSM-IV-TR criteria including age of onset, symptom duration, and impairment in multiple settings (APA, 2000) have been employed (Rooney, Chronis-Tuscano & Yoon, 2012; DuPaul et al., 2012).

As suggested by Green and Rabiner (2012), using different methods to identify college students with ADHD may select different groups of students. For example, students with a self-reported diagnosis are not likely to be the same students that are identified when normative cut-offs, symptom cut-offs, or full diagnostic criteria are used. This is likely to have affected the prevalence rate and correlates of ADHD that have been reported in different studies and thus contributed to inconsistencies in the literature that have emerged (see Dupaul et al., 2009; Green & Rabiner, 2012, for a review). Because all published studies have used only a single method for identifying participants with ADHD, however, and not compared findings associated with the use of different identification methods, the extent of this problem is unclear.

Another limitation of research examining the psychosocial functioning of college students with ADHD is that comorbid difficulties have generally not been considered (Green & Rabiner, 2012). For example, young adults with ADHD have higher rates of internalizing and externalizing difficulties than non-affected peers (Heiligenstein & Keeling, 1995) and these co-occurring problems may adversely impact students' academic and social functioning. However, other than a recent study by Rooney, Chronis-Tuscano, and Yoon (2012) where conduct disorder symptoms were controlled for when examining substance use patterns in students with and without ADHD, research on the adjustment of college students with ADHD has largely ignored this issue. As a result, it remains unclear whether adjustment difficulties that have been attributed to ADHD may be better explained by other problems that often accompany the disorder.

To begin exploring these issues, undergraduates at a university in the southeast US were administered an online survey that covered ADHD symptoms, additional criteria used to establish a DSM-IV-TR diagnosis (e.g., age of onset, degree of impairment, etc.), and students' adjustment in academic and psychosocial domains. Participants were then identified with ADHD using four different methods previously reported in the literature: self-reported diagnosis, scores for inattentive and/or hyperactive-impulsive symptoms above a normative threshold, symptom counts, and full DSM-IV-TR diagnostic criteria. This enabled us to examine how the prevalence and correlates of ADHD in college students may vary based on the identification method employed. To better understand the unique contribution of ADHD to academic and psychosocial functioning in college students, we also examined whether adjustment difficulties in students with ADHD remained evident after controlling for symptoms of emotional distress and antisocial behavior.

2. Methods

2.1 Participants

Participants were 197 undergraduate students at a private university in the southeast US with highly competitive admission standards; all participants were 18 years or over, and study procedures were approved by the university IRB. Participants were recruited from psychology classes with a research participation requirement (n = 133), as well as from across the university in exchange for $5 compensation (n = 67). Relative to the general undergraduate population, females (57%), Caucasians (63%), and Asians (27%) were overrepresented in our sample. African Americans (5%) were underrepresented and Hispanics (7%) participated at a rate consistent with their representation in the wider student body. The percent of participants who were freshman, sophomores, juniors, and seniors was 43, 30, 16 and 11 respectively. The concentration of freshman and sophomores is expected given that the research participation requirement is restricted to classes taken primarily by younger students.

2.2 Measures

Survey overview. Students completed a 10-15 minute online anonymous survey that included items corresponding to the DSM-IV-TR ADHD symptoms, additional diagnostic criteria for ADHD. The use of online surveys to identify college students as having ADHD has been used previously in this area of work (Blasé et al., 2009; Rabiner, Anastopoulos, Costello, & Swartzwelder, 2008). Students also reported on their demographic characteristics and their functioning in multiple domains. Aspects of the survey that are relevant to the current study are described below.

Demographics. Participants were asked to provide their gender, age, ethnicity, race, and class standing. They also reported their GPA on a 0.0 to 4.0 scale.

Self-reported ADHD diagnosis. Students were asked if they had ever been diagnosed with ADHD by a health

care professional (e.g., a physician or psychologist).

ADHD symptoms. Students rated the frequency with which they experienced each of the DSM-IV-TR ADHD symptoms. Half the participants rated each symptom on a four-point scale ranging from *never* to *often*; the remaining participants rated the symptoms on a five-point scale where 4 corresponded to *often* and 5 to *very often* (See Note 1).

Additional diagnostic criteria. For symptoms that students reported as occurring often, they were asked whether they recalled these symptoms being present in early childhood, whether they had persisted for at least six months, and whether the symptoms created difficulty in school, at work, or in their social relationships. These items were used to assess additional DSM-IV-TR (APA, 2000) criteria for ADHD.

Academic concerns. A four-item scale assessed students' concerns about their academic performance, e.g., *I worry that my grades will not be as good as I need them to be;* items were adapted from the Academic Self-Concept Questionnaire (ASCQ; Joyce & Yates, 2007). Students rated their agreement with each item on a five-point scale ranging from *strongly disagree* to *strongly agree.* Responses were summed with higher scores reflecting greater concerns about academic performance. The coefficient alpha for the scale was 0.77.

Alcohol, tobacco, and drug use. Three items assessed students' alcohol consumption. First, students reported how frequently they had consumed alcohol during the past six months, with response choices ranging from "never" to "40+ times". Next, they were asked how many alcoholic drinks they consumed on a typical day when they drank alcohol during the past 30 days. Response choices ranged from "did not drink" to "25 or more drinks". Finally, students reported the greatest number of drinks they consumed within a two-hour period during the past 30 days. Response choices ranged from "0" to "11 or more drinks". To obtain a composite alcohol use measures, responses to individual items were converted to standard scores and an average score was computed for each student. Coefficient alpha for the 3-item composite scale was .90.

To assess tobacco use, students reported how many cigarettes they had smoked in the past 30 days. Response choices ranged from "none" to "2 or more packs per day". Students were also asked about the number of occasions on which they had used marijuana in the past six months, with response choices ranging from "never" to "40+ times". Finally, students used the same scale to report how frequently they drank caffeinated beverages (responses from "less than once per day" to "more than 3 times per day") or used legal stimulants, e.g., caffeine pills, Red Bull, or 5-Hour Energy, in the past six months (responses from "never" to "40+ times").

Antisocial behavior. A ten-item scale adapted from the 32-item Adolescent Antisocial Behavior Scale (AASBS; Czech & Kemp, 2010) assessed frequency of antisocial behaviors that ranged from mild, e.g., *vandalized personal property*, to serious antisocial acts, e.g., *forced sexual contact*. Students rated the frequency with which they had engaged in each act on a three-point response scale of "never" "one time", and "two or more times". Items were summed with higher scores reflecting greater endorsement of antisocial behavior. Coefficient alpha for the scale was 0.80.

Anxiety. Eight items from the Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990) that were judged to be of greatest relevance to college students were used to assess students' experience of anxiety, e.g., *My worries overwhelm me*. Students responded to each item on a five-point scale ranging from *never* to *very often.* Responses were summed with higher scores reflecting greater self-reported anxiety. Coefficient alpha for the scale was 0.95.

Depressive symptoms. An eight-item scale based on a modified version of the Major Depression Inventory (MDI; Bech, Rasmussen, Olsen, Noerholm, & Abildgaard, 2001) assessed how often students experienced depressive symptoms during the past two weeks. Students rated the symptoms, e.g., *felt sad, blue, unhappy,* or *down in the dumps*, on a five-point scale ranging from *never* to *very often.* Responses were summed with higher total higher scores reflecting greater depressive symptomatology. Coefficient alpha for the scale was 0.88.

Money management. Students' ability to manage money was assessed using a seven-item scale developed for this study that inquired about the frequency of students' lapses in managing their finances, e.g., *How often do you have trouble saving money?* Students responded using a five-point scale ranging from *never* to *very often*. Their responses were summed so that higher scores indicated greater difficulties managing money. Coefficient alpha for the scale was 0.88.

Negative driving outcomes. Driving difficulties/infractions were assessed using an eight-item scale adapted from the traffic citations and other negative driving-related outcomes measure developed by Barkley, Guevremont, Anastopoulos, DuPaul, and Shelton (1993), e.g., *Have you ever been at fault for or caused a car crash?* Items were summed so that higher scores reflected more negative driving outcomes; coefficient alpha for

the scale was 0.58.

Social concerns. A six-item scale derived from the Social Adaptation Self-evaluation Scale (SASS; Bosc, Dubini, & Polin, 1997) assessed students' satisfaction with their social lives and involvement on campus, e.g., *I believe I have as many friends as most other students do*. Students indicated their agreement using a five-point scale that ranged from *strongly disagree* to *strongly agree*; their responses were summed with higher scores indicating greater social concerns. Coefficient alpha for the scale was 0.77.

Romantic relationships. Students were asked whether they were currently involved in a romantic relationship. For those responding affirmatively (n=62), relationship satisfaction was assessed using a five-item scale that inquired about qualities of that relationship, e.g., *How well does your partner meet your needs?* Students responded using a five-point scale ranging from *very poorly* to *very well*. Item responses were summed with higher scores indicating greater relationship satisfaction. Coefficient alpha for the scale was 0.73.

2.3 Procedure

Two methods were used to recruit participants. First, a short description of the survey and a link to it were available on the psychology department subject pool website during fall 2011. Students who opted to complete the survey were awarded credit toward their psychology course research credit requirement. In addition, flyers with information about the study and a web address for the online survey were posted around campus. Students recruited this way received a $5 incentive for participating.

3. Results

3.1 Identification of Students with ADHD Based on Different Diagnostic Methods

Four methods employed in prior research on ADHD in college students were used to identify students with ADHD. Students who indicated that they had been previously diagnosed with ADHD by a medical or mental health professional met the self-reported diagnosis criteria. The symptom count method required students to rate at least six of the DSM-IV-TR inattentive and/or hyperactive-impulsive symptoms as occurring *often*. For students administered the five-point response scale, ratings of *often* and *very often* were counted. To identify students using the normative method, ratings for inattentive and hyperactive-impulsive symptoms were summed and standardized; students with Z scores of at least 1.5 on either scale were categorized as having ADHD. To account for the fact that students using the five-point scale could obtain higher scores, standardization was done separately by scale type. Finally, students who reported at least 6 inattentive and/or hyperactive impulsive symptoms and who responded affirmatively to items inquiring about additional diagnostic criteria, i.e., symptom duration of at least six months, onset prior to age seven, and impairment from symptoms in at least two settings, were considered to have met full DSM-IV-TR criteria (APA, 2000). Students not identified with ADHD by any method were considered comparison students in analyses comparing psychosocial functioning in students with and without ADHD (see below).

The number of students identified by each method ranged from 6 (full DSM-IV-TR criteria) to 25 for the normative method. Thus, depending on the method used, the prevalence of ADHD in our sample varied considerably, from 3 to 13 percent. There was also substantial variability in the overlap between participants that were identified as having ADHD by the different methods. Of the 21 students with a self-reported ADHD diagnosis, 8 (38%) were identified using the normative method, 6 (29%) using the symptom count method, and 3 (14%) using the full criteria method. Among the 25 students identified using the normative method, 8 (32%) had a self-reported diagnosis, 16 (64%) met the symptom count criteria, and 6 (24%) met full criteria. Nineteen participants met the symptom count criteria; 6 (32%) of these had a self-reported diagnosis, 16 (84%) met the normative criteria, and 6 (32%) met full criteria.

3.2 Psychosocial Functioning in Students Identified by Different Methods

Self-reported psychosocial functioning of students in the comparison group, i.e., those not identified with ADHD by any method, and in students identified with ADHD via each method is presented in Table 1. The group of students meeting full DSM-IV-TR criteria is excluded because it contained only 6 students. Separate analyses comparing students identified with ADHD using each identification method with students not identified by any of the methods were conducted using Proc GLM in SAS version 9.2; direct comparisons of students identified with ADHD using the different methods was not possible because of the overlap of students in the different groups. In all analyses, students' gender, class standing, and race were included as control variables (See Note 2).

Table 1. Psychosocial functioning by diagnostic method in relation to comparison students

	Comparison	Self Report	Normative	Symptom Count
GPA[a]	.06	-.08	-.42	-.44
Money management[b]	-.13	.48*	1.13***	1.06**
Driving-related outcomes[b]	-.01	.19	.09	.12
Social concerns[a]	-.01	-.27	.17	.23
Depressive symptoms[b]	-.19	.60***	.94***	1.22***
Anxiety[b]	-.12	.20	.49***	.88***
Antisocial behavior[b]	-.09	.40	.41*	.08
Romantic relationship satisfaction[a]	.09	-.03	-.38	-.26
Academic concerns[b]	-.14	.46**	.56***	1.02***
Alcohol use[b]	-.07	.25	.30*	.37*
Cigarettes per day within the past 30 days[b]	-.12	.51**	.61**	.53*
Number of occasions of marijuana use within the past 6 months[b]	-.11	.46*	.41*	.34
Daily caffeine consumption within the past 6 months[b]	.08	.40*	.25	.40
Number of occasions of legal stimulant use within the past 6 months[b]	-.07	.30	.17	.34

a. Higher score indicates better functioning. b. Lower score indicates better functioning. Scores are in standard deviation units where the mean for each scale is set to zero.

* differs from comparison group at $p < .05$

** differs from comparison group at $p < .01$

*** differs from comparison group at $p < .001$

Although the significance levels indicated in Table 1 control for gender, race, and class year, unadjusted means are presented because covariate adjustments yielded different mean values for the comparison group in each set of analyses. To facilitate interpretation of the findings, dependent variables were converted to standard scores with a mean of 0 and standard deviation of 1. The difference between means for each ADHD group and the comparison subjects thus reflects the group differences in standard deviation units.

Although the degree of overlap between groups of students identified with ADHD using the different methods ranged from 29 percent to 84 percent, areas of psychosocial difficulty relative to comparison subjects were reasonably consistent across the groups. For four of the fourteen domains considered, i.e., difficulty with money management, depressive symptoms, academic concerns, and cigarette use, participants identified by each method reported significantly greater difficulty than comparison students. The effect sizes for these comparisons ranged from moderate to large. For several other domains – GPA, driving difficulties, social concerns, romantic relationship satisfaction, and use of legal stimulants – none of the ADHD groups differed significantly from comparison subjects.

For the remaining domains, consistency across students identified via the different methods was also evident. Students identified with the normative and symptom count methods both reported significantly higher anxiety ratings than comparison subjects; scores for those with self-reported diagnoses were lower but in the same direction. A similar pattern was evident for students' alcohol use. For marijuana use, scores for students identified using each method were highly similar, but only those in the self-report and normative groups differed significantly from comparison subjects. Finally, even for domains where only one group differed significantly

from comparison subjects, i.e., caffeine use, scores within the ADHD were generally consistent.

3.3 Adjustment of Students with ADHD Controlling for Internalizing and Externalizing Symptoms

The final issue examined is whether adjustment difficulties between college students with and without ADHD remain evident after controlling for internalizing and externalizing symptoms. Internalizing symptoms reflected the average standard scores for the depression and anxiety scales; these scales were correlated at r=.66. For externalizing symptoms, we used participants' standard score on the antisocial behavior scale. These were included as additional covariates in analyses comparing students identified using the normative method with comparison students. The normative method was selected for these analyses because it identified the largest number of students and is frequently used to identify students with ADHD in research with college samples.

Table 2 presents the means for these groups with and without adjusting for internalizing and externalizing symptom scores. Also indicated is the significance level for each outcome in relation to the comparison group (See Note 3). Although mean scores for the adjustment domains vary when controlling for internalizing and externalizing problems, the significant differences between students with and without ADHD remained generally consistent. Prior to controlling for internalizing and externalizing problems, students with ADHD reported more difficulties with money management, higher rates of antisocial behavior and more academic concerns than students in the normative group. Their self-reported alcohol, cigarette, and marijuana use was also significantly higher. After controlling for internalizing and externalizing problems, only their academic concerns no longer differed significantly from comparison students. Among the domains where significant differences were not previously found, only students self-reported social concerns emerged as significant after internalizing and externalizing difficulties were controlled for.

Table 2. Psychosocial functioning in students identified with ADHD using normative method with and without adjustment for internalizing and externalizing problems

	Comparison	Normative	Normative-C
GPA[a]	-.14	-.54	-.40
Money management[b]	.33	1.31***	.95*
Driving-related outcomes[b]	.05	.13	.03
Social concerns[a]	-.14	.07	.32*
Romantic relationship satisfaction[a]	-.09	-.63	-.24
Academic concerns[b]	.01	.64***	.37
Alcohol use[b]	-.42	.03*	-.01*
Cigarettes per day within the past 30 days[b]	.19	.90**	.81**
Number of occasions of marijuana use within the past 6 months[b]	-.24	.28*	.14*
Daily caffeine consumption within the past 6 months[b]	.18	.50	.23
Number of occasions of legal stimulant use within the past 6 months[b]	-.37	-.06	-.08

a. Higher score indicates better functioning. b. Lower score indicates better functioning. Scores are in standard deviation units where the mean for each scale is set to zero. Normative refers students identified with ADHD using normative method. Normative-C indicates results when internalizing and externalizing symptoms were included as covariates.

* differs from comparison group at $p < .05$

** differs from comparison group at $p < .01$

*** differs from comparison group at $p < .001$

4. Discussion

Important methodological limitations in the research on the prevalence and correlates of ADHD in college students includes an overreliance on convenience samples, the use of different methods for identifying ADHD, and the failure to control for comorbid difficulties when comparing psychosocial functioning in students with and without ADHD. To explore the extent to which inconsistencies in the literature may reflect the latter two limitations, we used four different methods to identify college students with ADHD and examined how the prevalence rate and adjustment correlates varied by method. We also examined whether adjustment differences between students with and without ADHD varied significantly depending on whether comorbid difficulties were controlled for.

Our results indicate that using different methods to identify college students with ADHD has a substantial impact on prevalence estimates for the disorder. In our sample, estimates ranged from 3 to 13 percent across methods, a difference of more than 400 percent. Not surprisingly, the normative method, i.e., students with self-reported symptoms that were at least 1.5 SDs about the sample mean, identified the most students and the use of full DSM-IV-TR criteria identified the fewest. Based on these findings, it appears that the use of different identification methods in prior studies of ADHD in college students is an important source of variability in the range of prevalence estimates that have been reported.

Although the overlap between groups of students identified with ADHD using the different methods was generally below 50 percent, differences in psychosocial functioning between each group and the comparison students, i.e., students not identified with ADHD by any method, remained relatively consistent. For 9 of the 14 adjustment outcomes examined, all ADHD groups were doing significantly worse than comparison students (depression, money management, academic concerns, and cigarette use) or did not differ from comparison students (GPA, driving difficulties, social concerns, romantic relationship satisfaction, and use of legal stimulants). And, for the remaining outcomes, (anxiety, antisocial behavior, caffeine consumption, alcohol use, and marijuana use) average scores for students identified by each method were typically more similar to one another than to comparison students. We thus found little evidence that the use of different identification methods across prior studies has contributed to inconsistencies in the psychosocial correlates of ADHD in college students that have been reported. It was also the case that controlling for internalizing and externalizing symptoms did little to alter the pattern of differences in psychosocial functioning between students with and without ADHD. The possibility that many of the previously reported psychosocial correlates of ADHD in college students may be better explained by comorbid difficulties that researchers did not control for was thus not supported.

Our study, like most work in this area, relied on a small convenience sample of students from a single institution. None of the identification methods that we employed provided a comprehensive ADHD evaluation or was consistent with suggested guidelines for diagnosing ADHD in young adults (McGough & Barkley, 2004). Our study thus suffers from the same shortcomings that characterize most research on ADHD in college students (DuPaul et al., 2009; Green & Rabiner, 2012). However, because our focus was to explore the extent to which these methodological limitations may have influenced the findings of prior investigations, these "shortcomings" were also "necessary" conditions to address the questions that motivated our work.

In summary, our results suggest that the use of different methods for identifying students with ADHD is likely to have significantly influenced published estimates of the prevalence of ADHD in college samples. The impact of this factor, as well as the general failure in prior research to control for comorbid difficulties, on the reported correlates of the disorder among students appears to be more modest. It is important to note, however, that nearly 20 years after research on college students with ADHD began appearing in the literature, the absence of any research utilizing comprehensive diagnostic methods with a representative sample of college students significantly undermines the conclusions that can be drawn about the psychosocial functioning among college students with ADHD. As was the case in the current study, much of the literature on ADHD in college students is based on small samples of individuals at single institutions who may not actually have ADHD as currently defined in the DSM-IV-TR. Given these concerns, examining the prevalence and correlates of ADHD in a nationally representative sample of college students whose diagnostic status—including comorbidities—has been well established following best practice guidelines, remains an important requirement for meaningfully advancing knowledge in this field.

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Notes

Note 1. The different response scales were used to examine whether the number of ADHD symptoms that participants report is influenced by the response format. Students did not report more symptoms as occurring at least *often* when the 5-point scale was used than when the 4-point scale was used.

Note 2. Because of the large number of analyses conducted, we do not include results of individual comparisons in the text. This information is available from the authors upon request.

Note 3. Mean values for the comparison group change slightly depending on whether internalizing and externalizing symptoms are included as covariates. To simplify the presentation, only one set of scores – those that do not include these adjustments – are presented.