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Is Attention Deficit Hyperactivity Disorder (ADHD) Symptom Severity Associated with Tobacco Use?

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Abstract

Several studies report a strong link between ADHD and tobacco use; however, the nature of this relationship is not entirely clear. We examined the relationship between attention deficit hyperactivity disorder (ADHD) symptoms and tobacco use within a sample of college students. Although tobacco use was the main focus, we also examined alcohol and marijuana use. We examined the association between the number of ADHD symptoms endorsed (severity), and tobacco, alcohol, and marijuana use in a convenience sample of 334 college students in the southeastern United States. Survey data were based on the annual Core Alcohol and Drug Survey for substance use, and the Current Symptom Scale (CSS) for ADHD, conduct disorder (CD), and antisocial personality disorder (ASPD) symptoms. Among ever users of a substance, the number (severity) of current ADHD symptoms, including inattentive and hyperactive symptoms, were significantly associated with the frequency of tobacco and marijuana use in the past month and past year, as well as to the frequency of alcohol use in the past month. The results suggest that the number of ADHD symptoms is proportionally associated with tobacco, alcohol, and marijuana use.

INTRODUCTION

With the past-month prevalence rates for cigarette smoking estimated at 26% among adults and 40% among young adults (ages 18–25), tobacco use remains a major public health concern.¹ In addition, psychiatric comorbidity is a major risk factor associated with cigarette smoking.² Attention deficit hyperactivity disorder (ADHD) is a common behavioral disorder affecting 3–10% of school-age children³ and 4% of the adults in the United States.⁴ There is a strong link between ADHD and substance use in general⁵ that is mediated to a large extent by comorbid conduct disorder.^{6,7} ADHD has been linked to greater rates of both lifetime and current smoking^{8,9} and early initiation of smoking.¹⁰ In addition, among both adults¹¹ and adolescents,¹² ADHD may undermine treatment success during smoking cessation.

We recently published the results of a cross-sectional study of college students that suggested uncontrolled ADHD symptoms are associated with tobacco use.⁵ In addition, a recent secondary data analysis of a large national epidemiological study of adolescents indicated that cigarette smoking is associated with self-reported symptoms of ADHD,¹³ and that severity of smoking is proportional to the severity of ADHD symptoms endorsed. Nicotine has been shown to improve attention in well-designed laboratory studies, including

smokers and non-smokers with and without ADHD, leading some authors to suggest that nicotine dependence may develop as an attempt to self-medicate symptoms of ADHD.^{14,15} Hence, we conducted a secondary analysis of data from our cross-sectional survey to examine if there was an association between the severity of ADHD symptoms and tobacco, alcohol, and marijuana use among participants who used any substance (including tobacco). Although tobacco use was our primary focus, we report here relationships between ADHD symptoms and other drugs as well (ie, alcohol and marijuana).

METHODS

Procedures and Assessments

Study methods have been described in detail in an earlier report.⁵ Briefly, students from a state-funded southeastern university were surveyed via the annual Core Alcohol and Drug Survey. This self-administered instrument assesses substance use attitudes and behaviors among college students.¹⁶ The survey presents ordinal categories to assess age of first use (ie, under 10, 10–11, 12–13, 14–15, 16–17, 18–20, 21–25, and 26+) as well as frequency of use in both the past year (ie, once per year, six times per year, once per month, twice per month, once per week, three times per week, five times per week, every day) and the past month (ie, 1–2 days, 3–5 days, 6–9 days, 10–19 days, 20–29 days, and all 30 days) for tobacco, alcohol, marijuana, and other drugs. We also included the Current Symptom Scale—Self Report (CSS),¹⁷ a rating scale for the assessment of ADHD based on the diagnostic criteria. The CSS references the past six months and contains two subscales that assess inattentive and hyperactive symptomatology (nine items each). Each item was scored from 0–3 (never or rarely, sometimes, often, very often), but was counted as a symptom of ADHD only if endorsed as often or very often. Thus, the number of ADHD symptoms represents a conservative measure of only those symptoms that met a clinically meaningful threshold of severity. Hence, ADHD symptoms were self-reported, and no clinical diagnosis of ADHD was made in the study. Finally, the questionnaire included items to assess both Conduct Disorder and Antisocial Personality Disorder. In all, 600 surveys were distributed, and 334 (56%) were returned. The study was approved by the Institutional Review Board of our university.

Data Analyses

All measures were scanned into a database using a PC-based TELEform system (Cardiff Software Inc., Vista, CA, USA). We omitted analyses of other drugs of abuse (besides tobacco, marijuana, and alcohol) for this report because use rates were moderately low and not normally distributed. Because data on age of first use and frequency of drug use (past month, year) were ordinal in nature, we opted not to use linear regressions. Rather, ADHD symptom counts (total number of symptoms, inattentive and hyperactive symptoms) were analyzed for both age of first use and frequency of use by logistic regression, yielding an estimate of increased risk for substance use for each increase in ADHD symptomatology. All analyses controlled for both lifetime conduct disorder and antisocial personality disorder (ASPD), with both diagnoses entered as covariates in the regression model.

RESULTS

Demographics

Survey respondents were representative of the source college population for age (mean 20.6 years, SD = 4.5), gender (61% female), and race (85% Caucasian), and were proportionate across all academic years. More than 97% of respondents had ever used alcohol, and more than 70% had ever used tobacco and/or marijuana; analyses were not limited to ever users but rather were based on the entire study sample. Twenty-seven percent had received a prior

diagnosis of ADHD, of whom more than 75% were currently ADHD-negative based on the CSS (past six months). ADHD symptomatology was unrelated to gender, age, or race. Twenty percent of participants endorsed symptoms that would meet criteria for Conduct Disorder, and 6% endorsed symptoms that would meet criteria for ASPD.

Age of First Drug Use

The number of current ADHD symptoms (total, inattentive, hyperactive) was unrelated to age of first tobacco, alcohol, or marijuana use.

Frequency of Drug Use: Past Month

The number of ADHD symptoms was significantly related to past month tobacco use (OR = 1.11; 95% CI = 1.04–1.18), marijuana use (OR = 1.14; 95% CI = 1.05–1.24), but not past month alcohol use (OR = 1.09; 95% CI = 0.99–1.2). For every one symptom increase in ADHD, the odds of using tobacco 20+ days per month increased by 11% and the odds of smoking marijuana 20+ days per month by 14%. However, these relationships appeared to be driven primarily by inattentive symptoms. For example, for every one symptom increase in inattentive behaviors, the odds of using tobacco 20+ days per month increased by 20% (OR = 1.2; 95% CI = 1.07–1.35), and the odds of smoking marijuana 20+ days per month increased by 29% (OR = 1.29; 95% CI = 1.09–1.59). The number of hyperactive symptoms was only related to past month tobacco use (OR = 1.18; 95% CI = 1.03–1.35). There were no significant relationships between hyperactive symptoms and past month alcohol or marijuana use.

Frequency of Substance Use: Past Year

Similarly, the number of ADHD symptoms was significantly related to past year smoking (OR = 1.1; 95% CI = 1.03–1.18) and marijuana use (OR = 1.14; 95% CI = 1.06–1.24), but not past year alcohol use (OR = 1.1; 95% CI = 0.98–1.16). For every one symptom increase in ADHD, the odds of using tobacco or marijuana 5+ times per week increased by 10 and 14%, respectively. However, unlike the finding listed previously, there were relationships between past year tobacco and marijuana use and both hyperactive and inattentive symptoms. For every one symptom increase in both hyperactive and inattentive behaviors, the odds of using tobacco 5+ times per week increased by at least 17% (OR = 1.17; 95% CI = 1.03–1.33) and 18% (OR = 1.18; 95% CI = 1.06–1.33), respectively. Figure 1 shows the association between ADHD symptomatology (total, hyperactive, inattentive) and frequency of tobacco use. Similarly, for every one symptom increase in both hyperactive and inattentive behaviors, the odds of smoking marijuana 5+ times per week increased by 21% (OR = 1.21; 95% CI = 1.03–1.42) and 29% (OR = 1.29; 95% CI = 1.13–1.47), respectively. There were no significant relationships between past year alcohol use and any ADHD symptomatology.

DISCUSSION

Results of our study suggest that ADHD symptom count was associated with substance use in a proportional manner. Confidence in our findings derives from the convergence of results: for both tobacco and marijuana (but not alcohol), across multiple measures of use frequency (past month, year), and within both inattentive and hyperactive symptom clusters of ADHD, there was a robust link between substance use and severity of ADHD symptoms. To our knowledge, this is one of the first reports noting an association between the number of ADHD symptoms (severity) and tobacco/marijuana use among college students. Our results are consistent with a similar study of adolescents,¹³ with the exception that we did not find an association between ADHD symptom count and age of smoking initiation. This

could be due to the retrospective and cross-sectional nature of the study in a relatively small sample.

Our study cannot infer any causal relationship between substance use and ADHD symptomatology. Nonetheless, the link between ADHD symptoms and tobacco use may offer implications for clinical treatment, given preliminary evidence that individuals with ADHD may have a poor smoking cessation outcome as compared to those without.^{11,12} The association of ADHD symptom severity and tobacco use is consistent with, though not a test of, the self-medication hypothesis, which suggests a possible nicotine-mediated amelioration of ADHD symptoms.^{14,15} The results raise an intriguing question: Would adequate treatment of ADHD potentially reduce or delay smoking initiation and/or reduce current smoking among individuals with ADHD?

The results of our study should be interpreted as preliminary in light of its limitations. Although our sample was college-based and non-clinical, it was mainly Caucasian and female. The survey response rate was moderate, and the cross-sectional design limits interpretation of causal relationships. ADHD symptoms were self-reported, and no clinical diagnosis of ADHD was made in the study. In addition, we had a higher proportion of respondents endorse ADHD symptoms than would be expected in a community sample. This was likely due to self-selection bias, in that subjects with ADHD symptoms were more likely to participate in the survey. Reflection of the self-selection bias was seen in the sample by high endorsement of ADHD symptoms. Nonetheless, this study offers further evidence linking ADHD symptoms to substance use, particularly, tobacco and marijuana. Future studies with longitudinal designs are needed to explore which ADHD symptoms are related to the initiation and progression of smoking, and to determine if early treatment of ADHD prevents initiation or progression of smoking. Finally, further studies should more fully examine possible relationships between ADHD symptom severity and smoking cessation rates.

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FIGURE 1. Relationship between ADHD Symptom Count and Past Year Cigarette Use. Percentages based on entire sample (N = 334).