

# Attention Deficit Hyperactivity Disorder Symptoms and Cigarette Use among College Students

**Keywords:** Attention deficit hyperactivity disorder; Tobacco use; Smoking cessation; Young adults

## Abstract

**Background:** Attention deficit hyperactivity disorder (ADHD) and cigarette smoking are positively associated among older adolescents. However, the specific symptoms of ADHD that contribute to this relationship remain unclear. We hypothesized that college smokers would report greater inattention and impulsivity compared to non-smokers.

**Methods:** College students ( $N=385$ ; non-smokers = 296; smokers = 89) completed the Cognitive Failures Questionnaire and the impulsivity subscale of the Zuckerman Kuhlman Personality Questionnaire. One-way analyses of covariance (ANCOVAs) compared differences by smoking status.

**Results:** College smokers reported significantly greater inattention [ $M=22.87$  ( $SD=9.89$ )] and impulsivity [ $M=12.2$  ( $SD=3.94$ )] compared to non-smokers [ $M=21.17$  ( $SD=8.68$ );  $M=9.10$  ( $SD=3.88$ ), respectively].

**Conclusions:** Findings suggest that college smokers may have difficulty with cognitive and emotional regulation. This is important to address given the lower academic success among students with ADHD symptoms. Moreover, these difficulties are associated with smoking maintenance and difficulty quitting. Cessation interventions targeting college students might address these factors.

## Introduction

Cigarette smoking is a major public health concern among emerging adults in the U.S. and globally. The prevalence of smoking has declined in all other age groups in the US; yet, the rate of decline among younger smokers, including young adults (18-25 years of age), has stalled [1]. Emerging adulthood is a critical period for intervention, as the transition from non-daily to regular smoking often occurs at this stage [1]. Many college students fall within this critical age range, and are thus an important target population.

Smoking is associated with psychiatric comorbidities, such as attention deficit hyperactivity disorder (ADHD). Compared to those without the disorder, young adult college students diagnosed with ADHD have a greater likelihood of having ever used tobacco, an earlier age at smoking onset [2] and a higher frequency of tobacco use [2,3]. The symptoms of ADHD may be particularly debilitating for college students, who tend to have high academic demands and social pressures. Thus, students might self-medicate with cigarettes to alleviate symptoms.

Little previous research has examined ADHD symptoms and smoking among college students. Studies in this population have shown a positive association between an ADHD diagnosis and tobacco use [2]. However, only two previous studies focused on



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the hallmark symptoms of ADHD, inattention and impulsivity. Upadhyaya and Carpenter [4] found positive relationships between inattentive and hyperactivity symptom-severity and tobacco use frequency. Glass and Flory [3] found that inattention, but not impulsivity, was positively associated with cigarette smoking. As nicotine may promote cognitive and behavioral inhibition [5], college students may (mis)use stimulants for cognitive enhancement purposes [6]. Given the increases in stimulant and illicit drug use on college campuses, additional research on the relationship between ADHD symptoms and smoking in college students will facilitate prevention and intervention efforts.

The present study examined whether college cigarette smokers differed from non-smokers in the degree of inattention and impulsivity they experience. We hypothesized that smokers would report greater inattention and impulsivity compared to non-smokers.

## Materials and Methods

### Participants

The sample consisted of 385 northeastern college students (smokers = 89; non-smokers = 296) aged 18 to 25. Students were recruited through flyers posted on campus and in near-by restaurants, an e-mail listserv, and class room visits. Participants provided written informed consent, completed a 60-minute self-administered assessment (anonymously), and received \$20 or course credit.

### Measures

Single items assessed age, sex, race/ethnicity, year in school, and grade point average (GPA). Smoking status was defined according to criteria used in national surveys of tobacco surveillance in the United States [7]. Participants who reported they had smoked at least 100 cigarettes in their lifetime and currently smoked on some days or every day were considered smokers. Participants who did not currently smoke cigarettes were considered non-smokers.

Inattention was measured using 14 items from the Cognitive Failures Questionnaire (CFQ) [8], which identifies deficits in attention, memory, and motor function ( $\alpha = 0.91$ ; test-retest reliability:  $r = 0.82$ ). The selected questions were those focused on lack of attentiveness, including: "Do you read something and find that you haven't been

paying attention and must read it again?” Responses were rated on a 5-point Likert scale, ranging from 0 (never) to 4 (very often). Items were summed to create a total score (range 0-56), with higher scores indicating greater cognitive deficits (current study  $\alpha=0.84$ ).

Impulsivity was measured using the impulsivity/sensation seeking subscale (19 items) of the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) [9]; reliability ranging from (0.72-0.82). Questions included: “I tend to begin a new job without much planning on how I will do it.” Items were scored in a true/false format and summed to calculate a total score, with a higher score indicating greater impulsivity (range 0-19; current study  $\alpha= 0.72$ ).

## Results

Characteristics of the sample by smoking status are reported in Table 1. Independent samples *t*-tests and chi-square tests indicated that smokers were more likely to be male, white, older, and have a lower GPA. The prevalence of smoking appeared to peak during the junior year in school (approximately Year 3), with some decline thereafter, but the overall comparison by year in school was not statistically significant ( $p=0.06$ ). Subsequent analyses controlled for significant covariates (i.e., sex, age, race, and GPA).

A one-way analysis of covariance (ANCOVA) evaluated the hypothesis that college student smokers would report greater inattention compared to non-smokers. Results were statistically

significant,  $F(1, 337) = 3.93, p = 0.048$ , partial  $\eta^2 = .012$ , demonstrating greater inattention among smokers compared to non-smokers (Table 1).

An ANCOVA was also conducted to evaluate the hypothesis that smokers would report greater impulsivity compared to non-smokers. As anticipated, the results confirmed this relationship,  $F(1, 339) = 26.89, p < .001$ , partial  $\eta^2 = .074$ , indicating greater impulsivity among smokers compared to non-smokers.

## Discussion

This study investigated the associations between two fundamental symptoms of ADHD, inattention and impulsivity, and cigarette smoking in a sample of college students. As hypothesized, smokers reported greater attention deficits and impulsivity compared to non-smokers. Students with this symptom pattern often have difficulty adjusting to the demands of college [10] and may be vulnerable to the use of multiple substances [2]. Our findings are consistent with previous research, which reported positive associations between ADHD symptoms and smoking frequency [4]. Moreover, several previous studies in larger samples of young adults have found that ADHD symptoms are related to the development of nicotine dependence or the progression to smoking [11,12].

This study contributes to the literature by focusing on college students. With an estimated 20 million college students in the U.S.,

**Table 1:** Sample Characteristics by Smoking Status.

	Smokers (n=89)	Nonsmokers (n=296)	Test Statistic
	%(n)	%(n)	
Gender			$\chi^2 (1, N = 384) = 19.66, p < .001$
Male	35% (61)	65% (113)	
Female	13% (28)	87% (182)	
Class			$\chi^2 (4, N = 373) = 9.09, p = .06$
Freshman	18% (24)	82% (108)	
Sophomore	25% (18)	75% (54)	
Junior	34% (31)	66% (61)	
Senior	17% (10)	83% (50)	
Fifth-year	24% (4)	76% (13)	
Race/Ethnicity			
Caucasian	29% (56)	71% (140)	$\chi^2 (5, N = 383) = 13.13, p = .02$
African American	10% (6)	90% (53)	
Asian	22% (39)	78% (11)	
Native American	100% (1)	0% (0)	
Bi-racial	11% (1)	89% (8)	
Other	20% (14)	80% (54)	
Hispanic (any race)	18% (8)	82% (36)	$\chi^2 (1, N = 382) = .39, p = .39$
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	
Age	20.18 (1.78)	19.58 (1.63)	$t (382) = -2.99, p = .003$
GPA	3.10 (0.50)	3.29 (0.48)	$t (358) = 3.10, p = .002$
Inattention*	22.87 (9.88)	21.23 (8.64)	$F (1, 337) = 3.93, p = .048$
Impulsivity*	12.2 (3.94)	9.10 (3.88)	$F (1, 339) = 26.894, p = < .001$

Note: \*covariates included in the models were sex, age, race, and grade point average (GPA)

addressing preventative health behaviors such as smoking in this population could have a significant impact on future health outcomes [13]. The present study assessed inattention and impulsivity using measures that are uniquely relevant to concerns faced by college students. The brevity of these measures allows for the practical assessment of ADHD symptoms in a college setting and may be useful in screening college students for health behavior and tobacco intervention needs.

Our results also indicated that demographic factors such as sex, race/ethnicity, and academic performance were associated with current smoking among college students. Consistent with previous research [14], males were more likely to be current smokers compared to females. As the prevalence of childhood ADHD is greater among boys than girls [15], future studies should examine sex as a potential moderating variable for the relationship between ADHD symptoms and smoking. Research on the relationship between ADHD and race/ethnicity has been inconsistent, and we were unable to locate any studies examining this association in the context of smoking. Future research in this area is warranted. With regard to GPA, ADHD is highly comorbid with learning disabilities [16] and many college students with ADHD experience academic difficulty [17]. Within the framework of the self-medication hypothesis [18], it is possible that difficulty concentrating on school work may facilitate smoking as a method of improving focus. Future studies should test the potential mediating role of academic functioning in the relationship between smoking and ADHD symptoms.

### Limitations

This study is limited by its quasi-experimental and cross-sectional design, which precludes causal explanations, and use of a convenience sample that may not be representative of all college students. Second, diagnosis of ADHD by a health professional was not assessed, however Levy and colleagues [19] suggest that the measurement of ADHD in young adults may be more appropriate using a continuum of symptoms rather than discrete groups (i.e., ADHD-predominantly inattentive, ADHD-hyperactive impulsive, and ADHD-combined). Third, the CFQ and ZKPQ are not established measures of ADHD, and can be viewed as proxies for these constructs. However, the strong internal consistencies are indicators of construct validity. The lack of empirically supported measures of ADHD for young adults is an acknowledged limitation in this area of research [20], and the development of such measures is imperative to gaining a better understanding of the relationship between ADHD and smoking in this population. We also do not know whether individuals with high scores on the CFQ and the ZKPQ have actual ADHD diagnoses. Finally, we did not control for comorbid conditions (e.g., other substance use, oppositional defiant disorder) that may also influence these associations.

### Conclusions

Among college students, smokers experience greater degrees of inattention and impulsive behavior. As these symptoms of ADHD are associated with adjustment difficulties and substance use, interventions to address these problems are needed in this population. Evidence suggests that cognitive and emotional dysregulation decrease the odds of quitting and success in college [21]. Longitudinal studies are needed to identify temporal associations between ADHD symptoms

and diagnoses, and cigarette smoking initiation, patterns, and cessation. Understanding the specific ADHD symptoms experienced among smokers can guide targeted academic, psychological, and cessation intervention approaches. Interventions including cognitive and behavioral methods may be of particular utility to manage these concerns. Cognitive Behavioral Therapy (CBT) interventions have shown promise in treating adults with ADHD [10]. CBT interventions for smoking cessation adapted for use in college student populations with ADHD symptoms may hold promise for future research.

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