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A COMPARISON OF THE ASSOCIATIONS OF CAFFEINE AND CIGARETTE USE WITH DEPRESSIVE AND ADHD SYMPTOMS IN A SAMPLE OF YOUNG ADULT SMOKERS

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Abstract

Objectives—This study examined the relationship between psychiatric symptoms and nicotine, caffeine, alcohol, and marijuana use in young adult smokers

Methods—Young adult smokers completed self-report measures of nicotine, caffeine, alcohol and marijuana use, Conner's Adult ADHD (Attention-Deficit/Hyperactivity Disorder) Rating Scale-Short Version (CAARS-SS), Beck Depression and Anxiety Inventories (BDI and BAI), and provided a breath carbon monoxide (CO) sample.

Results—Self-reported cigarette use was positively correlated with carbon monoxide, CAARS-SS and the BDI levels. Caffeine intake was correlated with CAARS-SS, BAI and BDI levels and emerged as the more significant predictor of BDI, BAI and CAARS-SS scores when regressed with cigarette use.

Conclusions—Caffeine use is associated with psychiatric symptoms in young adult cigarette smokers and should be considered in future research.

Keywords

nicotine; caffeine; alcohol; marijuana

Smoking initiation and treatment relapse are associated with depression (Kinnunen et al. 1996; Patton et al. 1998). Heavy cigarette smoking has also been associated with an increased risk for agoraphobia, generalized anxiety disorder, and panic disorder (Johnson et al. 2000). In addition, Attention-Deficit/Hyperactivity Disorder (ADHD) is a significant risk factor for early smoking initiation and level of nicotine dependence (Milberger et al. 1997). Nicotine dependence is also associated with alcohol and other drug use, including caffeine (Lynskey et al. 1998; Bernstein et al. 2002; John et al. 2003; SAMHSA 2008). It is generally assumed that the association between cigarette smoking and psychiatric symptoms is related to nicotine use and dependence (e.g., Farrell et al. 2001). In the general population, caffeine use is also associated with alcohol and other drug use, and symptoms of anxiety, depression, and ADHD (Leibenluft et al. 1993; Bernstein et al. 2002; Broderick and Benjamin 2004; Martin et al. 2008). We are aware of no previous studies that have examined the separate or

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combined effects of caffeine and nicotine use on psychiatric symptoms among young adult smokers (Hughes and Howard 1997). The aim of this study is to assess the relative association of caffeine and cigarette use and psychiatric symptoms in late adolescent and young adult cigarette smokers. We hypothesized that levels of caffeine use in young adult cigarette smokers would be correlated with symptoms of ADHD, depression, and anxiety, since caffeine use has been associated with these symptoms in the general population.

METHODS

Participants

The sample consisted of respondents to local newspaper advertisements and flyers for a smoking study placed on a college campus and in a student health clinic. The study was approved by the University of Kentucky Institutional Review Board.

Procedures

After a brief phone interview, subjects presented to a research clinic and consent was obtained. Breath carbon monoxide (CO) levels were then obtained with a PICO Smokerlyzer (Bedfont Scientific, Kent, England) and cigarette dependence was assessed using the Adolescent Fagerström Questionnaire (Prokhorov et al. 1996). Caffeine use was estimated based on reported coffee (100 mg per serving), tea (50 mg/serving) and caffeinated soft drink (mg/serving determined by the preferred beverage) consumption (Table 1). Drug use, including nicotine, alcohol and marijuana, was assessed with a self-report questionnaire similar to that used in a longitudinal study of adolescent drug use (Clayton et al. 1996). Subjects also completed the Beck Depression (BDI) and Anxiety Inventories (BAI) and the Conner's Adult ADHD Rating Scale-Short Version (CAARS-SS) (Conners et al. 1999). All measures were obtained during the same clinic visit.

Statistical Analysis

Pearson correlations were used to determine associations between numbers of cigarettes smoked per day, breath CO, Adolescent Fagerström score, daily caffeine use, monthly alcohol and marijuana use, BDI, BAI, and CAARS-SS scores. Chi-square tests were used to examine gender differences in caffeine, nicotine, alcohol and marijuana use. Linear regression was then used to determine the relative association of daily caffeine and cigarette use with psychiatric symptoms (BDI, BAI, and CAARS-SS.) Statistical significance was assumed at $p < .05$.

RESULTS

Thirty-seven male and 37 female late adolescent and young adult smokers between 18 and 24 years of age (mean age 20.39 ± 1.88 years) reporting daily cigarette smoking (i.e., 1 or more cigarettes per day) participated in the study. Of all the subjects, 81% were Caucasian, 8% African American, 3% Hispanic, 1% Asian, and 5.4% other.

Self-reported daily cigarette use was correlated with CO level ($r = .43$; $p \leq .001$) and the Adolescent Fagerström score ($r = .55$; $p \leq .001$). Cigarette use was also correlated with the CAARS-SS ($r = .26$; $p < .05$) and the BDI ($r = .24$; $p < .05$) but not the BAI.

Caffeine use estimates for coffee and tea for more than 3 cups/day were recorded as 400 mg for 3 subjects and 200 mg for 1 subject, respectively. Caffeine use estimates for caffeinated soft drink for more than 6 drinks/day were recorded as 7 servings for 3 subjects, with mg/serving determined by preferred beverage. Caffeine use was correlated with the CAARS-SS ($r = .28$; $p < .01$), the BAI ($r = .44$; $p < .001$), the BDI ($r = .35$; $p < .01$) but not with self-

report of cigarette use, Adolescent Fagerström score or CO. When step-wise linear regression was performed to determine the relative amount of variance in the BDI and the CAARS-SS accounted for by cigarette and caffeine use, caffeine emerged as a more significant predictor of both (Table 2).

Alcohol and marijuana use in the last 30 days was reported by 95% and 60% of subjects, respectively. Amount of use was not correlated with cigarette use, CO, Fagerström score or caffeine use in these young adult smokers. Other drug use in the last 30 days was reported as follows: smokeless tobacco (n=6), barbiturates (n=0), cocaine (n=3), opiates (n=6), oxycontin (n=4), PCP (n=0), LSD (n=0), methamphetamine (n=0), ecstasy (n=0), steroids (n=0), inhalants (n=0), stimulants (n=7), and benzodiazepines (n=11). Similarly, 87% of subjects denied any prescribed psychotropic medication while 7 reported use of a selective serotonergic reuptake inhibitor and 2 use of a stimulant medication. Due to the low rates of other drug use and psychotropic medication use, we did not enter any other drug or medication type into the current analysis.

There were no gender differences in self-reported cigarette use, CO levels, or Adolescent Fagerström score, although male smokers had significantly higher rates of monthly alcohol use [$t(60) = 3.20, p < 0.01$].

DISCUSSION

We believe that the current study is the first to have examined the separate and combined effects of caffeine and nicotine use on psychiatric symptoms among young adult smokers. Amounts of both cigarette smoking and caffeine use were associated with scores on the BDI and CAARS in this young adult population of smokers. When taking into account both cigarette smoking and caffeine use, caffeine was the more significant predictor of these symptoms. Caffeine may have a role in the association of psychiatric symptoms in smokers that studies have previously attributed to nicotine, at least in young adult populations (Breslau et al. 1993; Kinnunen et al. 1996; Milberger et al. 1997; Patton et al. 1998; Kollins et al. 2005). The interaction between caffeine and nicotine has been well described previously (Hughes and Howard 1997; Bernstein et al. 2002; Jones and Griffiths 2003), but few studies examining the association of psychiatric symptoms with either caffeine or cigarette use take combined use into account (Hewlett and Smith 2006; Gurpegui et al. 2007). For example, Martinez-Ortega et al. (2006) reported correlations between psychiatric symptoms and cigarette smoking. They did not see a relationship between caffeine use and psychiatric symptoms in the combined population of smokers and non-smokers. It is possible this difference from our current findings could be explained due to age and cultural differences in the study populations.

Caffeine use has been linked to anxiety, depression, and ADHD (Leibenluft et al. 1993; Bernstein et al. 2002; Broderick and Benjamin 2004); and the effects of caffeine on concentration, depression, and anxiety in cigarette smokers has been well described (Leibenluft et al. 1993; Griffiths and Mumford 1995; Bernstein et al. 2002; Broderick and Benjamin 2004). Since nicotine has been associated with similar psychiatric morbidity (Kinnunen et al. 1996; Milberger et al. 1997; Patton et al. 1998; Johnson et al. 2000), this study points to the importance of considering the effects of both caffeine and nicotine in young adult smokers. Given the present findings, routine assessment of cigarette smoking and nicotine dependence should be accompanied by consideration of caffeine use. It is important that the information elicited includes type and amount of drink due to the varying amounts of caffeine in substances and the increasingly popular high dose caffeine drinks.

It is important to note that a number of study limitations are apparent. First, this was cross-sectional study, and no biological measures were used to assess use of drugs other than nicotine. Furthermore, although subjects were smoking ad lib and were not seeking treatment at the time of the study, it is possible that symptoms of ADHD, anxiety or depression were elevated due to nicotine or caffeine deprivation. Subjects were not excluded from the study on the basis of a diagnostic history of ADHD, anxiety disorders or depressive disorders, and we did not ask about sources of nicotine consumption, other than smokeless tobacco use, or caffeine intake, other than coffee, tea and soft drinks. In addition, the recruitment strategy likely resulted in a sample that was over-represented by college students compared to the general population of young adults, and students may differ from non-students in patterns of caffeine and nicotine use.

CONCLUSIONS

Cigarette smoking is associated with depressive and ADHD symptoms in a young adult population. However, our data suggest caffeine use, in addition to nicotine, is associated with these symptoms. Further research examining the role of caffeine on psychiatric symptoms in young adult smokers is warranted.

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Table 1**Caffeine Use Questionnaire**

How much caffeinated coffee do you drink every day?				
☐ <i>None</i>	☐ <i>1 cup</i>	☐ <i>2 cups</i>	☐ <i>3 cups</i>	<i>more than 3 cups</i>
How much caffeinated tea do you drink every day?				
☐ <i>None</i>	☐ <i>1 cup</i>	☐ <i>2 cups</i>	☐ <i>3 cups</i>	<i>more than 3 cups</i>
How many Soft Drinks with caffeine (for example: Pepsi, Ale 8, etc.) do you drink every day?				
☐ <i>None</i>	☐ <i>1 drink</i>	☐ <i>2 drinks</i>	☐ <i>3 drinks</i>	
☐ <i>4 drinks</i>	☐ <i>5 drinks</i>	☐ <i>6 drinks</i>	☐ <i>More than 6 drinks</i>	

In the space below, please write down your favorite or first choice of soft drink with caffeine? (For example: Pepsi, Coke, Mountain Dew, Ale 8, etc.)

Table 2

Linear Regression with tobacco smoking and caffeine use as predictors of depression and Attention-Deficit/Hyperactivity Disorder

Dependent Variable	Independent Variables	B Weight (Standardized Regression Coefficient)	Adjusted R Square
Beck Depression Inventory	Caffeine/day	0.34 ^b	0.15
	Cigarette/day	0.23 ^a	
Conner's Adult Attention-Deficit/Hyperactivity Disorder Rating Scale-Short Version	Caffeine/day	0.28 ^b	0.12
	Cigarette/day	0.26 ^a	
Beck Anxiety Inventory	Caffeine/day	0.44 ^c	0.17
	Cigarette/day	.03	

^a a = p < 0.05

^b p < 0.01

^c p < 0.001