



Depression vulnerability predicts cigarette smoking among college students: Gender and negative reinforcement expectancies as contributing factors

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ABSTRACT

This study examined the association between vulnerability to depression and smoking behavior in 1214 college students (54% female), and evaluated gender and expectancies of negative affect reduction as moderators or mediators of this relationship. Depression vulnerability predicted smoking in females, but not males. The relationship between depression vulnerability and smoking status was mediated by expectancies of negative affect reduction in females only. Female college students who are vulnerable to depression may smoke because they expect smoking to relieve negative affect. Smoking interventions for college females may increase in effectiveness by targeting depression and emphasizing mood regulation.

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1. Introduction

Cigarette smoking is the leading preventable cause of death in the United States, and data suggest that it is responsible for over 438,000 deaths per year (Centers for Disease Control and Prevention, 2002, 2005; National Institute on Drug Abuse, 2001). Recent statistics indicate that approximately 19.8% of the general United States population currently smokes cigarettes, but prevalence estimates rise to 22.2% for college-aged adults ages 18 to 24 years (Centers for Disease Control and Prevention, 2007, 2008). Furthermore, studies have shown that 11% of smokers report that they first tried cigarettes after the age of 19, that between 11.5% and 22% of college students who have never smoked progress to occasional or daily smoking during the college years, and that the period of risk for smoking initiation may continue until age 20 (Costa, Jessor, & Turbin, 2007; DeWit, Offord, & Wong, 1997; Everett, et al., 1999; Stockdale, Dawson-Owens, & Sagrestano, 2005; Wetter, et al., 2004). Therefore, it is important to understand the factors that influence smoking behavior among college students.

Research suggests that smoking among college students may be influenced by the presence of clinical depression or depressive symptomatology (Brown, et al., 2001). As many as 31.9% of undergraduate smokers report that they smoke to manage depression (DeBernardo, et al., 1999). Higher levels of depression are associated with lower self-efficacy to resist smoking, which in turn is associated with higher levels of self-reported smoking behavior (Kear, 2002). In addition, higher scores on specific subscales of the Multiscore

Depression Inventory (Instrumental Helplessness, Social Isolation/Withdrawal) are associated with an increased likelihood and intention to smoke among high school and college students (Vogel, Hurford, Smith, & Cole, 2003). What is more, college students are more likely to use tobacco if they have a history of depression, which may represent proneness or vulnerability to depression (Lenz, 2004; McChargue & Cook, 2007; Schleicher, Harris, Catley, & Nazir, 2009). For example, college students are five to seven times more likely to use tobacco within the past month or year if they have a lifetime diagnosis of depression or have been treated for depression (McChargue, Spring, Cook, & Neumann, 2004).

If vulnerability to depression is linked to smoking behavior in college students, then it is important to understand the moderators and mediators of this relationship so that researchers and clinicians can develop more effective targeted smoking prevention and cessation interventions for this population. Gender may be one such important moderator, given that women are two times more likely than men to experience depression and that depressed female college students exhibit greater levels of nicotine dependence compared to their male counterparts (American Psychiatric Association, 2000; McChargue, Cohen, & Cook, 2004).

Expectations that smoking will reduce negative affect may mediate the relationship between depression and smoking, such that college students may be more likely to smoke because they expect it will relieve negative mood (i.e., they hold *negative reinforcement expectancies*). There is evidence to suggest that heavier, more dependent smokers hold more positive expectations about the consequences of smoking compared to lighter smokers or non-smokers (Brandon & Baker, 1991). In addition, expectancies for positive outcomes (e.g., social facilitation, relaxation, mood enhancement) appear to be more strongly related to cigarette consumption than expectancies for negative

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outcomes (e.g., negative health consequences) (Brandon, Juliano, & Copeland, 1999; Copeland & Carney, 2003).

Although research has demonstrated that affect and smoking expectancies are linked and may predict smoking behavior, only three studies to our knowledge have examined the role of smoking expectancies as a mediating variable between negative affect and smoking behavior in young adults (Brandon, Wetter, & Baker, 1996; McKee, Wall, Hinson, Goldstein, & Bissonnette, 2003; Schleicher, et al., 2009). One study found that positive smoking expectancies, or expectations of positive reinforcement from smoking, partially mediated the relationship between negative affect and self-reported smoking behavior among young adults (Cohen, McCarthy, Brown, & Myers, 2002). In a similar study among college students, positive smoking expectancies mediated the relationship between history of depression and smoking status, such that students with a history of depression were more likely to smoke when they held positive expectations about the consequences of smoking (McChargue, Spring, et al., 2004). A more recent study showed that negative reinforcement expectancies, in the form of negative affect reduction expectancies, mediated the relationship between a history of depression and the number of cigarettes smoked in the past month (Schleicher, et al., 2009). While these studies are informative, the first two did not evaluate negative reinforcement expectancies as a mediator of the relationship between depression and smoking status, and none of the three studies addressed whether smoking expectancies operate differently for males and females.

The present study was designed to examine the relationship between vulnerability to depression and smoking behavior among college students, while evaluating gender and negative reinforcement expectancies (specifically, expectations of negative affect reduction) as potential moderators or mediators of this relationship. It was hypothesized that depression vulnerability would predict self-reported smoking behavior. It was also hypothesized that gender would moderate the relationship between depression vulnerability and self-reported smoking behavior, such that this predictive relationship would exist for females, but not males. Finally, it was hypothesized that the relationship between depression vulnerability and self-reported smoking behavior would be mediated by negative reinforcement expectancies, but only among female participants.

2. Methods

2.1. Participants

Participants included 1214 undergraduate introductory psychology students (60% female) who completed the study for course credit. The modal age in the sample was 18 years, and the self-reported ethnic composition of the sample was 80.1% Caucasian, 11.4% Hispanic, 3.3% African American, 2.5% Asian American, 0.7% Native American, and 2.0% Other. Approximately 30.1% of males and 28.6% of females reported that they were current smokers. Among current smokers, 58.4% reported smoking fewer than 5 cigarettes per day, 16% reported smoking 6–10 cigarettes per day, 8.6% reported smoking 10–15 cigarettes per day, 2.9% reported smoking 16–19 cigarettes per day, 5.4% reported smoking one pack of cigarettes per day, and 1.1% reported smoking more than one pack of cigarettes per day (7.6% did not report their smoking status; these participants were excluded from analyses where appropriate).

2.2. Measures

2.2.1. Demographic characteristics and smoking behavior

Participants completed a questionnaire developed by the researchers that included questions about demographic characteristics (gender, age, and ethnicity) and smoking behavior.

2.2.2. Depression vulnerability

The present study utilized two single-item measures (the depression and anhedonia questions) that have been shown to indicate a vulnerability to depression (McChargue & Cook, 2007). One question assessed history of depressed mood (*Have you ever been down or depressed most of the day nearly every day for 2 weeks or more?*), and the other assessed history of anhedonia (*Have you ever lost interest or pleasure in most things you typically enjoy most of the day nearly every day for 2 weeks or more?*). Single-item measures of history of depression are well-established in the literature (Niaura, et al., 1999; Schleicher, et al., 2009). Responses to the two items used in the current study have been shown to predict depression vulnerability, as defined by clinician-diagnosed history of Major Depressive Disorder, number of past major depressive episodes, levels of depressive rumination, and proneness to depression (Schleicher, et al., 2009).

2.2.3. Smoking expectancies

Negative reinforcement expectancies in the form of affect reduction expectancies were measured using three items: (1) How much do you think smoking increases your ability to experience pleasure during situations that other people typically enjoy? (2) Do you feel like you can't experience pleasure during typically enjoyable situations without smoking? and (3) If you feel down or sad, do you think that smoking takes away your unhappy mood? Participants responded to items 1 and 3 on a four-point Likert scale (0 = *I do not smoke*; 1 = *Not at all*; 2 = *Moderately*; and 3 = *A lot*). Participants responded to item 2 by indicating that they did not smoke or did not agree with the statement (0), or that they agreed with the statement (1). There is no standardized scoring method for creating an expectancy score from these items. Therefore, responses on the three items were summed for each participant, such that higher summed scores corresponded with higher expectations regarding the positive effects of smoking. Reliability analyses indicated that this index of smoking expectancies had excellent reliability (Cronbach's $\alpha = .92$) and high inter-item correlations ($r = .78$ to $.83$).

2.3. Procedure

Potential participants signed up for assessment sessions that were held weekly in groups of 15 to 20 individuals. Informed consent was obtained prior to participants completing the research survey. Rights and privileges of volunteer participants in accordance with the university Institutional Review Board were explained to participants before they provided written informed consent. The Institutional Review Board approved all study procedures.

2.4. Analytical plan

Hierarchical binomial logistic regression analyses were performed to test the hypothesis that gender would moderate the relationship between depression vulnerability, as defined by responses to the depression and anhedonia questions separately, and self-reported smoking behavior. Moderation is said to occur when the following conditions are met: (1) the independent variable (depression/anhedonia) significantly predicts the dependent variable (smoking behavior), (2) the moderator (gender) does not significantly predict the dependent variable, and (3) the interaction between the moderator and the independent variable significantly predicts the dependent variable (Baron & Kenny, 1986).

Linear and logistic regression analyses were conducted to test the hypothesis that the relationship between depression vulnerability (as defined by responses to the depression and anhedonia questions separately) and self-reported smoking behavior would be mediated by negative reinforcement expectancies. These analyses were conducted for the full sample, as well as separately for males and females to test for gender effects. Mediation was said to occur if (1) the

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