



Short Communication

Examining the interrelationships between social anxiety, smoking to cope, and cigarette craving

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ABSTRACT

Smokers with symptoms of social anxiety often report smoking as a way to cope with negative affect. These individuals have lower success rates when attempting cessation compared with the general population. However, there is a paucity of research examining the role of social anxiety in nicotine dependence. The present study explored the relationships between symptoms of social anxiety, smoking to cope with these symptoms during social situations (STC), and cigarette craving. Thirty-eight participants completed measures of social anxiety and STC at baseline. Cigarette craving was subsequently assessed pre and post exposure to smoking-related images during periods of nicotine satiation and deprivation. Regression analyses revealed that greater symptoms of social anxiety predicted the frequency of STC behaviors and the number of cigarettes participants thought they would need in order to feel more comfortable in social situations. Symptoms of social anxiety and several behaviors associated with STC (e.g., avoiding social situations in which smoking is not permitted) predicted increases in craving during nicotine deprivation, but not satiation. These findings suggest that symptoms of social anxiety and STC behaviors may play a role in the maintenance of smoking behaviors. Further, targeting symptoms of social anxiety within the context of smoking cessation treatment may be particularly helpful and may improve the rates of smoking cessation among individuals with symptoms of social anxiety.

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1. Introduction

Although tobacco is the leading cause of preventable death in the United States (National Institute of Drug Abuse, 2009), an estimated 19.2% of U.S. adults are current smokers (Center for Disease Control and Prevention, 2011). Interestingly, rates are higher among individuals diagnosed with anxiety disorders (Ziedonis et al., 2008). For example, co-occurring social anxiety disorder (SAD) and cigarette smoking is well documented (Wittchen, Stein, & Kessler, 1999; Wu et al., 2010; Ziedonis et al., 2008), with estimates as high as 31.5% (Lasser et al., 2000).

Understanding factors related to the comorbidity of social anxiety and cigarette smoking is important because evidence suggests symptoms of social anxiety may play a role in the development and maintenance of nicotine dependence (e.g., Morissette, Tull, Gulliver, Kamholz, & Zimering, 2007; Sonntag, Wittchen, Hofler, Kessler, & Stein, 2000). Many smokers use cigarettes to feel relaxed in social situations (Junghans, Lovett, Eldridge, Grant, & Dempsey, 2009; Spielberg & Reheiser, 2006), and social anxiety may induce craving (Buchmann et al., 2010; Childs & de Wit, 2010; Niaura, Shadel, Britt, & Abrams, 2002) and prevent successful cessation (Lopes et al., 2002; Piper, Cook,

Schlam, Jorenby, & Baker, 2011). Further, socially anxious individuals may be especially likely to crave cigarettes during abstinence in social settings if they have a history of smoking to cope in these settings. However, no studies to date have examined how these relationships may vary as a function of level of social anxiety. Addressing these gaps in the literature is important because of the implications for smoking relapse among this high-risk population of smokers.

Using a cue-exposure paradigm to trigger cravings (Carter & Tiffany, 1999), this study attempted to provide unique insight into the maintenance of smoking behaviors via cigarette craving among individuals with varying levels of social anxiety. Based on preliminary research, it was predicted that the severity of symptoms of social anxiety would be associated with higher levels of smoking to cope (STC), that the severity of symptoms of social anxiety would predict increased craving in response to smoking-related cues, and that the degree to which an individual endorsed smoking to cope would predict increased craving in response to smoking-related cues.

2. Method

2.1. Participants

This analysis was part of a larger study examining relapse potential among college-aged binge and non-binge drinkers (VanderVeen,

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Cohen, & Watson, 2011). Participants were 38 regular smokers (i.e., ≥ 16 cigarettes per day for six months with an expired carbon monoxide level of ≥ 10 parts per million [ppm]) between the ages of 18 and 24 who were recruited from a university campus. Individuals were excluded if they were currently nursing, pregnant, or trying to become pregnant. The University's Institutional Review Board approved all procedures.

2.2. Procedure

After a brief phone interview, eligible participants were invited to the laboratory for a screening session. Consistent with the recommendations of the Society for Research on Nicotine and Tobacco's (SRNT) Subcommittee on Biochemical Verification (2002), a carbon monoxide (CO) level of at least 10 ppm was needed in order to continue in the study. Those remaining eligible completed baseline self-report questionnaires and scheduled their two experimental sessions (order of sessions were counterbalanced).

2.2.1. Nicotine deprived and satiated conditions

Participants provided a baseline CO measurement one day prior to their deprivation session and were reminded to remain abstinent for 24 h. The following day, a CO level of at least 50% less than baseline was required (SRNT, 2002). Participants who did not meet this criterion were rescheduled for the following week ($n = 2$). Otherwise, the cue-exposure paradigm commenced. A similar procedure was used for the satiation condition; however, if the CO level was $\leq 50\%$ of baseline, they were asked to smoke a cigarette ($n = 2$) to ensure satiation.

2.2.2. Cue-exposure paradigm

Participants viewed 70 randomized images on a 17-inch monitor, including 12 pleasant, 12 unpleasant, and 12 neutral images standardized by the National Institute of Mental Health: International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008). Twelve standardized images each of smoking and alcohol-related objects were also included (Geier, Pauli, & Mucha, 2000). Images were presented in five pseudorandomized orders, displayed for 7 to 8 s, and then followed by a black screen for 12–18 s (Geier et al., 2000). Subjective measures of craving were taken immediately prior to and following cue-exposure.

2.3. Measures

2.3.1. Nicotine craving/urge

The Questionnaire of Smoking Urges – Brief (QSU-B; Cox, Tiffany, & Christen, 2001) was used to assess subjective cigarette craving. The QSU-B is a 10-item measure that yields a total score representing a combination of hedonic/reward craving and relief craving. Change in QSU-B scores was calculated by subtracting scores obtained prior to cue exposure from scores obtained after cue exposure.

2.3.2. Nicotine dependence

The Fagerström Test for Nicotine Dependence was used to assess level of nicotine dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991). The FTND consists of six questions that result in a score ranging from 0 to 10, with higher scores representing greater dependence.

2.3.3. Smoking to cope

The Smoking to Cope (STC) survey was used to assess levels of smoking to cope with social anxiety during social situations (cf. Thomas, Randall, Book, & Randall, 2008). A subset of five questions was used to determine a person's proclivity to smoke to cope. The first item (*Do you ever smoke cigarettes to help you feel less anxious during social situations, events, or parties?*) was used to differentiate

between participants who reported engaging in STC behaviors and those who did not. The other four items were used to determine the extent of STC behaviors: (1) *What percentage of social situations do you smoke to help you feel less anxious (when smoking is permitted)?*; (2) *How many cigarettes do you usually need to feel comfortable or less anxious in social situations (over a one hour period)?*; (3) *How often do you avoid a social situation if you know you will be unable to smoke?*; (4) *How much does smoking relieve your anxiety or discomfort in social situations?*

2.3.4. Social anxiety

The Liebowitz Social Anxiety Scale (LSAS; Heimberg et al., 1999) was used to assess the severity of social anxiety. The LSAS is a 24-item self-report measure designed to assess social interaction and performance situations often feared or avoided by individuals with SAD. The overall total score (0 to 144) is calculated by summing the Fear and Avoidance subscale scores, with scores of ≥ 60 representing a clinically significant degree of social anxiety (Mennin et al., 2002).

3. Analyses and results

3.1. Participant characteristics

Participants ($n = 38$, 68.4% male) were primarily Caucasian (97.4%) with a mean age of 20.61 years ($SD = 1.73$) (see Table 1 for descriptive statistics). Thirty-one (81.6%) participants endorsed STC behaviors. On average, these individuals indicated using STC behaviors in social situations 46.39% ($SD = 34.49$) of the time, avoiding social situations 16.03% ($SD = 21.39$) of the time if they knew they would be unable to smoke, needing 2.16 ($SD = 1.44$) cigarettes to feel more comfortable in social situations, and that smoking relieved their symptoms of social anxiety 68.66% ($SD = 31.89$) of the time.

3.2. Level of social anxiety, STC behaviors, and cue-induced craving

To examine the relationship between level of social anxiety and degree to which individuals reported engaging in STC, each STC variable was regressed separately on LSAS scores. Each LSAS score (Total, Fear, and Avoidance) significantly predicted the percentage of social situations in which STC behaviors were used ($p < .01$, $p < .05$, and $p < .01$, respectively). Additionally, LSAS-Total and LSAS-Fear scores were significant predictors of the number of cigarettes participants believed they would need to feel comfortable in social situations ($p < .05$). See Table 2 for more details.

To examine the relationship between level of symptoms of social anxiety and craving in response to cues, differential craving scores were regressed separately on LSAS scores. There were no significant relationships between LSAS scores and differential craving scores during the satiation condition. During the deprivation condition however,

Table 1
Participant characteristics ($n = 38$).

Variables	Baseline	Satiation	Deprivation
	M (SD)	M (SD)	M (SD)
Age	20.61 (1.73)		
CPD	16.74 (2.51)		
LSAS-Total	40.32 (21.14)		
LSAS-Fear	21.29 (10.75)		
LSAS-Avoidance	19.03 (10.89)		
FTND	4.47 (1.78)		
Pre QSU-B		3.02 (1.38)	5.14 (1.39)
Post QSU-B		4.16 (1.47)	5.33 (1.34)
Δ QSU-B		1.14 (.75)	.19 (.57)

Note. LSAS = Liebowitz Social Anxiety Scale; FTND = Fagerström Test for Nicotine Dependence; QSU = Questionnaire of Smoking Urges.

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