Published in final edited form as:
Exp Clin Psychopharmacol. 2014 August ; 22(4): 341–347. doi:10.1037/a0037206.

Robust Impact of Social Anxiety in Relation to Coping Motives and Expectancies, Barriers to Quitting, and Cessation-Related Problems

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Abstract

Although social anxiety is related to smoking and nicotine dependence, little work has sought to identify factors that contribute to these relations. The current study examined whether social anxiety was associated with cognitive vulnerability factors related to smoking: perceived barriers for quitting, cessation-related problems, negative affect reduction outcome expectancies, and negative affect reduction motives. Further, we tested whether social anxiety was robustly related to these factors after controlling for cigarettes smoked per day, gender, alcohol use frequency, lifetime cannabis use status, panic attack frequency, anxiety sensitivity, and negative affectivity. The sample consisted of 580 (38.6% female) treatment-seeking smokers. Social anxiety was associated with perceived barriers for quitting, cessation-related problems, negative affect reduction outcome expectancies, and negative affect reduction motives. After controlling for covariates, social anxiety was robustly related to perceived barriers for quitting, cessation- related problems, and negative affect reduction outcome expectancies. Social anxiety was robustly related to negative affect reduction motives among men but not women. Results indicate that social anxiety is robustly related to cognitive vulnerability factors associated with poorer cessation outcomes, suggesting that social anxiety may be an important therapeutic target during smoking cessation.

Keywords

Smoking; Nicotine withdrawal; Social anxiety; Gender; Motives; Expectancies

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Disclosures
All authors contributed in a significant way to the manuscript and all authors have read and approved the final manuscript. The authors have no conflicts of interest to report.

Individuals with elevated social anxiety and social anxiety disorder (SAD) are vulnerable to developing nicotine dependence and regular smoking (Sonntag, Wittchen, Höfler, Kessler, & Stein, 2000). For example, smokers with SAD, compared to those without SAD, experience more severe nicotine dependence, heavier smoking, and more unsuccessful quit attempts after controlling for other anxiety disorders, depression, and substance use disorders (Cougle, Zvolensky, Fitch, & Sachs-Ericsson, 2010). Elevated social anxiety is prospectively related to more severe nicotine dependence after controlling for depression (Sonntag et al., 2000). Importantly, social anxiety may be unique among the anxiety conditions as a risk factor for smoking and/or nicotine dependence given that age of SAD onset tends to occur prior to smoking initiation whereas smoking initiation tends to occur prior to age of onset of anxiety disorders (Cougle et al., 2010).

Despite mounting evidence of a potentially unique link between social anxiety and smoking, there are several gaps in this literature. To illustrate, although negative reinforcement models of drug use (e.g., Baker, Piper, McCarthy, Majeskie, & Fiore, 2004) suggest that socially anxious persons rely on smoking to cope with negative affect, little work has directly tested this hypothesis. Smokers report smoking to relax in social situations (Spielberger & Reheiser, 2006) and social anxiety is related to smoking to cope in social situations (N. L. Watson, VanderVeen, Cohen, DeMarree, & Morrell, 2012). Yet, it is unknown whether social anxiety is related to smoking to cope more broadly. It is also unknown whether social anxiety is related to the expectation that smoking will reduce negative affect (negative reinforcement outcome expectancies). However, smoking to cope with negative affect (e.g., Shiffman et al., 2007; Shiffman & Waters, 2004) and negative reinforcement outcome expectancies (Wetter et al., 1994) have been linked to poorer smoking cessation outcomes. Also, no known studies have examined whether social anxiety is related to perceived barriers to quitting (Macnee & Talsma, 1995b). Research indicates that perceived barriers to quitting smoking reflect stressors negatively related to smoking cessation (Macnee & Talsma, 1995a). Specifically, the greater the level of perceived barriers to quitting (e.g., withdrawal symptoms, poor mood control), the less likely one is to make positive steps forward in stages of smoking cessation (Macnee & Talsma, 1995b). Given that social anxiety is related to greater catastrophic thinking regarding personally- relevant stressors across various domains of life functioning (see Rapee & Heimberg, 1997), social anxiety may be related to perceived barriers to smoking cessation.

It is also currently unclear whether observed relations between social anxiety and smoking remain after accounting for the variance attributable to factors common among smokers and those with elevated social anxiety. Although social anxiety is related to smoking after controlling for depression (Sonntag et al., 2000), it is important to test whether it remains related to smoking after controlling for other substance use and other types of negative affect. To illustrate, socially anxious persons are vulnerable to misusing alcohol and cannabis (Buckner et al., 2008) and thus observed relations between social anxiety and smoking could be due to co-occurring alcohol or cannabis use. Further, anxiety sensitivity (AS; fear of the consequences of anxiety; McNally, 1996) and panic attacks are two established vulnerability factors related to both social anxiety and smoking (e.g., Scott, Heimberg, & Jack, 2000; Zvolensky, Stewart, Vujanovic, Gavric, & Steeves, 2009; Zvolensky et al., 2007). In fact, AS has been found to be uniquely related to a variety of

smoking variables among non-treatment seeking community participants (Zvolensky et al., 2007). Although AS is correlated with social anxiety, this correlation is modest (Deacon & Abramowitz, 2006) and AS is more strongly related to panic disorder than SAD (Deacon & Abramowitz, 2006; Taylor, Koch, & McNally, 1992). Thus, AS is a construct distinct from, but related to social anxiety and it is important to delineate whether observed associations between social anxiety and smoking are unique to social anxiety or whether they are an artifact of co-occurring AS and/or panic.

Overall, the present study sought to examine whether social anxiety was related to an array of cognitive vulnerability factors related to smoking among treatment-seeking smokers. Specifically, we examined whether social anxiety was related to problems reported during past quit attempts, perceived barriers for quitting, negative reinforcement outcome expectancies, and negative affect reduction motives for smoking. In light of evidence suggesting social anxiety may be unique among the anxiety conditions as a risk factor for smoking (Cougle et al., 2010) and remains related to smoking after controlling for some negative affective states (depression; Sonntag et al., 2000), it was hypothesized that social anxiety would be positively related to these smoking variables even after accounting for the variance attributable to cigarettes smoked per day, alcohol use frequency, lifetime cannabis use status, panic attack frequency, AS, and negative affectivity. Social anxiety was assessed continuously given that data suggest social anxiety is a continuous construct (e.g., Crome, Baillie, Slade, & Ruscio, 2010) and that individuals with elevated social anxiety who do not necessarily meet criteria for SAD are vulnerable to smoking and nicotine dependence (e.g., Buckner & Vinci, 2013; Sonntag et al., 2000).

Method

Participants and Procedures

Participants (N = 580, 38.6% female) were adult daily smokers who were recruited as part of a larger smoking cessation treatment trial. Participants were recruited from the community (via flyers, newspaper ads, radio announcements) to participate in a large randomized controlled trial examining the efficacy of two smoking cessation interventions, which took place at two sites (University of Vermont, Florida State University). The current study is based on secondary analyses of pre-treatment cross-sectional data. Inclusion criteria included daily cigarette use (average ≥ 8 cigarettes per day for at least 1 year), ages 18–65, and reported motivation to quit smoking of ≥ 5 on a 10-point scale. Exclusion criteria included inability to give informed consent, current use of smoking cessation products or treatment, past-month suicidality, and history of psychotic-spectrum disorders. Participant demographic data appear in Table 1. Notably, 46% of the sample met criteria for an Axis I disorder and SAD was the most common primary disorder. Further, 13.3% of the sample met criteria for current SAD.

After providing written informed consent, participants underwent a clinical interview (described below) then completed a computerized battery of self-report questionnaires. The study protocol was approved by the Institutional Review Board at each study site; all study procedures and treatment of human subjects were conducted in compliance with ethical standards of the American Psychological Association.

Measures

Social Interaction Anxiety Scale (SIAS)—The SIAS assessed social interaction fears (Mattick & Clarke, 1998). The scale demonstrates adequate internal consistency across clinical, community, and student samples (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992; Mattick & Clarke, 1998; Osman, Gutierrez, Barrios, Kopper, & Chiros, 1998) and test-retest reliability in clinical and non-clinical samples (Heimberg et al., 1992; Osman et al., 1998). In this sample, the SIAS demonstrated excellent internal consistency (α =.94) and 19.5% of the sample scored above the clinical cut-score (Heimberg et al., 1992).

Smoking History Questionnaire (SHQ)—The SHQ (Brown, Lejuez, Kahler, & Strong, 2002) is a self-report questionnaire used to assess smoking history (e.g., onset of regular daily smoking) and pattern (e.g., number of cigarettes consumed per day), and problematic symptoms experienced during prior quitting attempts (e.g., weight gain, nausea, irritability, and anxiety; Brown et al., 2002; Zvolensky et al., 2004). In the present study, the SHQ was used to first describe the sample on smoking history and patterns of use (e.g., smoking rate) and then to create a mean composite score of problems experienced during past quit attempts.

Reasons for Smoking (RFS)—The RFS (Ikard, Green, & Horn, 1969) is a 23-item self-report measure that assesses motivations for smoking. Participants are asked to rate their tendency to smoke in each of the circumstances listed, rated on a 5-point Likert scale from 1 (*never)* to 5 (*always*). The psychometric properties of this scale, including measures of factor structure, internal consistency, and test-retest reliability, are well established (Shiffman, 1993). In the present study, the negative affect reduction motives subscale (RFS-NA; e.g., “When I feel uncomfortable or upset about something, I light up a cigarette”) demonstrated adequate internal consistency (α = .89).

Smoking Consequences Questionnaire (SCQ)—The SCQ (Brandon & Baker, 1991) is a 50-item measure that assesses various smoking expectancies for likelihood of occurrence from 0 (*completely unlikely)* to 9 (*completely likely).* The entire measure and its constituent factors have good psychometric properties (Brandon & Baker, 1991; Buckley et al., 2005; Downey & Kilbey, 1995). We utilized the Negative Reinforcement/Negative Affect Reduction (e.g., “Smoking helps me calm down when I feel nervous”) subscale of the SCQ. In the present investigation, internal consistency was excellent (α = .94).

Barriers to Cessation Scale (BCS)—The BCS (Macnee & Talsma, 1995a) was used to assess perceived barriers associated with smoking cessation. The BCS is a 19-item measure on which respondents indicate from 0 (*not a barrier*) to 3 (*large barrier*) the extent to which they identify with each of the identified barriers to cessation (e.g., “Weight gain”, “Withdrawal symptoms”, “No encouragement or help from friends”). The BCS has been found to have good internal consistency as well as good content and predictive validity (Macnee & Talsma, 1995a). As in prior work (Macnee & Talsma, 1995b), the total BCS score was utilized in this study. Internal consistency was acceptable (α = .89).

Other substance use—Alcohol use was assessed with an item from the *Alcohol Use Disorders Identification Test* (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) that ask participants to rate from 0 (*Never*) to 4 (*4 or more times per week*) frequency of current alcohol use. Lifetime cannabis use status was determined via the *Marijuana Smoking History Questionnaire* (Bonn-Miller & Zvolensky, 2009) that asks participants to whether they had ever used cannabis. These items were entered as covariates in regression analyses.

Other affective states—Anxiety sensitivity was assessed with the *Anxiety Sensitivity Index* (ASI; Reiss, Peterson, Gursky, & McNally, 1986), which measures the degree to which participants were concerned about possible negative consequences of anxiety symptoms. Negative affect was assessed with the negative affect subscale of the *Positive and Negative Affect Scale* (PANAS; D. Watson, Clark, & Tellegen, 1988), a self-report measure that asks participants to rate the extent to which they experience each of 10 different feelings and emotions (e.g., nervous) from 1 (*Very slightly or not at all*) to 5 (*Extremely*). Participants were also asked to report the approximate number of panic attacks they have experienced in the past year as per the *Panic Disorder Severity Scale* (Shear et al., 1992). These items were entered as covariates in regression analyses.

Axis I diagnoses were assessed to describe the sample using the *Structured Clinical Interview for DSM-IV Axis I Disorders* (First, Spitzer, Gibbon, & Williams, 2002). The SCID was administered by trained advanced doctoral students under the supervision of a licensed psychologist. The rate of agreement between clinical interviewers during the course of this study has been found to be over 80% with a kappa value of .77 (Timpano & Schmidt, 2012).

Data Analytic Strategy

First, bivariate correlations were conducted to test whether social anxiety was related to cessation problems during prior quit attempts, number of perceived barriers to quitting, negative affect reduction outcome expectancies, and negative affect reduction motives. Given the large number of correlations conducted, alpha was set to .001. Next, to test whether social anxiety was robustly related to these smoking vulnerability factors after controlling for relevant covariates, four hierarchical linear regression models were conducted. Separate models were conducted for each dependent variable (cessation problems during prior quit attempts, number of perceived barriers to quitting, negative affect reduction outcome expectancies, and negative affect reduction motives). Covariates (cigarettes smoked per day, gender, frequency of alcohol use, lifetime cannabis use (yes vs no), panic attack frequency, anxiety sensitivity, and negative affectivity) were entered in Step 1. SIAS total scores were entered in Step 2. This strategy ensured that effects of social anxiety in Step 2 are not attributable to the covariates in Step 1 (Cohen & Cohen, 1983).

Results

Table 2 presents means, standard deviations, and bivariate correlations among study variables. As hypothesized, social anxiety was correlated with cessation problems during prior quit attempts, number of perceived barriers to quitting, negative affect reduction outcome expectancies, and negative affect reduction motives.

Table 3 presents the significant results of the hierarchical linear regression models. Regarding cessation problems during prior quit attempts, predictors together accounted for 23.8% of the variance. Social anxiety remained significantly related to more problems during prior quit attempts, accounting for an additional 2.3% of unique variance. Regarding perceived barriers to quitting, predictors together accounted for an additional 25.7% of the variance. Social anxiety remained significantly related to perceived barriers, accounting for an additional 1.4% of unique variance. Regarding negative affect reduction expectancies, predictors together accounted for 19.3% of the variance. Social anxiety remained significantly related to this expectancy, accounting for an additional 1.2% of unique variance.

Regarding negative affect reduction motives, predictors accounted for 25.9% of the variance; however, social anxiety was no longer significantly related to this motive, $\beta = .07$, $p = .241$, $sr^2 = .00$. In light of evidence that social anxiety can be differentially related to substance use motives among men and women (Buckner, Zvolensky, & Schmidt, 2012; Norberg, Norton, Olivier, & Zvolensky, 2010), analyses were conducted separately by gender. Among men, predictors accounted for 21.5% of the variance in negative affect reduction motives. Social anxiety remained significantly related to this motive, accounting for 1.8% of unique variance, $\beta = .17$, $p = .025$, $sr^2 = .02$. Although predictors accounted for 24.3% of the variance in negative affect reduction motives among women, social anxiety was not a significant predictor, $\beta = .01$, $p = .943$, $sr^2 = .00$.

Discussion

Despite emerging research suggesting that social anxiety is robustly related to nicotine dependence and cessation problems (for review see Buckner, Heimberg, Ecker, & Vinci, 2013), little research has examined the impact of social anxiety on cognitive vulnerability factors related to smoking. Social anxiety was related to more severe cessation-related problems reported during prior quit attempts, more perceived barriers to quitting, and negative affect reduction expectancies even after controlling for smoking rate, alcohol use frequency, lifetime cannabis use status, negative affectivity, panic attacks, and AS. This finding is especially important given that social anxiety is associated with elevated AS (Taylor et al., 1992) and AS has been found to be robustly related to a wide range of smoking variables among non-treatment seeking daily smokers (Zvolensky et al., 2007). These data indicate that social anxiety may represent a unique characteristic associated with smoking vulnerability factors. It is noteworthy that although the size of the effect of social anxiety on these variables was small (1.2–2.3% of unique variance), the effect was obtained after controlling for a wide range of relevant variables that accounted for a substantial amount of variance (over 20%) in these variables, suggesting that these small effects may be clinically relevant (Abelson, 1985).

Contrary to expectation, social anxiety was not related to negative affect reduction motives after controlling for covariates. However, in light of evidence that social anxiety can be differentially related to substance use motives among men and women (Buckner et al., 2012; Norberg et al., 2010), analyses were conducted separately by gender. Social anxiety was related to coping motivated smoking among men, but not women. This finding is consistent

with the cannabis literature in which socially anxious men, but not women, endorse more coping- motivated cannabis use (Buckner et al., 2012). Yet, this result differs from the relations between social anxiety and drinking behaviors in which social anxiety was related to coping motives among women but not men (Norberg et al., 2010). Thus, socially anxious women appear especially vulnerable to coping-motivated drinking whereas socially anxious men seem vulnerable to smoking cigarettes or using cannabis to cope with negative affect. Given that men are more likely than women to be current cigarette smokers and cannabis users (Schiller, Lucas, & Peregoy, 2012), socially anxious men may believe that using these substances is a socially acceptable way to cope with negative affect, and are therefore more likely to endorse coping-motivated use. Future research testing these hypotheses could inform theoretical models of gender differences in substance use among socially anxious persons that could have important implications for treatment and prevention efforts.

Findings should be considered in light of limitations that can inform future directions for this line of research. First, participants voluntarily sought tobacco smoking cessation treatment; it is, therefore, unknown whether results generalize to individuals interested in self-quit or those unmotivated to quit. Second, the study's cross-sectional nature precludes our ability to make causal inferences. Third, our sample consisted of community-recruited, treatment-seeking daily cigarette smokers with moderate levels of nicotine dependence. Future studies may benefit by sampling from lighter and heavier smoking populations to ensure the generalizability of the results to the general smoking population. Fourth, the current study relied solely on self-report measures and future research could benefit by utilizing multi-method approaches and minimizing the role of method variance in the observed relations. For example, experimental provocation procedures such as emotion elicitation via social stress induction could be useful in examining the present relations in response to aversive social anxiety states elicited in real time. Fifth, the sample was comprised of a relatively homogenous group of treatment-seeking smokers and it will be important for future studies to recruit a more ethnically/racially diverse sample of smokers. Sixth, this study represents secondary analyses and participants were not recruited based on elevated social anxiety. The aim of the manuscript was to test whether social anxiety measured continuously (as per Crome et al., 2010) was related to smoking processes in light of data suggesting that elevated social anxiety regardless of whether it meets DSM criteria for SAD (e.g., Buckner & Vinci, 2013; Sonntag et al., 2000) is related to smoking. However, future work is necessary to determine whether results generalize to samples with larger representation of socially anxious smokers.

Overall, the present study serves as an initial investigation into the nature of the role of social anxiety in a rather wide range of smoking vulnerability factors among adult treatment-seeking smokers. The present data suggest social anxiety is related to severity of problems reported during past quit attempts, negative affect reduction motives, negative affect reduction outcomes expectancies, and perceived barriers for quitting. Based upon these data, future work is needed to explore the extent to which social anxiety relates to other smoking vulnerability factors (e.g., nicotine withdrawal, cessation outcome).

Acknowledgments

This work was supported by National Institute of Mental Health grants awarded to Drs. Zvolensky and Schmidt (R01-MH076629-01A1) and to Dr. Buckner (R21DA029811-02, R34DA031937-01A1). The funding sources had no other role other than financial support.

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Table 1

Demographic characteristics

	M (SD)
Age	36.9 (13.5)
Daily smoking rate	16.6 (10.0)
Number of years smoking	18.6 (13.4)

	%
Race/ethnicity	
Asian/Asian American	1.0
Caucasian	82.9
Black/non-Hispanic	9.8
Black/Hispanic	0.9
Non-Black/Hispanic	2.6
"Other"	2.8
Primary current DSM-IV-TR Axis I disorder	
Social anxiety disorder	9.8
Generalized anxiety disorder	5.1
Major depressive disorder	5.0
Specific phobia	3.9
Alcohol use disorder	3.8
Cannabis use disorder	3.2
Post-traumatic stress disorder	3.0
Level of education	
High school diploma (or equivalent) or less	28.0
Some college education	35.5
Graduated from 2-year college	9.5
Graduated from 4-year college	14.0
Graduate school experience	13.1
Marital status	
Never married	42.9
Married/living with someone	34.5
Widowed	1.7
Separated	3.6
Divorced	17.2

Table 2

Bivariate correlations of social anxiety and outcome variables

	1	2	3	4	5	6	7	8	9	10	11	*M (SD)*
1. Social anxiety		.35**	.32**	.29**	.29**	.03	−.06	.08	.24**	.57**	.48**	22.38 (15.3
2. Cessation-related problems			.49**	.42**	.43**	.02	−.02	.01	.18**	.39**	.37**	34.74 (11.6
3. Perceived barriers to quitting				.50**	.53**	.08	.03	.10*	.12*	.37**	.32**	24.80 (11.1
4. Negative Affect Reduction expectancies					.70**	.08	.06	.09*	.10*	.38**	.26**	5.63 (1.82
5. Negative Affect Reduction motives						.19**	−.07	.05	.13*	.39**	.29**	3.45 (.81)
6. Cigarettes per day							−.10*	−.11*	.01	.00	.08	16.65 (9.97
7. Alcohol frequency								.09	.05	.06	−.02	1.85 (1.32
8. Lifetime cannabis use status									−.04	.11*	.01	0.80 (.40)
9. Panic attacks										.34**	.29**	2.18 (2.60
10. Negative affectivity											.59**	19.22 (7.53
11. Anxiety sensitivity												18.40 (11.4

* $p < .05$

** $p < .001$

Table 3

Hierarchical linear regressions of social anxiety predicting cessation-related problems, perceived barriers to quitting, and negative affect reduction expectancies

		⊗R^2	®	*t*	*p*	sr^2
DV: Severity of cessation-related problems						
Step 1		.215			<.001	
	Sex		0.28	5.86	.000	0.08
	Cigarettes per day		0.08	1.74	.083	0.01
	Alcohol frequency		0.03	0.66	.511	0.00
	Lifetime cannabis use status		0.05	0.98	.329	0.00
	Panic attacks		0.05	1.00	.317	0.00
	Negative affectivity		0.17	2.89	.004	0.02
	Anxiety sensitivity		0.19	3.24	.001	0.02
Step 2		.023			.001	
	Social anxiety		0.19	3.27	.001	0.02
DV: Perceived barriers to quitting						
Step 1		.243			<.001	
	Sex		0.25	5.25	.000	0.06
	Cigarettes per day		0.12	2.58	.010	0.01
	Alcohol frequency		0.08	1.76	.079	0.01
	Lifetime cannabis use status		0.12	2.56	.011	0.01
	Panic attacks		−0.04	−0.72	.475	0.00
	Negative affectivity		0.25	4.43	.000	0.04
	Anxiety sensitivity		0.18	3.15	.002	0.02
Step 2		.014			.010	
	Social anxiety		0.15	2.59	.010	0.01
DV: Negative affect reduction expectancies						
Step 1		.181			<.001	
	Sex		0.19	3.81	.000	0.03
	Cigarettes per day		0.12	2.49	.013	0.01
	Alcohol frequency		0.07	1.50	.134	0.01

		⊗R^2	®	*t*	*p*	sr^2
	Lifetime cannabis use status		0.10	2.13	.034	0.01
	Panic attacks		−0.06	−1.20	.230	0.00
	Negative affectivity		0.29	4.83	.000	0.05
	Anxiety sensitivity		0.09	1.51	.131	0.01
Step 2		.012			.021	
	Social anxiety		0.14	2.31	.021	0.01