

Original Investigation

Panic Attack History and Anxiety Sensitivity in Relation to Cognitive-Based Smoking Processes Among Treatment-Seeking Daily Smokers

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Abstract

Introduction: Empirical research has found that panic attacks are related to increased risk of more severe nicotine withdrawal and poor cessation outcome. Anxiety sensitivity (AS; fear of anxiety and related sensations) has similarly been found to be related to an increased risk of acute nicotine withdrawal and poorer cessation outcome. However, research has yet to examine the relative contributions of panic attacks and AS in terms of cognitive-based smoking processes (e.g., negative reinforcement smoking expectancies, addictive and negative affect-based reduction smoking motives, barriers to cessation, problem symptoms experienced while quitting).

Method: Participants ($n = 242$; 57.4% male; $M_{\text{age}} = 38.1$) were daily smokers recruited as a part of a larger randomized control trial for smoking cessation. It was hypothesized that both panic attacks and AS would uniquely and independently predict the studied cognitive-based smoking processes.

Results: As hypothesized, AS was uniquely and positively associated with all smoking processes after controlling for average number of cigarettes smoked per day, current Axis I diagnosis, and participant sex. However, panic attack history was only significantly related to problem symptoms experienced while quitting smoking.

Conclusions: Although past research has demonstrated significant associations between panic attacks and certain aspects of cigarette smoking (e.g., severity of nicotine withdrawal; lower abstinence rates, and negative affect reduction motives), the present findings suggest that AS may be more relevant to understanding beliefs about and motives for smoking behavior as well as perceptions of cessation-related difficulties.

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Introduction

Recent work has suggested that panic attacks may be associated with certain substance use disorders (Baillie & Rapee, 2005; Bernstein, Zvolensky, Sachs-Ericsson, Schmidt, & Bonn-Miller, 2006; Zvolensky, Bernstein, Marshall, & Feldner, 2006; Zvolensky, Cogle, Johnson, Bonn-Miller, & Bernstein, 2010; Zvolensky et al., 2008). One line of inquiry within this substance use domain has focused on the relation between panic attacks and cigarette smoking. This work was initially stimulated by the observation that panic attacks co-occur with smoking at rates that exceed those found in the general nonpsychiatric population (Amering et al., 1999; Breslau, Kilbey, & Andreski, 1991; Breslau & Klein, 1999; Glassman et al., 1990; R. Goodwin & Hamilton, 2002; Hughes, Hatsukami, Mitchell, & Dahlgren, 1986; Pohl, Yeragani, Balon, Lycaki, & McBride, 1992). Notably, there is evidence to suggest that panic attacks can contribute to the maintenance of smoking (Zvolensky, Schmidt, & Stewart, 2003). For example, panic attacks are associated with more severe nicotine withdrawal symptoms during quitting (E. C. Marshall, Johnson, Bergman, Gibson, & Zvolensky, 2009), shorter durations of abstinence from smoking (Zvolensky, Lejuez, Kahler, & Brown, 2004), and overall lower success rates in quitting (Piper et al., 2010). Additionally, panic attacks are related to increased motivation to smoke to reduce negative affect (Zvolensky et al., 2005).

One pressing, yet unresolved, question pertains to whether panic attacks “mark” or explain relations with tobacco use or whether the “fear of panic-related sensations” may better explain panic attack-smoking associations. Anxiety sensitivity (AS) is a cognitive characteristic reflecting the extent to which individuals believe anxiety and anxiety-related sensations have harmful consequences (McNally, 2002; Reiss & McNally, 1985).

There is a rich and well-established history between risk for, and incidence of, panic attacks and elevated levels of AS. Integrative models of panic psychopathology and other clinical anxiety conditions (e.g., posttraumatic stress disorder, certain specific phobias) posit that panic attacks play a central role in interoceptive fear conditioning, thereby promoting the belief that certain bodily sensations may be personally dangerous or threatening (Bouton, Mineka, & Barlow, 2001; Falsetti & Resnick, 2000; Forsyth & Eifert, 1996; Jones & Barlow, 1990). Although much existing work has focused on the role of AS in predicting future panic attacks and related forms of psychopathology (Gonzalez, Zvolensky, Hogan, McLeish, & Weibust, 2011; Hayward, Killen, Kraemer, & Taylor, 2000; Maller & Reiss, 1992; Schmidt, Lerew, & Jackson, 1999; Schmidt, Zvolensky, & Maner, 2006), other studies suggest persons with panic attacks, compared with those without such histories, are more apt to report significantly elevated levels of AS (Taylor, Koch, & McNally, 1992), suggesting a possible bidirectional relation between these two related, yet distinct, constructs (Schmidt, Lerew, & Joiner, 2000).

A growing corpus of empirical work also indicates that AS is associated with numerous aspects of cigarette smoking (Morissette, Tull, Gulliver, Kamholz, & Zimering, 2007; Zvolensky & Bernstein, 2005; Zvolensky, Kotov, Antipova, & Schmidt, 2003). For example, AS is positively correlated with smoking to reduce negative affect (Battista et al., 2008; Comeau, Stewart, & Loba, 2001; Novak, Burgess, Clark, Zvolensky, & Brown, 2003; Stewart, Karp, Pihl, & Peterson, 1997; Zvolensky, Bonn-Miller, Bernstein, & Marshall, 2006) as well as addictive-based smoking motives (Leyro, Zvolensky, Vujanovic, & Bernstein, 2008). Other studies have found that AS is related to the belief that smoking will reduce negative affect (i.e., negative reinforcement/negative affect reduction expectancies; Brown, Kahler, Zvolensky, Lejuez, & Ramsey, 2001; Gregor, Zvolensky, McLeish, Bernstein, & Morissette, 2008). Additionally, smokers high in AS perceive the prospect of quitting as both a more difficult and personally threatening experience (Zvolensky et al., 2007), possibly due to a hypersensitivity to aversive internal sensations such as nicotine withdrawal symptoms (Zvolensky et al., 2004) or elevated state anxiety (Mullane et al., 2008; Vujanovic & Zvolensky, 2009). Perhaps most notably, AS is significantly associated with less success during smoking cessation attempts (Zvolensky & Bernstein, 2005). Specifically, higher levels of AS are related to greater odds of early lapse (Brown et al., 2001) and relapse during quit attempts (Zvolensky et al., 2006, 2007; Zvolensky, Stewart, Vujanovic, Gavric, & Steeves, 2009).

Although promising, extant work on panic attacks, AS, and smoking are limited in at least two key respects. First, past research on panic and smoking has demonstrated that panic attacks are associated with specific cessation-relevant outcomes (e.g., severity of nicotine withdrawal, shorter duration of abstinence); however, this line of work has yet to comprehensively evaluate the role of panic attacks in terms of cognitive-based smoking processes (e.g., smoking outcome expectancies, reasons for smoking, perceived barriers to quitting). As a result, relatively little is known about the mechanisms through which panic attacks influence cessation outcomes, an important next step in developing and refining specialized smoking interventions for panic vulnerable smokers (Ziedonis et al., 2008). Second, although empirical work suggests that panic attacks and AS are

independently associated with smoking-related variables, research has yet to concurrently evaluate the relative contribution of each factor in relation to cognitive-based smoking processes. This neglect is unfortunate, as it is possible that the previously noted relations between panic attacks and smoking may be better accounted for by shared variance with the fear of interoceptive cues (e.g., anxiety-related bodily sensations). Alternatively, simultaneous examination of these two related yet distinct factors may reveal both shared and unique relations with cognitive-based smoking processes and thereby represent a more ecologically valid model of panic vulnerability in regard to psychological predictors of cessation difficulties.

Together, the present investigation sought to examine panic attacks, in the context of AS, in terms of predicting smoking beliefs, motives, and perceptions of cessation-related difficulties among adult treatment-seeking daily smokers. Our study focused on negative affect-based smoking motives and expectancies, given theoretical models linking panic psychopathology to emotional reactivity and regulatory processes (Zvolensky & Bernstein, 2005). Consistent with past research, motives reflect reasons for smoking (Ikard, Green, & Horn, 1969), whereas expectancies reflect beliefs about the effects or consequences of smoking (Brandon & Baker, 1991). While motives and expectancies represent similar constructs, they offer unique explanatory value in terms of better understanding psychological risk factors for smoking behavior. Notably, these specific outcome variables were selected on an a priori basis, as they represent malleable cognitive risk factors that are associated with poor cessation outcomes. It was hypothesized that both endorsement of a history of panic attacks and higher levels of AS would be significantly incrementally related to the belief that smoking will reduce negative affect (i.e., negative reinforcement/negative affect reduction smoking outcome expectancies), smoking for addictive and negative affect reduction motives, and perceptions of cessation-relevant difficulties (e.g., barriers to cessation and problem symptoms experienced while quitting smoking). It also was predicted that (a) after accounting for shared variance between the two predictor variables, AS would explain a larger percentage of variance (relative to panic attacks) for the criterion variables and (b) the hypothesized significant effects for AS would be evident above and beyond the variance accounted for by average number of cigarettes smoked per day, presence/absence of current Axis I diagnoses, and participant sex; factors known to covary with panic attacks, AS, and smoking (Leyro et al., 2008). The aforementioned hypotheses were broadly guided by integrative models of smoking-anxiety comorbidity that posit the fear of internal sensations, rather than panic attacks per se, may be highly relevant to beliefs about and motives for smoking behavior as well as perceived and/or actual difficulties experienced during cessation (Zvolensky et al., 2003).

Method

Participants

Participants included 242 adult daily smokers (57.4% male; $M_{age} = 38.1$, $SD = 12.8$), who responded to advertisements (e.g., flyers, newspaper ads, radio announcements) to participate in a randomized control trial examining the efficacy of a four-session smoking-based behavioral intervention program focused on emotional vulnerability in comparison with standard pharmacological

and psychosocial care. In terms of ethnic background, 86.0% of participants identified as Caucasian, 8.9% identified as Black, 1.9% identified as Hispanic, 1.2% identified as Asian, and 1.9% identified as “other.” Participants reported smoking an average of 19.6 cigarettes/day ($SD = 8.1$; range = 10–60), smoking their first cigarette at 17.4 years of age ($SD = 3.8$), and smoking regularly at 19.6 years of age ($SD = 4.1$). Regarding smoking cessation, participants endorsed an average of 3.4 ($SD = 2.5$) “serious” lifetime quit attempts. The average score on the Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991) was 5.7 ($SD = 2.1$), indicating moderate overall levels of nicotine dependence.

As assessed by the Structured Clinical Interview for *DSM-IV* Axis I Disorders–Non-Patient Version (SCID-I-NP; First, Spitzer, Gibbon, & Williams, 1994), 38.7% of the sample met criteria for current (past month) Axis I psychopathology. Participants endorsing current psychopathology met criteria for an average of 1.94 ($SD = 1.18$) diagnoses. Specifically, 12.7% of the total sample met criteria for major depressive disorder, 6.4% met criteria for dysthymia, 1.9% met criteria for other depression-related disorder(s) [e.g., bipolar disorder, depressive disorder not otherwise specified (NOS)], 21.7% met criteria for social anxiety disorder, 13.4% met criteria for a specific phobia, 3.8% met criteria for obsessive–compulsive disorder, 9.6% met criteria for generalized anxiety disorder, 8.3% met criteria for panic disorder with or without agoraphobia, 8.3% met criteria for post-traumatic stress disorder, 3.2% met criteria for anxiety disorder NOS, 0.6% met criteria for an eating disorder, 12.7% met criteria for alcohol abuse or dependence, 9.6% met criteria for marijuana abuse or dependence, and 3.8% met criteria for other substance abuse or dependence (e.g., opiate). Additionally, 44.2% of the entire sample met criteria for the past 2-year unexpected panic attacks; 54.5% of the individuals currently meeting criteria for an Axis I disorder, also met criteria for the past 2-year unexpected panic attacks.

Eligible participants were at least 18 years old, reported smoking an average of 10 or more cigarettes daily for at least 1 year and provided a expired-air carbon monoxide (CO) breath sample of 10 ppm or higher at baseline session. Participants were excluded based on the following criteria: (a) current suicidality or homicidality; (b) endorsement of current or past psychotic-spectrum symptoms via structured interview screening; and (c) limited mental competency and inability to provide informed, voluntary written consent.

Measures

Structured Clinical Interview–Non-Patient Version for *DSM-IV*

Diagnostic assessments were conducted using the SCID-I-NP (First et al., 1994). SCID-I-NP interviews were administered by trained research assistants or doctoral level staff and supervised by independent doctoral level professionals. Interviews were audiotaped and the reliability of a random selection of 12.5% of interviews were checked (MJZ) for accuracy; no cases of (diagnostic coding) disagreement were noted. The SCID-I-NP was employed to document psychopathology for the inclusionary/exclusionary criteria and history of panic attacks. In addition, the present investigation utilized a binary score (Y/N) to categorize whether participants met current diagnostic criteria for an Axis I diagnosis.

Smoking History Questionnaire

The Smoking History Questionnaire (SHQ; Brown, Lejuez, Kahler, & Strong, 2002) is a self-report questionnaire used to assess smoking history and pattern. The SHQ has been used in previous studies as a measure of smoking history (e.g., onset of regular smoking), pattern (e.g., number of cigarettes consumed per day), past quit attempts (e.g., how many times in your life have you made a serious quit attempt [rated on 0–9 scale where if more than nine attempts were made, participants indicate 9]), and problematic symptoms experienced during quitting (e.g., weight gain, nausea, irritability, and anxiety; Brown et al., 2002; Zvolensky et al., 2004). In the present study, we used the SHQ to measure a composite score regarding a lifetime index of problem symptoms experienced during past quit attempts (Cronbach’s $\alpha = .92$ in the present sample) as well as descriptive smoking history variables (e.g., age of smoking onset and smoking rate; see Participants section).

Fagerström Test for Nicotine Dependence

The FTND (Heatherton et al., 1991) is a well-established six-item scale designed to assess gradations in tobacco dependence. This measure exhibits good internal consistency, positive relations with key smoking variables (e.g., salivary cotinine; Heatherton et al., 1991; Payne, Smith, McCracken, & McSherry, 1994), and high test–retest reliability (Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994).

Expired-Air Carbon Monoxide

Biochemical verification of smoking status was completed by CO analysis of breath samples (10 ppm cutoff; Cocores, 1993). CO levels were assessed using a CMD/CO Carbon Monoxide Monitor (Model 3110; Spirometrics, Inc.).

Anxiety Sensitivity Index-III

The Anxiety Sensitivity Index (ASI)-III is an 18-item measure in which respondents indicate on a 5-point Likert-type scale (0 = *very little* to 4 = *very much*) the degree to which they are concerned about possible negative consequences of anxiety-related symptoms (e.g., “It scares me when my heart beats rapidly”; Taylor et al., 2007). ASI-III items were derived from the ASI (Reiss, Peterson, Gursky, & McNally, 1986) and the ASI-Revised (ASI-R; Taylor & Cox, 1998). ASI-III and its subscales demonstrated strong and improved reliability and factorial validity relative to previous measures of the construct as well as convergent, discriminant, and criterion-related (known-group) validity (Taylor et al., 2007). In the present investigation, the total (global) score was utilized as a primary predictor variable (Cronbach’s $\alpha = .93$ in the present sample).

Smoking Consequences Questionnaire

The Smoking Consequences Questionnaire (SCQ; Brandon & Baker, 1991) is a 50-item self-report measure that assesses smoking expectancies on a 10-point scale for likelihood of occurrence (0 = *completely unlikely* to 9 = *completely likely*). The entire measure and its constituent factors have demonstrated sound psychometric properties (Brandon & Baker, 1991; Buckley et al., 2005; Downey & Kilbey, 1995). In the present investigation, only the negative reinforcement/negative affect reduction subscale (SCQ-NR; e.g., “Smoking helps me calm down when I feel nervous”) of the SCQ was used (Cronbach’s $\alpha = .93$ in the present sample).

Reasons for Smoking

The Reasons For Smoking (RFS; Ikard et al., 1969) is a self-report measure consisting of 23 items, rated on a 5-point Likert-type

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scale (1 = *never* to 5 = *always*), used to assess smoking motives. The psychometric properties of this scale, including measures of factor structure, internal consistency, and test–retest reliability, have been well established (Shiffman, 1993). In the present investigation, the addictive (RFS-AD; e.g., “Between cigarettes, I get a craving only a cigarette can satisfy”) and negative affect reduction (RFS-NA; e.g., “When I feel uncomfortable or upset about something, I light up a cigarette”) subscales were used owing to their theoretical relevance to the study objectives (Cronbach’s $\alpha = .77$ and $.88$, respectively).

Barriers to Cessation Scale

The Barriers to Cessation Scale (BCS; Macnee & Talsma, 1995a) was used to assess barriers, or specific stressors, associated with smoking cessation. The BCS is a 19-item measure on which respondents indicate, on a 4-point Likert-type scale (0 = *not a barrier or not applicable* to 3 = *large barrier*), the extent to which they identify with each of the listed barriers to cessation (e.g., “Fear of failing to quit”). The BCS has been found to have good internal consistency regarding the total score as well as the three subscales (i.e., addictive barriers, external barriers, and internal barriers; Macnee & Talsma, 1995a). The BCS also has evidenced good content and predictive validity (Macnee & Talsma, 1995a). As in past work (Macnee & Talsma, 1995b), we used the total BCS score in the present investigation (Cronbach’s $\alpha = .88$ in the present sample).

Procedure

Participants were recruited to participate in a larger study examining the efficacy of a novel four-session smoking cessation behavioral intervention that focused on vulnerability to panic (Panic-Smoking Program [PSP]) in comparison with a standard smoking cessation program (SP). Both treatments took place over four 90-min sessions, occurring once per week; participants were also provided with nicotine replacement therapy during their cessation attempt. The PSP integrates interoceptive exposure, cognitive restructuring, and psychoeducation exercises developed for panic prevention and treatment programs with standard smoking cessation counseling. The SP includes only the smoking-related components of PSP as well as review of general health information not specific to anxiety or smoking (in order to equilibrate contact time across the two conditions). Follow-up assessments involved the collection of smoking outcome data as well as emotional symptomatology for both treatment groups, which occurred up to 2 years following quit day.

Participants were recruited at two sites (University of Vermont, Burlington, VT, USA and Florida State University, Tallahassee, FL, USA) at which identical procedures were executed. The collection of outcome data is currently ongoing as of November 2011. The current report is based on secondary analyses of data collected during the study’s baseline assessment session, which took place prior to randomization and the commencement of the intervention. These analyses have not been published or presented previously. At this session, participants were administered the measures described above and later compensated for their time. All participants provided informed consent, and the study protocol was approved by both universities’ Institutional Review Board.

Data Analytic Strategy

Zero-order (or bivariate as applicable) correlations were first obtained to examine associations between the predictor and

criterion variables. Subsequently, the incremental validity of panic attack history and AS were examined in relation to the criterion variables using hierarchical multiple regression (Cohen & Cohen, 1983). Separate models were constructed for each of the smoking-based criterion variables: negative reinforcement smoking outcome expectancies; addiction-based smoking motives; negative affect-based smoking motives; barriers to cessation; and a composite score of problem symptoms experienced while quitting in past attempts. Average number of cigarettes smoked per day, current Axis I diagnosis (dummy coded: 0 = *no*; 1 = *yes*), and participant sex (dummy coded: 1 = *male*; 2 = *female*) were entered as a block at Step 1. These covariates were chosen on an a priori basis as factors that could theoretically affect relations between the studied predictor and criterion variables. At Step 2 of the model, panic attack history (dummy coded: 1 = *no*; 2 = *yes*) was entered. Finally, at Step 3, AS was entered in order to evaluate the relative contribution of each predictor variable in relation to the criterion variables.

Results

Zero-Order (or Bivariate) Correlations

See Table 1 for descriptive data and zero-order (or bivariate, as applicable) correlations among the studied variables. Only partially consistent with prediction, panic attack history was only significantly (positively) related to problem symptoms experienced while quitting smoking ($r = .21, p < .01$). As expected, AS was significantly (positively) related to the following criterion variables: negative reinforcement smoking outcome expectancies ($r = .29, p < .01$), addiction-based smoking motives ($r = .21, p < .01$), negative affect-based smoking motives ($r = .29, p < .01$), barriers to cessation ($r = .30, p < .01$), and problem symptoms experienced while quitting ($r = .38, p < .01$). Additionally, consistent with past work (e.g., Maller & Reiss, 1992; G. N. Marshall, Miles, & Stewart, 2010; Schmidt & Zvolensky, 2007), panic attack history and AS were significantly (positively) related to each other ($r = .31, p < .01$; 9.6% shared variance). Notably, a significant difference was observed between a history of panic attacks ($M = 19.78, SD = 14.88$) and no history of panic attacks ($M = 11.90, SD = 8.92$) with regard to AS scores ($t(247) = -5.15, p < .001$).

Hierarchical Regression Analyses

Prior to conducting the following regression analyses, we examined the overall distribution of our data to determine whether it fulfilled the required assumptions. Results revealed that our data met the standards of normality, and therefore, no subsequent transformations were necessary. Thereafter, a series of hierarchical regressions were conducted to examine the effect of each predictor variable on the five smoking-related outcomes. Regression results are presented in Table 2. Analyses for the negative reinforcement smoking outcome expectancies subscale revealed that the overall model was significant ($F(5, 241) = 6.84, p < .001$). At Step 1 of the model, cigarettes per day, current Axis I diagnosis, and participant sex were significant predictors. However, at Step 2, panic attack history was not significantly related to expectancies for negative affect reduction. Finally, at Step 3, AS was significantly related to the negative reinforcement smoking outcome expectancies subscale above and beyond the covariates at Step 1 and panic attack history at Step 2 of the model (see Table 2).

Table 1. Zero-Order (or Bivariate) Correlations Among Theoretically Relevant Variables

Variable	1	2	3	4	5	6	7	8	9	10	M or % (SD)
1. CPD	1	.04	-.13*	-.01	.20**	.09*	.26**	.19**	.03	.00	19.59 (8.81)
2. Diagnosis		1	.14*	.17**	.43**	.17**	.01	.17**	.10	.18**	37.2% (Yes)
3. Sex			1	.16**	.05	.16**	.15*	.26**	.27**	.30**	57.4% (Male)
4. PA Hx				1	.31**	.10	.05	.10	.13	.21**	44.2% (Yes)
5. ASI					1	.29**	.21**	.29**	.30**	.38**	15.42 (12.58)
6. SCQ-NR						1	.48**	.70**	.54**	.42**	5.68 (1.73)
7. RFS-AD							1	.66**	.53**	.43**	3.36 (.76)
8. RFS-NA								1	.59**	.45**	3.49 (.79)
9. BCS									1	.47**	25.17 (10.95)
10. Quit probs										1	33.35 (11.57)

Note. CPD = average cigarettes smoked per day—Smoking History Questionnaire (SHQ; Brown et al., 2002); Diagnosis = current Axis I diagnosis, dummy coded (*no* = 0; *yes* = 1), per Structured Clinical Interview-Non-Patient Version for *DSM-IV* (SCID-I-NP; First et al., 1994); Sex = dummy coded (1 = *males*; 2 = *females*); PA Hx = two-year history of panic attacks, dummy-coded (*no* = 1, *yes* = 2), per SCID-I-NP (First et al., 1994); ASI-III = Anxiety Sensitivity Index-III-Total Score (Taylor et al., 2007); SCQ-NR = Smoking Consequences Questionnaire-Negative Reinforcement/Negative Affect Reduction Subscale (Brandon & Baker, 1991); RFS-AD = Reasons for Smoking-Addictive Subscale (Ikard et al., 1969); RFS-NA = Reasons for Smoking-Negative Affect Subscale (Ikard et al., 1969); BCS = Barriers to Cessation Scale-Total Score (Macnee & Talsma, 1995a); Quit probs = composite score of problematic symptoms experienced during quitting—SHQ (Brown et al., 2002).

* $p < .05$. ** $p < .01$.

Regarding the addiction-based smoking motives subscale, results indicated that the overall model was significant ($F(5, 245) = 6.45, p < .001$). At Step 1 of the model, participant sex and cigarettes per day were significant predictors. However, at Step 2, panic attack history was not significantly related to addiction-based smoking motives. Finally, at Step 3, AS was significantly related to the addiction-based smoking motives subscale above and beyond the covariates at Step 1 and panic attack history at Step 2 of the model (see Table 2).

Regarding the negative affect-based smoking motives subscale, results indicated that the overall model was significant ($F(5, 245) = 9.94, p < .001$). At Step 1 of the model, participant sex and cigarettes per day were significant predictors. However, at Step 2, panic attack history was not significantly related to negative-affect based smoking motives. Finally, at Step 3, AS was significantly related to the negative affect-based smoking motives subscale above and beyond the covariates at Step 1 and panic attack history at Step 2 of the model (see Table 2).

Analyses for barriers to cessation revealed that the overall model was significant ($F(5, 244) = 8.16, p < .001$). At Step 1 of the model, participant sex was the only significant predictor. However, at Step 2, panic attack history was not significantly related to barriers to cessation. Finally, at Step 3, AS was significantly related to barriers to cessation above and beyond the covariates at Step 1 and panic attack history at Step 2 of the model (see Table 2).

A small percentage of participants within the current sample reported that they had no prior quit attempts. Thus, these individuals ($n = 16$) were dropped from this particular regression analysis, resulting in a sample size of 226. Here, results indicated that the overall model was significant ($F(5, 226) = 16.90, p < .001$). At Step 1 of the model, participant sex and current Axis I diagnosis were significant predictors of problem symptoms experienced while quitting smoking. At Step 2, endorsement of a history of panic attacks was significantly related to greater levels of problem symptoms experienced while quitting smoking.

Finally, at Step 3, AS was still significantly related to problem symptoms experienced while quitting above and beyond the covariates at Step 1 and panic attack history at Step 2 of the model (see Table 2).

Discussion

The present study examined panic attack history and AS in terms of predicting smoking beliefs, motives, and perceptions of cessation-related difficulties among adult treatment-seeking daily smokers. As hypothesized, there was consistent evidence that the fear of internal sensations was significantly and uniquely associated with a variety of cognitive-based smoking processes. The size of the observed effects were generally medium (Cohen, 1988; see Table 2), with higher levels of AS being incrementally associated with greater endorsement of the studied criterion variables. These findings are broadly consistent with integrated theoretical models of cigarette smoking and panic vulnerability, which suggest that AS is related to numerous aspects of cognitive-based smoking processes (Morissette et al., 2007; Zvolensky & Bernstein, 2005; Zvolensky et al., 2003). The observed results also are noteworthy for at least two reasons. First, the effects for AS were apparent over and above the significant variance accounted for by smoking rate, current Axis I diagnosis, and participant sex. Thus, the results cannot be attributed to these co-occurring risk factors. Second, the effects for AS were independent of shared variance with panic attacks. Thus, the fear of internal sensations, rather than panic attacks per se, is more related to beliefs about and motives for smoking behavior as well as perceptions of cessation-related difficulties. Given that the global dimension of AS was consistently related to the studied cognitive-based smoking processes, future work might build from these findings to examine possible associations between the subdimensions of AS (i.e., physical, cognitive, and social) and these outcome variables. Examination of the subdimensions of AS may yield important information about the ways in which AS directly influences smoking behavior.

Table 2. Hierarchical Regression Analyses

Dependent variable		Predictors	ΔR^2	sr^2	<i>B</i>	β
SCQ-NR	Step 1	CPD	.08	.02	2.22	.14*
		Diagnosis		.02	2.12	.14*
		Sex		.03	2.76	.18**
	Step 2	PA Hx	.00	.00	.86	.05
	Step 3	ASI	.05	.05	3.62	.26**
	RFS-AD	Step 1	CPD	.08	.06	4.04
Diagnosis				.00	−.33	.02
Sex				.03	2.54	.16*
Step 2		PA Hx	.00	.00	.53	.03
Step 3		ASI	.04	.04	3.18	.22**
RFS-NA		Step 1	CPD	.13	.05	3.43
	Diagnosis			.01	1.87	.11
	Sex			.07	4.24	.26**
	Step 2	PA Hx	.00	.00	.59	.04
	Step 3	ASI	.04	.05	3.49	.24**
	BCS	Step 1	CPD	.07	.01	1.26
Diagnosis				.00	1.06	.07
Sex				.05	3.66	.23**
Step 2		PA Hx	.00	.00	1.09	.07
Step 3		ASI	.07	.08	4.56	.32**
Quit probs		Step 1	CPD	.12	.00	−.46
	Diagnosis			.02	2.26	.14*
	Sex			.08	4.47	.29**
	Step 2	PA Hx	.03	.03	2.61	.17*
	Step 3	ASI	.13	.16	6.40	.42**

Note. β = Standardized beta weight provided for hierarchical multiple regression; sr^2 = squared partial correlation; CPD = average cigarettes smoked per day—Smoking History Questionnaire (SHQ; Brown et al., 2002); Diagnosis = current Axis I diagnosis, dummy coded (*no* = 0; *yes* = 1), per Structured Clinical Interview-Non-Patient Version for *DSM-IV* (SCID-I-NP; First et al., 1994); Sex = dummy coded (1 = *males*; 2 = *females*); PA Hx = two-year history of panic attacks, dummy-coded (*no* = 1, *yes* = 2), per SCID-I-NP (First et al., 1994); ASI-III = Anxiety Sensitivity Index-III-Total Score (Taylor et al., 2007); SCQ-NR = Smoking Consequences Questionnaire-Negative Reinforcement/Negative Affect Reduction Subscale (Brandon & Baker, 1991); RFS-AD = Reasons for Smoking-Addictive Subscale (Ikard et al., 1969); RFS-NA = Reasons for Smoking-Negative Affect Subscale (Ikard et al., 1969); BCS = Barriers to Cessation Scale-Total Score (Macnee & Talsma, 1995a); Quit probs = composite score of problematic symptoms experienced during quitting—SHQ (Brown et al., 2002).

* $p < .01$. ** $p < .001$.

Contrary to prediction, panic attacks were not significantly incrementally associated with any of the cognitive-based criterion variables, with the exception of problem symptoms experienced while quitting smoking. Notably, however, AS accounted for a larger percentage of variance in problem symptoms experienced while quitting in comparison with panic attack history. Such findings are somewhat surprising, given that panic attacks

have been shown to be related to more severe withdrawal symptoms (E. C. Marshall et al., 2009), shorter durations of abstinence from smoking (Zvolensky et al., 2004), overall lower success rates in quitting (Piper et al., 2010), and negative affect reduction smoking motives (Zvolensky et al., 2005). However, the present results suggest that panic attacks do not maintain robust relations with negative reinforcement smoking outcome

expectancies, addictive or negative affect reduction smoking motives, or certain smoking-cessation relevant factors (e.g., barriers to cessation). Thus, panic attacks may be related to some, but not all, aspects of smoking behavior.

Although not the primary aim of the present study, at least two other observations warrant brief comment. First, AS and panic attacks were related but distinct from one another, sharing only 9.6% of variance. This observation indicates that panic attacks and fear of the negative consequences of panic-relevant sensations are distinct constructs among daily smokers (G. N. Marshall et al., 2010; Schmidt & Zvolensky, 2007). Indeed, the present results suggest that there may be different patterns of relations between panic attacks, AS, and various aspects of smoking (e.g., nicotine withdrawal versus expectancies and/or motives). Such findings highlight the need for additional research to examine the putative role of each factor in relation to smoking behaviors in an effort to further elucidate the mechanisms through which AS, panic attacks, and smoking impact one another. Second, consistent with past extant work, which has documented sex differences in relation to cessation rates (Wetter et al., 1999) as well as smoking motives (Feldner et al., 2007; Ikard et al., 1969), participant sex evidenced robust relations across the studied smoking processes, with female sex being incrementally associated with greater endorsement of the criterion variables. Given the strength and consistency of these associations, future work could perhaps usefully integrate sex into multirisk models for cigarette smoking-anxiety comorbidity.

A number of limitations of the present investigation and points for future direction should be considered. First, the present sample is limited in that it is comprised of a relatively homogenous (e.g., primarily Caucasian) group of adult smokers who volunteered to participate in smoking cessation treatment. Given that the vast majority of cigarette smokers attempt to quit on their own (70% of smokers; Levy & Friend, 2002), it will be important for researchers to draw from populations other than those included in the present study to rule out potential self-selection bias among persons with these characteristics and increase the generalizability of these findings. Second, we sampled community-recruited daily smokers. Inspection of the level of nicotine dependence among this sample was relatively low. To enhance the generalizability of the results, it may therefore be useful to replicate and extend the present findings to heavier smoking samples and evaluate if similar patterns emerge. Third, the present study was correlational and cross-sectional in nature. It is therefore necessarily limited because it cannot shed light on processes over time or isolate causal relations between variables. Finally, in the present study, we modeled a wide range, but naturally only a select number, of smoking-based processes. Thus, it is advisable for future work to explore the relative explanatory utility of AS and panic attacks in terms of other smoking processes such as smoking cessation outcomes (i.e., lapse and relapse) and the course of nicotine withdrawal symptoms during treatment.

Overall, the present study provides novel empirical information concerning panic attacks, as well as AS, in terms of their relations to cognitive-based smoking processes among adult treatment-seeking daily smokers. Although past research has demonstrated significant associations between panic attacks and certain aspects of cigarette smoking (e.g., severity of nicotine

withdrawal, lower abstinence rates), results of the present investigation suggest that AS may be more relevant to understanding beliefs about and motives for smoking behavior as well as perceptions of cessation-related difficulties. Such findings serve to conceptually inform the development of specialized intervention strategies for smokers who have a propensity to smoke for affect-regulatory reasons as well as frequently encounter problems while quitting smoking. Specifically, smokers with elevated levels of AS may benefit from intensive cognitive-behavioral strategies (e.g., interoceptive exposure, cognitive restructuring, and affective regulation strategies) to address beliefs about the effects of smoking, reasons underlying smoking behavior, as well as perceived and/or actual cessation-related barriers in an effort to promote greater degrees of smoking abstinence.

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Declaration of Interests

The authors declare that they have no competing interests.

References

- Amering, M., Bankier, B., Berger, P., Griengl, H., Windhaber, J., & Katschnig, H. (1999). Panic disorder and cigarette smoking behavior. *Comprehensive Psychiatry*, *40*, 35–38. doi:10.1016/S0010-440X(99)90074-3
- Baillie, A. J., & Rapee, R. M. (2005). Panic attacks as risk markers for mental disorders. *Social Psychiatry and Psychiatric Epidemiology*, *40*, 240–244. doi:10.1007/s00127-005-0892-3
- Battista, S. R., Stewart, S. H., Fulton, H. G., Steeves, D., Darredeau, C., & Gavric, D. (2008). A further investigation of the relations of anxiety sensitivity to smoking motives. *Addictive Behaviors*, *22*, 1402–1408. doi:10.1016/j.addbeh.2008.06.016
- Bernstein, A., Zvolensky, M. J., Sachs-Ericsson, N., Schmidt, N. B., & Bonn-Miller, M. (2006). Associations between age of onset and lifetime history of panic attacks and alcohol use, abuse, and dependence in a representative sample. *Comprehensive Psychiatry*, *47*, 342–349. doi:10.1016/j.comppsy.2006.01.002
- Bouton, M. E., Mineka, S., & Barlow, D. H. (2001). A modern learning theory perspective on the etiology of panic disorder. *Psychology Review*, *108*, 4–32. doi:10.1037//0033-295X.108.1.4
- Brandon, T. H., & Baker, T. B. (1991). The smoking consequences questionnaire: The subjective expected utility of smoking in college students. *Psychological Assessment*, *3*, 484–491. doi:10.1037//1040-3590.3.3.484
- Breslau, N., Kilbey, M., & Andreski, P. (1991). Nicotine dependence, major depression, and anxiety in young adults. *Archives of General Psychiatry*, *48*, 1069–1074.

Panic attacks and anxiety sensitivity

- Breslau, N., & Klein, D. F. (1999). Smoking and panic attacks: An epidemiologic investigation. *Archives of General Psychiatry*, *56*, 1141–1147. doi:10.1001/archpsyc.56.12.1141
- Brown, R. A., Kahler, C. W., Zvolensky, M. J., Lejuez, C. W., & Ramsey, S. E. (2001). Anxiety sensitivity: Relationship to negative affect smoking and smoking cessation in smokers with past major depressive disorder. *Addictive Behaviors*, *26*, 887–899. doi:10.1016/S0306-4603(01)00241-6
- Brown, R. A., Lejuez, C. W., Kahler, C. W., & Strong, D. R. (2002). Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology*, *111*, 180–185. doi:10.1037//0021-843X.111.1.180
- Buckley, T. C., Kamholz, B. W., Mozley, S. L., Gulliver, S. B., Holohan, D. R., Helstrom, A. W., et al. (2005). A psychometric evaluation of the Smoking Consequences Questionnaire—adult in smokers with psychiatric conditions. *Nicotine & Tobacco Research*, *7*, 739–745. doi:10.1080/14622200500259788
- Cocores, J. (1993). Nicotine dependence: Diagnosis and treatment. *Recent Advances in Addictive Disorders*, *16*, 49–60.
- Cohen, J. (1988). *Statistical power for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence-Erlbaum Associates.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Comeau, N., Stewart, S. H., & Loba, P. (2001). The relations of trait anxiety, anxiety sensitivity, and sensation seeking to adolescents' motivations for alcohol, cigarette, and marijuana use. *Addictive Behaviors*, *26*, 803–825. doi:10.1016/S0306-4603(01)00238-6
- Downey, K. K., & Kilbey, M. M. (1995). Relationship between nicotine and alcohol expectancies and substance dependence. *Experimental and Clinical Psychopharmacology*, *3*, 174–182. doi:10.1037/1064-1297.3.2.174
- Falsetti, S. A., & Resnick, H. S. (2000). Cognitive behavioral treatment for PTSD with comorbid panic attacks. *Journal of Contemporary Psychotherapy*, *30*, 163–179. doi:10.1023/A:1026522931013
- Feldner, M. T., Babson, K. A., Zvolensky, M. J., Vujanovic, A. A., Lewis, S. F., Gibson, L. E., et al. (2007). Posttraumatic stress symptoms and smoking to reduce negative affect: An investigation of trauma-exposed daily smokers. *Addictive Behaviors*, *32*, 214–227. doi:10.1016/j.addbeh.2006.03.032
- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1994). *Structured clinical interview for DSM-IV patient edition (SCID-N/P), Version 2.0*. New York: Biometrics Research, New York State Psychiatric Institute.
- Forsyth, J. P., & Eifert, G. H. (1996). Systemic alarms in fear conditioning I: A reappraisal of what is being conditioned. *Behavior Therapy*, *27*, 441–462. doi:10.1016/S0005-7894(96)80026-8
- Glassman, A. H., Helzer, J. E., Covey, L. S., Cottler, L. B., Stetner, F., Tipp, J. E., et al. (1990). Smoking, smoking cessation, and major depression. *Journal of the American Medical Association*, *264*, 1546–1549. doi:10.1001/jama.1990.03450120058029
- Gonzalez, A., Zvolensky, M. J., Hogan, J., McLeish, A. C., & Weibust, K. S. (2011). Anxiety sensitivity and pain-related anxiety in the prediction of fear responding to bodily sensations: A laboratory test. *Journal of Psychosomatic Research*, *70*, 258–266. doi:10.1016/j.jpsychores.2010.07.011
- Goodwin, R., & Hamilton, S. P. (2002). Cigarette smoking and panic: The role of neuroticism. *American Journal of Psychiatry*, *159*, 1208–1213. doi:10.1176/appi.ajp.159.7.1208
- Gregor, K. L., Zvolensky, M. J., McLeish, A. C., Bernstein, A., & Morissette, S. (2008). Anxiety sensitivity and perceived control over anxiety-related events: Associations with smoking outcome expectancies and perceived cessation barriers among daily smokers. *Nicotine & Tobacco Research*, *10*, 627–635. doi:10.1080/14622200801978706
- Hayward, C., Killen, J. D., Kraemer, H. C., & Taylor, C. B. (2000). Predictors of panic attacks in adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*, 207–214. doi:10.1097/00004583-200002000-00021
- Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerström, K.-O. (1991). The Fagerström test for nicotine dependence: A revision of the Fagerström Tolerance Questionnaire. *British Journal of Addiction*, *86*, 1119–1127. doi:10.1111/j.1360-0443.1991.tb01879.x
- Hughes, J. R., Hatsukami, D. K., Mitchell, J. E., & Dahlgren, L. A. (1986). Prevalence of smoking among psychiatric outpatients. *American Journal of Psychiatry*, *143*, 993–997.
- Ikard, F. F., Green, D. E., & Horn, D. (1969). A scale to differentiate between types of smoking as related to the management of affect. *International Journal of the Addictions*, *4*, 649–659. doi:10.3109/10826086909062040
- Jones, J. C., & Barlow, D. H. (1990). The etiology of posttraumatic stress disorder. *Clinical Psychology Review*, *10*, 299–328. doi:10.1016/0272-7358(90)90064-H
- Levy, D. T., & Friend, K. (2002). A simulation model of policies directed at treating tobacco use and dependence. *Medical Decision Making*, *22*, 6–17.
- Leyro, T. M., Zvolensky, M. J., Vujanovic, A., & Bernstein, A. (2008). Anxiety sensitivity and smoking motives and outcome expectancies among adult daily smokers: Replication and extension. *Nicotine & Tobacco Research*, *10*, 985–994. doi:10.1080/14622200802097555
- Macnee, C. L., & Talsma, A. (1995a). Development and testing of the barriers to cessation scale. *Nursing Research*, *44*, 214–219. doi:10.1097/00006199-199507000-00005
- Macnee, C. L., & Talsma, A. (1995b). Predictors of progress in smoking cessation. *Public Health Nursing*, *12*, 242–248. doi:10.1111/j.1525-1446.1995.tb00143.x
- Maller, R. G., & Reiss, S. (1992). Anxiety sensitivity in 1984 and panic attacks in 1987. *Journal of Anxiety Disorders*, *6*, 241–247. doi:10.1016/0887-6185(92)90036-7

- Marshall, E. C., Johnson, K., Bergman, J., Gibson, L. E., & Zvolensky, M. J. (2009). Anxiety sensitivity and panic reactivity to bodily sensations: Relation to quit-day (acute) nicotine withdrawal symptom severity among daily smokers making a self-guided quit attempt. *Experimental and Clinical Psychopharmacology, 17*, 356–364. doi:10.1037/a0016883
- Marshall, G. N., Miles, J. N. V., & Stewart, S. H. (2010). Anxiety sensitivity and PTSD symptom severity are reciprocally related: Evidence from a longitudinal study of physical trauma survivors. *Journal of Abnormal Psychology, 119*, 143–150.
- McNally, R. J. (2002). Anxiety sensitivity and panic disorder. *Biological Psychiatry, 52*, 938–946. doi:10.1016/S0006-3223(02)01475-0
- Morissette, S. B., Tull, M. T., Gulliver, S. B., Kamholz, B. W., & Zimering, R. T. (2007). Anxiety, anxiety disorders, tobacco use, and nicotine: A critical review of interrelationships. *Psychological Bulletin, 133*, 245–272. doi:10.1037/0033-2909.133.2.245
- Mullane, J. C., Stewart, S. H., Rhyno, E., Steeves, D., Watt, M., & Eisner, A. (2008). Anxiety sensitivity and difficulties with smoking cessation. In F. Columbus (Ed.), *Advances in psychology research*. Hauppauge, NY: Nova Science.
- Novak, A., Burgess, E. S., Clark, M., Zvolensky, M. J., & Brown, R. A. (2003). Anxiety sensitivity, self-reported motives for alcohol and nicotine use and level of consumption. *Journal of Anxiety Disorders, 17*, 165–180. doi:10.1016/S0887-6185(02)00175-5
- Payne, T. J., Smith, P. O., McCracken, L. M., & McSherry, W. C., (1994). Assessing nicotine dependence: A comparison of the Fagerström Tolerance Questionnaire (FTQ) with the Fagerström Test for Nicotine dependence (FTND) in a clinical sample. *Addictive Behaviors, 19*, 307–317. doi:10.1016/0306-4603(94)90032-9
- Piper, M. E., Smith, S. S., Schlam, T. R., Fleming, M. F., Bittrich, A. A., Brown, J. L., et al. (2010). Psychiatric disorders in smokers seeking treatment for tobacco dependence: Relations with tobacco dependence and cessation. *Journal of Consulting and Clinical Psychology, 78*, 13–23. doi:10.1037/a0018065
- Pohl, R., Yeragani, V. K., Balon, R., Lycaki, H., & McBride, R. (1992). Smoking in patients with panic disorder. *Psychiatry Research, 43*, 253–262. doi:10.1016/0165-1781(92)90058-B
- Pomerleau, C. S., Carton, S. M., Lutzke, M. L., Flessland, K. A., & Pomerleau, O. F. (1994). Reliability of the Fagerström Tolerance Questionnaire and the Fagerström Test for Nicotine Dependence. *Addictive Behaviors, 19*, 33–39. doi:10.1016/0306-4603(94)90049-3
- Reiss, S., & McNally, R. J. (1985). Expectancy model of fear. In S. Reiss, & R. R. Bootzin (Eds.), *Theoretical issues in behavior therapy* (pp. 107–121), San Diego, CA: Academic Press.
- Reiss, S., Peterson, R. A., Gursky, M., & McNally, R. J. (1986). Anxiety, sensitivity, anxiety frequency, and the prediction of fearfulness. *Behaviour Research and Therapy, 24*, 1–8. doi:10.1016/0005-7967(86)90143-9
- Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons With Harmful Alcohol Consumption-II. *Addiction, 88*, 791–804. doi:10.1111/j.1360-0443.1993.tb02093.x
- Schmidt, N. B., Lerew, D. R., & Jackson, R. J. (1999). Prospective evaluation of anxiety sensitivity in the pathogenesis of panic: Replication and extension. *Journal of Abnormal Psychology, 108*, 532–537. doi:10.1037//0021-843X.108.3.532
- Schmidt, N. B., Lerew, D. R., & Joiner, T. E., Jr. (2000). Prospective evaluation of the etiology of anxiety sensitivity: Test of a scar model. *Behaviour Research and Therapy, 38*, 1083–1095. doi:10.1016/S0005-7967(99)00138-2
- Schmidt, N. B., & Zvolensky, M. J. (2007). Anxiety sensitivity and CO₂ challenge reactivity as unique and interactive prospective predictors of anxiety pathology. *Depression and Anxiety, 24*, 527–536. doi:10.1002/da.20267
- Schmidt, N. B., Zvolensky, M. J., & Maner, J. K. (2006). Anxiety sensitivity: Prospective prediction of panic attacks and Axis I pathology. *Journal of Psychiatric Research, 40*, 691–699. doi:10.1016/j.jpsychires.2006.07.009
- Shiffman, S. (1993). Assessing smoking patterns and motives. *Journal of Consulting and Clinical Psychology, 61*, 732–742. doi:10.1037//0022-006X.61.5.732
- Stewart, S. H., Karp, J., Pihl, R. O., & Peterson, R. A. (1997). Anxiety sensitivity and self-reported reasons for drug use. *Journal of Substance Abuse, 9*, 223–224. doi:10.1016/S0899-3289(97)90018-3
- Taylor, S., & Cox, B. J. (1998). An expanded anxiety sensitivity index: Evidence for a hierarchical structure in a clinical sample. *Journal of Anxiety Disorders, 12*, 463–483.
- Taylor, S., Koch, W. J., & McNally, R. J. (1992). How does anxiety sensitivity vary across the anxiety disorders? *Journal of Anxiety Disorders, 6*, 249–259. doi:10.1016/0887-6185(92)90037-8
- Taylor, S., Zvolensky, M. J., Cox, B. J., Deacon, B., Heimberg, R. G., Ledley, D. R., et al. (2007). Robust dimensions of anxiety sensitivity: Development and initial validation of the Anxiety Sensitivity Index-3. *Psychological Assessment, 19*, 176–188. doi:10.1037/1040-3590.19.2.176
- Vujanovic, A. A., & Zvolensky, M. J. (2009). Anxiety sensitivity, acute nicotine withdrawal symptoms, and anxious and fearful responding to bodily sensations: A laboratory test. *Experimental and Clinical Psychopharmacology, 17*, 181–190. doi:10.1037/a0016266
- Wetter, D. W., Kenford, S. L., Smith, S. S., Fiore, M. C., Jorenby, D. E., & Baker, T. B. (1999). Gender differences in smoking cessation. *Journal of Consulting and Clinical Psychology, 67*, 555–562. doi:10.1037/0022-006X.67.3.555
- Ziedonis, D., Hitsman, B., Beckham, J. C., Zvolensky, M. J., Adler, L. E., Audrain-McGovern, J., et al. (2008). Tobacco use and cessation in psychiatric disorders: National Institute of Mental Health Report (NIMH). *Nicotine and Tobacco Research, 10*, 1691–1715. doi:10.1080/14622200802443569

Panic attacks and anxiety sensitivity

Zvolensky, M. J., & Bernstein, A. (2005). Cigarette smoking and panic psychopathology. *Current Directions in Psychological Science, 14*, 301–305. doi:10.1111/j.0963-7214.2005.00386.x

Zvolensky, M. J., Bernstein, A., Cardenas, S. J., Colotla, V. A., Marshall, E. C., & Feldner, M. T. (2007). Anxiety sensitivity and early relapse to smoking: A test among Mexican daily, low-level smokers. *Nicotine & Tobacco Research, 9*, 483–491. doi:10.1080/14622200701239621

Zvolensky, M. J., Bernstein, A., Marshall, E. C., & Feldner, M. T. (2006). Panic attacks, panic disorder, and agoraphobia: Associations with substance use, abuse, and dependence. *Current Psychiatry Reports, 33*, 279–285. doi:10.1007/s11920-006-0063-6

Zvolensky, M. J., Bonn-Miller, M. O., Bernstein, A., & Marshall, E. (2006). Anxiety sensitivity and abstinence duration to smoking. *Journal of Mental Health, 15*, 659–670. doi:10.1080/09638230600998888

Zvolensky, M. J., Coughle, J. R., Johnson, K. A., Bonn-Miller, M. O., & Bernstein, A. (2010). Marijuana use and panic psychopathology among a representative sample of adults. *Experimental and Clinical Psychopharmacology, 18*, 129–134. doi:10.1037/a0019022

Zvolensky, M. J., Kotov, R., Antipova, A. V., & Schmidt, N. B. (2003). Cross cultural evaluation of smokers risk for panic and anxiety pathology: A test in a Russian epidemiological sample.

Behaviour Research and Therapy, 41, 1199–1215. doi:10.1016/S0005-7967(03)00031-7

Zvolensky, M. J., Lejuez, C. W., Kahler, C. W., & Brown, R. A. (2004). Panic attack history and smoking cessation: An initial examination. *Addictive Behaviors, 29*, 825–830. doi:10.1016/j.addbeh.2004.02.017

Zvolensky, M. J., Lewinsohn, P., Bernstein, A., Schmidt, N. B., Buckner, J. D., Seeley, J., et al. (2008). Prospective associations between cannabis use, abuse, and dependence and panic attacks and disorders. *Journal of Psychiatric Research, 42*, 1017–1023. doi:10.1016/j.jpsychires.2007.10.012

Zvolensky, M. J., Schmidt, N. B., Antony, M. M., McCabe, R. E., Forsyth, J. P., Feldner, M. T., et al. (2005). Evaluating the role of panic disorder in emotional sensitivity processes involved with smoking. *Journal of Anxiety Disorders, 19*, 673–686. doi:10.1016/j.janxdis.2004.07.001

Zvolensky, M. J., Schmidt, N. B., & Stewart, S. H. (2003). Panic disorder and smoking. *Clinical Psychology: Science and Practice, 10*, 29–51. doi:10.1093/clipsy/10.1.29

Zvolensky, M. J., Stewart, S. H., Vujanovic, A. A., Gavric, D., & Steeves, D. (2009). Anxiety sensitivity and anxiety and depressive symptoms in the prediction of early smoking lapse and relapse during smoking cessation treatment. *Nicotine & Tobacco Research, 11*, 323–331. doi:10.1093/ntr/ntn037