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Anxiety Sensitivity Mediates Relations between Emotional Disorders and Smoking

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Abstract

Objectives—Research has documented consistent and robust relations between emotional disorders (i.e., depressive and anxiety disorders) and smoking. Yet, it is presently unclear whether anxiety sensitivity, the fear of aversive internal anxiety states, may account for the relations between emotional disorders and various smoking processes, including nicotine dependence, perceived barriers to smoking cessation, and severity of problematic symptoms while quitting during past cessation attempts.

Method—Participants ($n = 465$) were treatment-seeking daily tobacco smokers recruited as part of a larger tobacco cessation study. Baseline (pre-treatment) data were utilized. Emotional disorders were assessed via clinical diagnostic interview; self-report measures were used to assess anxiety sensitivity and three criterion variables: nicotine dependence, barriers to smoking cessation, and severity of problematic symptoms while quitting in past attempts.

Results—Emotional disorders were predictive of higher levels of nicotine dependence, greater perceived barriers to cessation, and greater severity of problematic symptoms while quitting in past attempts; each of these relations were accounted for by the indirect effect of anxiety sensitivity.

Discussion—The present findings suggest that anxiety sensitivity may be an important transdiagnostic construct in explicating the nature of the relations between emotional disorders and various smoking processes.

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Keywords

anxiety sensitivity; depressive disorders; anxiety disorders; smoking cessation; nicotine dependence

Expert consensus indicates that cigarette smokers with psychiatric disorders are a particularly high-risk group of smokers (Ziedonis et al., 2008). Among the various psychiatric symptoms and psychopathologies, depressive and anxiety syndromes -- i.e., emotional disorders -- are highly prevalent in the general population and comorbid with smoking (Leventhal, Ramsey, Brown, LaChance, & Kahler, 2008; Piper, Cook, Schlam, Jorenby, & Baker, 2011; Piper et al., 2010). Among current smokers, emotional disorders significantly increase risk of smoking cessation failure (Hall, Muñoz, & Reus, 1994; Hitsman, Borrelli, McChargue, Spring, & Niaura, 2003; Piper et al., 2011), heighten severity of tobacco withdrawal (Marshall, Johnson, Bergman, Gibson, & Zvolensky, 2009; Piper et al., 2010), and contribute to maladaptive cognitive beliefs and cognitive-affective reactions to tobacco use (Vujanovic, Marshall, Gibson, & Zvolensky, 2010). Also, although smoking cessation may produce acute changes in mood during the first few days of cessation (i.e., increases in negative affect; Berlin, Chen, & Covey, 2010; West & Hajek, 1997), it appears that successfully quitting smoking and maintaining abstinence can decrease risk for experiencing more severe negative emotional symptoms. For instance, successful smoking cessation appears to decrease or have no effects on emotional disorder symptoms (Kahler, Spillane, Busch, & Leventhal, 2011). Based upon such work, scholars have seen merit in better understanding and clinically targeting emotional disorders in order to improve cessation outcome (e.g., Feldner, Smith, Monson, & Zvolensky, 2013; Hertzberg, Moore, Feldman, & Beckham, 2001; MacPherson et al., 2010; McFall et al., 2010; Richards, Cohen, Morrell, Watson, & Low, 2013).

Despite the empirically robust and clinically significant relation between emotional disorders and smoking, remarkably little is known about the core mechanisms underlying this association. Anxiety sensitivity is a cognitive-affective transdiagnostic factor that has been most commonly conceptualized as an individual difference factor related to sensitivity to aversive internal states of anxiety (i.e., how one reacts to aversive internal states; Reiss, Peterson, Gursky, & McNally, 1986). Anxiety sensitivity is a relatively stable, but malleable, construct that is implicated in the increased development and maintenance of various emotional symptoms and disorders (e.g., panic attacks, depressive symptoms, major depression, suicide, panic disorder, posttraumatic stress disorder; Capron, Norr, Zvolensky, & Schmidt, 2014; Hayward, Killen, Kraemer, & Taylor, 2000; Marshall, Miles, & Stewart, 2010; McNally, 2002; Schmidt, Zvolensky, & Maner, 2006; Taylor, 2003), and is distinguishable empirically and theoretically from anxiety *symptoms* and other negative affect states like depressive symptoms (Rapee & Medoro, 1994; Schmidt et al., 2006).

Research also indicates anxiety sensitivity is related to smoking behavior. For example, anxiety sensitivity is positively correlated with smoking motives to reduce negative affect (e.g., Battista et al., 2008; Comeau, Stewart, & Loba, 2001) and beliefs (i.e., expectancies) that smoking will reduce negative affect (Johnson, Farris, Schmidt, Smits, & Zvolensky,

2013). Recent research has found that higher levels of anxiety sensitivity were predictive of greater increase in positive affect after cigarette smoking, and therefore, appear particularly susceptible to mood enhancement from smoking (Wong et al., 2013). Other work has found smoking reduces anxiety in high anxiety sensitive smokers who smoked during a stressful situation (speech task), but not in a no stress situation (Evatt & Kassel, 2010). These data suggest high anxiety sensitive smokers are particularly sensitive to anxiety reduction from smoking during a stressful situation. From a cessation perspective, smokers higher in anxiety sensitivity, relative to those lower, perceive quitting as more difficult (Zvolensky, Vujanovic, et al., 2007) and experience more intense nicotine withdrawal during early phases in quitting (Johnson, Stewart, Rosenfield, Steeves, & Zvolensky, 2012; Langdon et al., 2013). Moreover, higher levels of anxiety sensitivity are related to greater odds of early smoking lapse (Brown, Kahler, Zvolensky, Lejuez, & Ramsey, 2001) and relapse during quit attempts (Assayag, Bernstein, Zvolensky, Steeves, & Stewart, 2012; Zvolensky et al., 2006; Zvolensky, Stewart, Vujanovic, Gavric, & Steeves, 2009). Importantly, the observed anxiety sensitivity-smoking effects do not appear to be explained by smoking rate, gender, other concurrent substance use (e.g., alcohol, cannabis), panic attack history, or trait-like negative mood propensity (Johnson et al., 2013; Wong et al., 2013).

Overall, there is consistent empirical evidence that emotional disorders are significantly related to smoking processes, but it remains unclear what cognitive-affective processes may underlie such linkages. Anxiety sensitivity is one promising construct that may, at least partially, account for the relations between anxiety/depressive disorders and various smoking processes. In this sense, it is theoretically a mediator (Hayes, 2009), as emotional disorders may give risk to anxiety sensitivity, which may in turn, give rise to various cognitive and behavioral aspects of smoking. This work sits on the backdrop of the growing general recognition that how one responds to aversive internal or emotional states (perceived and/or actual) may play a central role in smoking processes and cessation behavior (e.g., Brown et al., 2009; Gifford & Lillis, 2009). Specifically, anxiety sensitivity may underlie emotional psychopathology because it may promote the perception that internal cues are aversive, driving the tendency to escape/avoid such sensations through smoking. Accordingly, individuals with emotional disorders due, in part, to high anxiety sensitivity levels may be more apt to smoke to help diminish anxiety and other aversive states (Cohen et al., 2009). Moreover, smoking abstinence exacerbates such states in regular smokers (Leventhal et al., 2010). Collectively, such processes could ultimately increase dependence on nicotine, pose barriers to cessation, and generate unpleasant symptoms upon deprivation.

With this background, the present investigation provides an empirical test of the role of anxiety sensitivity in the relation between emotional disorders and three common and clinically-relevant smoking processes, including nicotine dependence, perceived barriers to smoking cessation, and severity of problematic symptoms while quitting. It was hypothesized that variance in anxiety sensitivity would explain (i.e., statistically mediate and theoretically underpin) the relation between current (past year) emotional disorders (depressive and anxiety disorders) and smoking processes among treatment-seeking smokers and that such effects would not be better accounted for by gender, tobacco-related medical problems, alcohol problems, cannabis use, or trait-like propensity to experience negative mood (i.e., negative affectivity; Johnson et al., 2013).

Method

Participants

Participants ($n = 465$) were adult treatment-seeking daily smokers ($M_{age} = 36.6$, $SD = 13.59$; 48.4% female). Participants primarily identified as White (86.0%) while fewer identified as African-American (8.1%), Hispanic (2.4%), Asian (1.1%), and other (2.4%). Participants were generally well educated with 74.0% indicating that they completed at least part of college. In terms of relationship status, 43.9% reported marital status as never married, 33.3% as married/cohabitating, 20.9% as divorced/separated, and 1.9% as widowed. The average daily smoking rate of this sample was 16.7 ($SD = 9.92$) cigarettes per day and on average, moderate levels of nicotine dependence as were reported (Fagerström Test for Nicotine Dependence: $M = 5.2$, $SD = 2.27$). Participants reported starting smoking at age 14.9 ($SD = 3.47$), daily smoking at age 17.4 ($SD = 3.78$), and during their heaviest period of smoking, were smoking at a rate of 25.0 ($SD = 12.61$) cigarettes per day. A small percentage of participants reported current use of cigars (14.0%) and smokeless tobacco (4.1%). Participants reported 3.4 ($SD = 2.49$) previous quit attempts. Slightly more than one-quarter of the participants (29.5%) reported a tobacco-related illness (heart problems, hypertension, respiratory disease, and/or asthma).

Of the sample, 34.0% met criteria for a primary current (past year) anxiety or depressive disorder. Of those with a past year emotional disorder, specific diagnoses included social anxiety disorder (30.4%), generalized anxiety disorder (14.6%), specific phobia (12.1%), major depressive disorder (12.0%), posttraumatic stress disorder (8.9%), panic disorder with or without agoraphobia (6.4%), dysthymia (5.7%), anxiety disorder not otherwise specified (NOS; 4.4%), obsessive-compulsive disorder (3.2%), depressive disorder NOS (1.3%), and agoraphobia without panic disorder (0.6%). Overall, the average global assessment of functioning (GAF) rating for the sample was 73.4 ($SD = 11.04$), suggesting mild functional impairment.

Predictor Variable

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I/ Non-Patient Version)—Current (past year) mood and anxiety disorders were assessed with *SCID-I/NP* (First, Spitzer, Gibbon, & Williams, 2007). Interviews were administered by trained research assistants or doctoral level staff and supervised by independent doctoral-level professionals. All cases were checked by two independent raters for diagnostic accuracy (no discrepancies were noted). A dichotomous variable was created to reflect those who met criteria for a primary depressive or anxiety disorder (1 = current emotional disorder); all other participants were coded as the reference group (0 = no *current* emotional disorder); this variable was the predictor in all analyses. Past emotional disorders (successfully treated or remitted), as indexed by a lifetime history, were not grouped with current emotional disorders. This approach was employed to provide a more conservative and rigorous test of the study hypotheses, and conceptually most relevant given current anxiety or mood psychopathology would most directly relate to anxiety sensitivity.

Mediator

Anxiety Sensitivity Index-III—The ASI-III (Taylor et al., 2007) is an 18-item measure in which respondents indicate the extent to which they are concerned about possible negative consequences of anxiety-related symptoms (e.g., “It scares me when my heart beats rapidly”). The ASI-III was derived, in part, from the 16-item ASI (Reiss et al., 1986). Responses are rated on a 5-point Likert scale ranging from 0 (*very little*) to 4 (*very much*) and summed to create a total score. ASI-III has strong and improved psychometric properties relative to previous measures of the construct (Taylor et al., 2007). In the present investigation, the total score was utilized as the mediator; internal constancy was excellent in the current sample (Cronbach’s $\alpha = .928$).

Dependent Measures

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 past quit attempts (e.g., weight gain, nausea, irritability, and anxiety). In the present study, as in past work (Zvolensky, Farris, Schmidt, Smits, in press), the SHQ was employed to describe the sample on smoking history and patterns of use (e.g., smoking rate), and to create a mean composite score of the severity of problematic symptoms experienced during past quit attempts by computing an average severity score for severity of past symptoms endorsed as problematic in previous quit attempts. The symptoms included: weight gain, increased eating, digestive problems, nausea, headaches, drowsiness, depressed mood, fatigue, insomnia, difficulty concentrating, heart pounding or sweating, decreased heart rate, irritability, restlessness, anxiety, and tobacco craving. These symptoms include common aspects of nicotine withdrawal, but also other common symptoms of internal distress not formally included in strict definitions of nicotine withdrawal.

Fagerström Test for Nicotine Dependence (FTND)—The FTND (Heatherton, Kozlowski, Frecker, & Fagerström, 1991) is a 6-item scale that assesses gradations in tobacco dependence. Scores range from 0–10, with higher scores reflecting high levels of physiological dependence on nicotine. The FTND has adequate internal consistency, positive relations with key smoking variables (e.g., saliva cotinine), and high test-retest reliability (Heatherton et al., 1991; Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994). The FTND total score was used as a criterion variable in the present study (Cronbach’s $\alpha = .642$).

Barriers to Cessation Scale (BCS)—The BCS (Macnee & Talsma, 1995) is a self-report assessment of perceived barriers associated with quitting smoking. Specifically, the BCS is a 19-item measure on which respondents indicate, on a 4-point Likert scale (0 = *Not a barrier or not applicable* to 3 = *Large barrier*), the degree to which they identify with each listed barriers (e.g., “Weight gain,” “Friends encouraging you to smoke,” “Fear of failing to quit”). Scores are summed and a total score is derived. The BCS has strong psychometric properties, including content and predictive validity, internal consistency, and reliability (Macnee & Talsma, 1995). The BCS total score was used as a criterion variable in the present study; Cronbach’s $\alpha = .890$ in the present sample.

Descriptive Measures and Covariates

Demographics Questionnaire—Demographic information collected included gender, age, race, educational level, marital status, and employment status. These data were used for descriptive purposes and gender was entered as a covariate in all analyses.

Medical History Form—A medical history checklist was used to assess medical-based exclusionary criteria for the current study. A composite variable was computed for the present study as an index of tobacco-related medical problems, which was entered as a covariate in all models. Items in which participants indicated having ever been diagnosed (heart problems, hypertension respiratory disease and asthma; all coded 0 = no, 1 = yes) were summed and a total score was created (observed range from 0 – 3), with greater scores reflecting the occurrence of multiple markers of tobacco-related disease.

Alcohol Use Disorders Identification Test (AUDIT)—The AUDIT (Babor, de la Fuente, Saunders, & Grant, 1992) is a 10-item self-report measure developed to identify individuals with alcohol problems. Total scores range from 0 to 30, with higher scores reflecting more hazardous drinking. The psychometric properties are well documented (Babor et al., 1992). In the present study, the AUDIT total score was used as a covariate in all analyses; internal consistency was good (Cronbach's $\alpha = .839$).

Marijuana Smoking History Questionnaire (MSHQ)—The MSHQ (Bonn-Miller & Zvolensky, 2009) is a 40-item measure that assesses cannabis use history and patterns of use. One item was used in the current study to determine status of marijuana use in the past 30 days: "Please rate your marijuana use in the past 30 days" (Responses range from 0 = *No use*, 4 = *Once a week*, to 8 = *More than once a day*). This item was dichotomously coded to reflect a marijuana use status variable (0 = No use; 1 = Past 30-day use), which was entered as a covariate in all analyses.

Positive and Negative Affect Scale (PANAS)—The PANAS (Watson, Clark, & Tellegen, 1988) is a self-report measure that requires participants to rate the extent to which they experience each of 20 different feelings and emotions (e.g., nervous, interested) based on a Likert scale that ranges from 1 ("Very slightly or not at all") to 5 ("Extremely"). The measure yields two factors, negative and positive affect, and has strong documented psychometric properties (Watson et al., 1988). The negative affectivity subscale was used as a covariate in the present study; internal consistency was excellent (Cronbach's $\alpha = .902$).

Procedure

Adult daily smokers 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 (Zvolensky et al., in press). The current study is based on secondary analyses of baseline (pre-treatment) data for a sub-set of the sample. Inclusion criteria for the parent study included daily cigarette use (average 8 cigarettes per day for at least 1 year), between ages 18–65, and reported motivation to quit smoking of at least 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. Participants provided informed consent prior to participation and the study protocol was approved by the respective Institutional Review Boards; all study procedures and treatment of human subjects were conducted in compliance with ethical standards of the American Psychological Association. Individuals responding to study advertisements were scheduled for an in-person, baseline assessment and were evaluated according to study inclusion and exclusion criteria. After providing written informed consent, participants were interviewed using the SCID-I/NP and completed a computerized battery of self-report questionnaires.

Data Analytic Strategy

First, correlations among the emotional disorders (depressive/anxiety psychopathology), ASI-III, and the criterion variables (nicotine dependence, perceived barriers to smoking cessation, and severity of problematic symptoms reported in past quit attempts) were examined. Three mediator models were conducted next to examine the impact of ASI-III-Total in regard to the relation between past-year emotional disorders and the three criterion outcomes (see Figure 1). Gender, tobacco-related medical problems, alcohol use problems (AUDIT), cannabis use status (per MSHQ), and negative affectivity (PANAS-NA) were included as covariates in the models for all analyses. Each of these variables could serve as ‘third variables’ in the relations between anxiety sensitivity, current emotional disorders, and the studied smoking criterion variables; thus, by controlling for these factors, the unique effects of anxiety sensitivity can be tested. The analyses were conducted using PROCESS, a conditional modeling program that utilizes an ordinary least squares-based path analytical framework to test for both direct and indirect effects (Hayes, 2013). All relative indirect effects were subjected to follow-up bootstrap analyses with 10,000 samples. A 95-percentile confidence interval (CI) estimate was derived for significance testing (as recommended by Hayes, 2009; Preacher & Hayes, 2004, 2008).

Results

As illustrated in Table 1, having a current emotional disorder was positively associated with female gender, higher levels of negative affectivity, higher anxiety sensitivity, greater perceived barriers to smoking cessation, and increased severity of problematic symptoms while quitting in past attempts. Anxiety sensitivity (the mediator) also was significantly and positively associated with alcohol use, negative affectivity, nicotine dependence, perceived barriers to smoking cessation, and severity of problems experienced while quitting in past attempts; correlations were small to moderate in strength. Additionally, male gender was significantly associated with more problematic drinking, whereas female gender was related to higher levels of negative affect, perceived barriers to smoking cessation, and severity of problematic symptoms while quitting in past attempts.

Results for paths a , b , c , and c' are presented in Table 2, which correspond to each of the three models. The estimates of the indirect effects were the paths tested for mediation, which are also presented in Table 2.

The total effects model accounted for significant variance in nicotine dependence ($R^2_{y1,x} = .039$, $df = 6, 458$, $F = 3.071$, $p = .006$). The full model with the mediator predicted significant

variance in nicotine dependence ($R^2_{M,x} = .053$, $df = 7, 457$, $F = 3.661$, $p = .0007$). There was a significant direct effect of current emotional disorders on nicotine dependence after controlling for the anxiety sensitivity. The indirect effect revealed that emotional disorders were predictive of higher levels of nicotine dependence scores indirectly through higher levels of anxiety sensitivity.

In terms of perceived barriers to smoking cessation, the total effect model was significant ($R^2_{y2,x} = .169$, $df = 6, 458$, $F = 15.532$, $p < .0001$), as was the full model with the mediator ($R^2_{M,x} = .181$, $df = 7, 457$, $F = 14.460$, $p < .0001$). The direct effect of emotional disorders on barriers to smoking cessation after controlling for the mediator was non-significant. Regarding the test of the indirect effect, current emotional disorders were predictive of greater perceived barriers to smoking cessation indirectly through higher levels of anxiety sensitivity.

In terms of severity of problematic symptoms while quitting during past cessation attempts, the total effects model accounted for significant variance ($R^2_{y3,x} = .216$, $df = 6, 458$, $F = 21.073$, $p < .0001$). The full model with the mediator also predicted significant variance in severity of problematic symptoms reported while quitting in past attempts ($R^2_{M,x} = .248$, $df = 7, 457$, $F = 21.569$, $p < .0001$); there was a non-significant direct effect of current emotional disorders on severity of problematic symptoms reported in past quit attempts controlling for anxiety sensitivity. To test mediation, the indirect effect was estimated and revealed that current emotional disorders were predictive of greater severity of problematic quit symptoms indirectly through higher levels of anxiety sensitivity.

Discussion

The present study indicated that significant variance in the relation of current (past year) emotional disorders to nicotine dependence, perceived barriers for quitting, and problematic symptoms reported in past quit attempts was explained by anxiety sensitivity. There appears to be a direct effect of having a current emotional disorder in terms of higher levels of nicotine dependence and more problematic symptoms during prior cessation attempts. In both cases, anxiety sensitivity indirectly accounted for the effect of current emotional disorders on nicotine dependence and problematic quit symptoms, which supports the mediational hypothesis. While the direct effect of current emotional disorders on perceived barriers for quitting was not significant¹, findings revealed a robust indirect relation between emotional disorders and perceived barriers via anxiety sensitivity. Overall, the present findings consistently indicated, across three different smoking processes, that anxiety sensitivity may, at least partially, indirectly account for the link between current emotional disorders and various clinically-relevant smoking processes among treatment-seeking smokers. Notably, the observed effect of anxiety sensitivity was evident above and beyond the variance accounted for by gender, tobacco-related medical problems, alcohol problems,

¹As indicated elsewhere (Hayes, 2009), a 'causal steps approach' to a testing mediation that requires a direct effect of X on Y for there to be a mediational effect of M, has been heavily criticized. In fact, X can indirectly impact Y through M in the absence of a direct association between X and Y. Thus, despite the lack of a direct effect in the case of barriers to smoking cessation (c path) and significant total effects for nicotine dependence (c'), the effect of anxiety sensitivity still appears to have a significant indirect effect on emotional disorders in terms of all three aspects of cigarette smoking examined here.

cannabis use, and negative affectivity. That is, the observed anxiety sensitivity effects were incremental and cannot be attributed to these factors. Together, these results highlight the theoretical and potential clinical significance of anxiety sensitivity in explaining the role of emotional disorders and select smoking processes. The model tested assumes that a major reason why active emotional disorders are associated with smoking outcomes is because people with (vs. without) emotional disorders tend to have higher anxiety sensitivity levels, which ultimately, may increase vulnerability to more severe and persistent smoking patterns. Because other theoretical models could be possible based upon the current data and cross-sectional design, and the pattern/sequencing of these associations was not tested here, the proposed model could benefit from further evaluation using longitudinal designs.

The present data raise the possibility that anxiety sensitivity may be an important mechanism linking emotional disorders and smoking. Anxiety sensitivity may underlie or exacerbate existing emotional psychopathology because those with high anxiety sensitivity perceive unpleasant sensations as more aversive and are thus driven to avoid experiencing such sensations, which in turn may prevent extinction of anxiety responses and negatively reinforce fears and emotional pathology (Taylor, 1999). As a result, individuals with active (current) emotional disorders due to high anxiety sensitivity may be prone to actions that prevent and attenuate aversive states. Interestingly, smoking helps to diminish anxiety and other aversive states (Cohen et al., 2009) and smoking abstinence exacerbates such states in regular smokers (Leventhal et al., 2010). Such processes could ultimately increase dependence on nicotine, pose barriers to cessation, and generate unpleasant symptoms upon cessation. Thus, it is possible that anxiety sensitivity may be a common factor that increases vulnerability to both emotional psychopathology and smoking. Hence, anxiety sensitivity may be a central factor why people with emotional disorders (at least with active symptomology) may be more prone to smoking.

The present findings serve to conceptually inform the development of specialized intervention strategies for smokers with current emotional disorders. Specialized treatments targeting specific emotional disorders for smoking cessation have been developed (e.g., Feldner et al., 2013; Hertzberg et al., 2001; MacPherson et al., 2010; McFall et al., 2010). Yet, the results of these studies generally suggest rather modest improvements or even mixed results in smoking outcome (e.g., Brown et al., 2007; Hitsman et al., 2003; Ziedonis et al., 2008). Rather than focus exclusively on the manifest symptoms of depression/anxiety or their diagnostic syndromes, the present data add to a growing theoretical and empirical literature suggesting that there may be merit to identify and target transdiagnostic factors such as anxiety sensitivity that are related to emotional disorders and their sequelae to facilitate cessation success (Zvolensky & Bernstein, 2005). For example, by integrating anxiety sensitivity reducing methods via psychoeducation, cognitive restructuring, interoceptive exposure, and emotion regulation strategies into smoking cessation treatment (e.g., Feldner, Zvolensky, Babson, Leen-Feldner, & Schmidt, 2008; Zvolensky, Bogiaizian, Salazar, Farris, & Bakhshaie, in press; Zvolensky, Yartz, Gregor, Gonzalez, & Bernstein, 2008), it may be possible to facilitate greater success in smoking cessation for smokers with various emotional disorders.

There are a number of interpretive caveats to the present study. First, given the cross-sectional nature of these data, it is unknown whether emotional disorders are causally related to greater anxiety sensitivity, or the criterion smoking processes. Based upon the present results, future prospective studies are necessary to determine the directional effects of these relations. Second, 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. It also is noteworthy that the FTND internal consistency was relatively low, an issue often apparent with this measure (Korte, Capron, Zvolensky, & Schmidt, 2013). Yet, Cronbach alpha values are fairly sensitive to the number of items in each scale and it is not uncommon to find lower Cronbach values with shorter scales (e.g., scales with less than 10 items; DeVellis, 2003). Third, the sample was largely comprised of a relatively homogenous group of treatment-seeking smokers. To rule out a selection bias and increase the generalizability of these findings, it will be important for future studies to recruit a more diverse sample with regard to ethnicity/racial identification and socioeconomic status. Fourth, another limitation of the present study pertains to the retrospective methods used to define more severe problems while trying to quit in past attempts. We selected this measure because it allowed us to capture a historical perspective on severity of symptoms experienced in past attempts. Still, it is possible a recall bias somehow influenced this effect. Based upon the present findings, researchers are now well positioned to conduct a direct, prospective test of the emotional disorders-anxiety sensitivity and smoking model. Finally, due to sample size restrictions, we could not model the data by specific emotional disorders. It is therefore unclear if anxiety sensitivity may mediate the relation between *many* or just *specific* emotional disorders and smoking processes. Additionally, past year coding of emotional disorders could possibly include a remitted case in the most recent period of time (i.e., past month). It is worth noting that among the smokers with no current anxiety/depressive psychopathology, 21.5% ($n = 66$) and 4.9% ($n = 15$) met criteria for a past mood and anxiety disorder, respectively. Future research could benefit by directly exploring the degree of specificity in the anxiety sensitivity linkage to specific emotional disorders and smoking and include additional characterization of remission status.

Overall, the present study serves as an initial investigation into the nature of the association between emotional disorders, anxiety sensitivity, and an array of clinically-relevant smoking processes among adult treatment-seeking smokers. Based upon these data, future work is need to explore the extent to which anxiety sensitivity accounts for relations between emotional disorders and other smoking processes (e.g., withdrawal, cessation outcome) so as to further inform clinical assessment and intervention development/refinement for this high-risk group of smokers.

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References

- Assayag Y, Bernstein A, Zvolensky MJ, Steeves D, Stewart SS. Nature and role of change in anxiety sensitivity during NRT-aided cognitive-behavioral smoking cessation treatment. *Cognitive Behaviour Therapy*. 2012; 41(1):51–62.10.1080/16506073.2011.632437 [PubMed: 22375732]
- Babor, TF.; de la Fuente, JR.; Saunders, J.; Grant, M. WHO Document No. WHO/PSA/92.4. Geneva, Switzerland: World Health Organization; 1992. AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Health Care, Revision.
- Battista SR, Stewart SH, Fulton HG, Steeves D, Darredeau C, Gavric D. A further investigation of the relations of anxiety sensitivity to smoking motives. *Addictive Behaviors*. 2008; 22:1402–1408.10.1016/j.addbeh.2008.06.016 [PubMed: 18691826]
- Berlin I, Chen H, Covey LS. Depressive mood, suicide ideation and anxiety in smokers who do and smokers who do not manage to stop smoking after a target quit day. *Addiction*. 2010; 105(12): 2209–2216.10.1111/j.1360-0443.2010.03109.x [PubMed: 20840207]
- Bonn-Miller MO, Zvolensky MJ. An evaluation of the nature of marijuana use and its motives among young adult active users. *The American Journal on Addictions*. 2009; 18(5):409–416.10.3109/10550490903077705 [PubMed: 19874161]
- Brown RA, Kahler CW, Zvolensky MJ, Lejuez CW, Ramsey SE. Anxiety sensitivity: Relationship to negative affect smoking and smoking cessation in smokers with past major depressive disorder. *Addictive Behaviors*. 2001; 26:887–899.10.1016/S0306-4603(01)00241-6 [PubMed: 11768550]
- Brown RA, Lejuez CW, Kahler CW, Strong DR. Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology*. 2002; 111:180–185.10.1037//0021-843X.111.1.180 [PubMed: 11866171]
- Capron DW, Norr AM, Zvolensky MJ, Schmidt NB. Prospective evaluation of the effect of an anxiety sensitivity intervention on suicidality. *Cognitive Behaviour Therapy*. 2014; 43:72–82.10.1080/16506073.2013.777466 [PubMed: 23767786]
- Cohen A, Young RW, Velazquez MA, Groysman M, Noorbehesht K, Ben-Shahar OM, Ettenberg A. Anxiolytic effects of nicotine in a rodent test of approach-avoidance conflict. *Psychopharmacology*. 2009; 204(3):541–549.10.1007/s00213-009-1486-7 [PubMed: 19241061]
- Comeau N, Stewart SH, Loba P. The relations of trait anxiety, anxiety sensitivity, and sensation seeking to adolescents' motivations for alcohol, cigarette, and marijuana use. *Addictive Behaviors*. 2001; 26:803–825.10.1016/S0306-4603(01)00238-6 [PubMed: 11768546]
- DeVellis, RF. Scale development: Theory and applications. 2. Thousand Oaks, California: Sage; 2003.
- Evatt DP, Kassel JD. Smoking, arousal, and affect: The role of anxiety sensitivity. *Journal of Anxiety Disorders*. 2010; 24(1):114–123.10.1016/j.janxdis.2009.09.006 [PubMed: 19819669]
- Feldner MT, Smith RC, Monson CM, Zvolensky MJ. Initial evaluation of an integrated treatment for comorbid PTSD and smoking using a nonconcurrent, multiple-baseline design. *Behavior Therapy*. 2013; 44(3):514–528.10.1016/j.beth.2013.04.003 [PubMed: 23768677]
- Feldner MT, Zvolensky MJ, Babson K, Leen-Feldner EW, Schmidt NB. An integrated approach to panic prevention targeting smoking and anxiety sensitivity: Theoretical basis and evidence from a pilot project evaluating feasibility and short-term efficacy. *Journal of Anxiety Disorders*. 2008; 22:1227–1243.10.1016/j.janxdis.2008.01.005 [PubMed: 18281190]
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW. Structured clinical interview for DSM-IV-TR Axis I disorders, research version, non-patient edition (SCIDI/NP). New York: Biometrics Research, New York State Psychiatric Institute; 2007.
- Hayes AF. Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*. 2009; 76(4):408–420.10.1080/03637750903310360
- Hayes, AF. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guildford Press; New York, NY: 2013.
- Hall SM, Muñoz RF, Reus VI. Cognitive-behavioral intervention increases abstinence rates for depressive-history smokers. *Journal of Consulting and Clinical Psychology*. 1994; 62(1):141–146.10.1037/0022-006X.62.1.141 [PubMed: 8034816]

- Hayward C, Killen JD, Kraemer HC, Taylor CB. Predictors of panic attacks in adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2000; 39:207–214.10.1097/00004583-200002000-00021 [PubMed: 10673832]
- Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO. The Fagerstrom test for nicotine dependence: A revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addiction*. 1991; 86:1119–1127.10.1111/j.1360-0443.1991.tb01879.x [PubMed: 1932883]
- Hertzberg MA, Moore SD, Feldman ME, Beckham JC. A preliminary study of bupropion sustained-release for smoking cessation in patients with chronic posttraumatic stress disorder. *Journal of Clinical Psychopharmacology*. 2001; 21(1):94–98.10.1097/00004714-200102000-00017 [PubMed: 11199956]
- Hitsman B, Borrelli B, McChargue DE, Spring B, Niaura R. History of depression and smoking cessation outcome: A meta-analysis. *Journal of Consulting and Clinical Psychology*. 2003; 71(4):657–663.10.1037/0022-006X.71.4.657 [PubMed: 12924670]
- Johnson KA, Farris SG, Schmidt NB, Smits JA, Zvolensky MJ. Panic attack history and anxiety sensitivity in relation to cognitive-based smoking processes among treatment-seeking daily smokers. *Nicotine & Tobacco Research*. 2013; 15(1):1–10.10.1093/ntr/ntr332 [PubMed: 22544839]
- Johnson KA, Stewart S, Rosenfield D, Steeves D, Zvolensky MJ. Prospective evaluation of the effects of anxiety sensitivity and state anxiety in predicting acute nicotine withdrawal symptoms during smoking cessation. *Psychology of Addictive Behaviors*. 2012; 26(2):289–297.10.1037/a0024133 [PubMed: 21644805]
- Kahler CW, Spillane NS, Busch AM, Leventhal AM. Time-varying smoking abstinence predicts lower depressive symptoms following smoking cessation treatment. *Nicotine & Tobacco Research*. 2011; 13(2):146–150.10.1093/ntr/ntq213 [PubMed: 21106663]
- Korte KJ, Capron DW, Zvolensky MJ, Schmidt NB. The Fagerström scales: Does altering the scoring enhance the psychometric properties? *Addictive Behaviors*. 2013; 38:1757–1763.10.1016/j.addbeh.2012.10.013 [PubMed: 23254226]
- Langdon KJ, Leventhal AM, Stewart S, Rosenfield D, Steeves D, Zvolensky MJ. Anhedonia and anxiety sensitivity: Prospective relationships to nicotine withdrawal symptoms during smoking cessation. *Journal of Studies on Alcohol and Drugs*. 2013; 74(3):469–478.10.1037/a0024133 [PubMed: 23490577]
- Leventhal AM, Ramsey SE, Brown RA, LaChance HR, Kahler CW. Dimensions of depressive symptoms and smoking cessation. *Nicotine & Tobacco Research*. 2008; 10(3):507–517.10.1080/14622200801901971 [PubMed: 18324570]
- Leventhal AM, Waters AJ, Moolchan ET, Heishman SJ, Pickworth WB. A quantitative analysis of subjective, cognitive, and physiological manifestations of the acute tobacco abstinence syndrome. *Addictive Behaviors*. 2010; 35(12):1120–1130.10.1016/j.addbeh.2010.08.007 [PubMed: 20807673]
- Macnee CL, Talsma A. Development and testing of the barriers to cessation scale. *Nursing Research*. 1995; 44(4):214–219.10.1097/00006199-199507000-00005 [PubMed: 7624231]
- MacPherson L, Tull MT, Matusiewicz AK, Rodman S, Strong DR, Kahler CW, Lejuez CW. Randomized controlled trial of behavioral activation smoking cessation treatment for smokers with elevated depressive symptoms. *Journal of Consulting and Clinical Psychology*. 2010; 78(1):55–61.10.1037/a0017939 [PubMed: 20099950]
- Marshall EC, Johnson K, Bergman J, Gibson LE, Zvolensky MJ. 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*. 2009; 17(5):356–364.10.1037/a0016883 [PubMed: 19803635]
- Marshall GN, Miles JV, Stewart SH. Anxiety sensitivity and PTSD symptom severity are reciprocally related: Evidence from a longitudinal study of physical trauma survivors. *Journal of Abnormal Psychology*. 2010; 119(1):143–150.10.1037/a0018009 [PubMed: 20141251]
- McFall M, Saxon AJ, Thompson CE, Yoshimoto D, Malte C, Straits-Troster K, Steele B. Improving the rates of quitting smoking for veterans with posttraumatic stress disorder. *The American Journal of Psychiatry*. 2005; 162(7):1311–1319.10.1176/appi.ajp.162.7.1311 [PubMed: 15994714]

- McNally RJ. Anxiety sensitivity and panic disorder. *Biological Psychiatry*. 2002; 52:938–946.10.1016/S0006-3223(02)01475-0 [PubMed: 12437935]
- Perkins KA, Karelitz JL, Giedgowd GE, Conklin CA, Sayette MA. Differences in negative mood-induced smoking reinforcement due to distress tolerance, anxiety sensitivity, and depression history. *Psychopharmacology*. 2010; 210:25–34.10.1007/s00213-010-1811-1 [PubMed: 20217051]
- Piper ME, Cook JW, Schlam TR, Jorenby DE, Baker TB. Anxiety diagnoses in smokers seeking cessation treatment: Relations with tobacco dependence, withdrawal, outcome and response to treatment. *Addiction*. 2011; 106(2):418–427.10.1111/j.1360-0443.2010.03173.x [PubMed: 20973856]
- Piper ME, Smith SS, Schlam TR, Fleming MF, Bittrich AA, Brown JL, Baker TB. Psychiatric disorders in smokers seeking treatment for tobacco dependence: Relations with tobacco dependence and cessation. *Journal of Consulting and Clinical Psychology*. 2010; 78(1):13–23.10.1037/a0018065 [PubMed: 20099946]
- Pomerleau C, Carton S, Lutzke M, Flessland K, Pomerleau O. Reliability of the Fagerstrom tolerance questionnaire and the Fagerstrom test for nicotine dependence. *Addictive Behaviors*. 1994; 19:33–39.10.1016/0306-4603(94)90049-3 [PubMed: 8197891]
- Preacher KJ, Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments & Computers*. 2004; 36(4):717–731.10.3758/BF03206553
- Rapee RM, Medoro L. Fear of physical sensations and trait anxiety as mediators of the response to hyperventilation in nonclinical subjects. *Journal of Abnormal Psychology*. 1994; 103(4):693–699.10.1037/0021-843X.103.4.693 [PubMed: 7822570]
- Reiss S, Peterson RA, Gursky M, McNally RJ. Anxiety, sensitivity, anxiety frequency, and the prediction of fearfulness. *Behaviour Research and Therapy*. 1986; 24:1–8.10.1016/0005-7967(86)90143-9 [PubMed: 3947307]
- Richards CS, Cohen LM, Morrell HER, Watson NL, Low BE. Treating depressed and anxious smokers in smoking cessation programs. *Journal of Consulting and Clinical Psychology*. 2013; 81(2):263–73.10.1037/a0027793 [PubMed: 22428940]
- Schmidt NB, Zvolensky MJ, Maner JK. Anxiety sensitivity: Prospective prediction of panic attacks and Axis I pathology. *Journal of Psychiatric Research*. 2006; 40(8):691–699.10.1016/j.jpsychires.2006.07.009 [PubMed: 16956622]
- Taylor S. Anxiety sensitivity and its implications for understanding and treating PTSD. *Journal of Cognitive Psychotherapy*. 2003; 17(2):179–186.10.1891/jcop.17.2.179.57431
- Taylor, S. Anxiety sensitivity: Theory, research, and treatment for the fear of anxiety. Mahwah, NJ US: Lawrence Erlbaum Associates Publishers; 1999.
- Taylor S, Zvolensky MJ, Cox BJ, Deacon B, Heimberg RG, Ledley DR, Cardenas SJ. Robust dimensions of anxiety sensitivity: Development and initial validation of the Anxiety Sensitivity Index-3. *Psychological Assessment*. 2007; 19(2):176–188.10.1037/1040-3590.19.2.176 [PubMed: 17563199]
- Vujanovic AA, Marshall EC, Gibson LE, Zvolensky MJ. Cognitive–affective characteristics of smokers with and without posttraumatic stress disorder and panic psychopathology. *Addictive Behaviors*. 2010; 35(5):419–425.10.1016/j.addbeh.2009.12.005 [PubMed: 20060228]
- Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*. 1988; 47:1063–1070.10.1037//0022-3514.54.6.1063 [PubMed: 3397865]
- West R, Hajek P. What happens to anxiety levels on giving up smoking? *American Journal of Psychiatry*. 1997; 154:1589–1592. [PubMed: 9356569]
- Wong M, Krajisnik A, Truong L, Lisha NE, Trujillo M, Greenberg JB, Leventhal AM. Anxiety sensitivity as a predictor of acute subjective effects of smoking. *Nicotine & Tobacco Research*. 2013; 15(6):1084–1090.10.1093/ntr/nts208 [PubMed: 23144083]
- Ziedonis D, Hitsman B, Beckham JC, Zvolensky M, Adler LE, Audrain-McGovern J, Riley WT. Tobacco use and cessation in psychiatric disorders: National Institute of Mental Health report.

- Nicotine & Tobacco Research. 2008; 10(12):1691–1715.10.1080/14622200802443569 [PubMed: 19023823]
- Zvolensky MJ, Bernstein A. Cigarette smoking and panic psychopathology. *Current Directions In Psychological Science*. 2005; 14(6):301–305.10.1111/j.0963-7214.2005.00386.x
- Zvolensky MJ, Bonn-Miller M, Bernstein A, Marshall E. Anxiety sensitivity and abstinence duration to smoking. *Journal of Mental Health*. 2006; 15(6):659–670.10.1080/09638230600998888
- Zvolensky MJ, Bogiaizian D, Salazar PL, Farris SG, Bakhshaie J. An anxiety sensitivity reduction smoking cessation program for Spanish-speaking smokers (Argentina). *Cognitive and Behavioral Practice*. In press. 10.1016/j.cbpra.2013.10.005
- Zvolensky MJ, Farris SG, Schmidt NB, Smits JAJ. The role of smoking inflexibility/avoidance in the relation between anxiety sensitivity and tobacco use and beliefs among treatment-seeking smokers. *Experimental and Clinical Psychopharmacology*. in press. 10.1037/a0035306
- Zvolensky MJ, Stewart SH, Vujanovic AA, Gavric D, Steeves D. Anxiety sensitivity and anxiety and depressive symptoms in the prediction of early smoking lapse and relapse during smoking cessation treatment. *Nicotine & Tobacco Research*. 2009; 11(3):323–331.10.1093/ntr/ntn037 [PubMed: 19246426]
- Zvolensky MJ, Vujanovic AA, Miller M, Bernstein A, Yartz AR, Gregor KL, Gibson LE. Incremental validity of anxiety sensitivity in terms of motivation to quit, reasons for quitting, and barriers to quitting among community-recruited daily smokers. *Nicotine & Tobacco Research*. 2007; 9(9): 965–975.10.1080/14622200701540812 [PubMed: 17763114]
- Zvolensky MJ, Yartz AR, Gregor K, Gonzalez A, Bernstein A. Interoceptive exposure-based cessation intervention for smokers high in anxiety sensitivity: A case series. *Journal of Cognitive Psychotherapy*. 2008; 22(4):346–365.10.1891/0889-8391.22.4.346

Figure 1.

Proposed conceptual mediation model

Notes: a = Effect of X on M; b = Effect of M on Y_i; c' = Direct effect of X on Y_i controlling for M; a*b = Indirect effect of M.

Table 1

Descriptive statistics and correlations for study variables ($n = 465$).

	2	3	4	5	6	7	8	9	10	M (SD) or n (%)
1. Gender (% Female) ^a	-.012	-.102 [*]	-.063	.134 ^{**}	.178 ^{**}	.079	-.011	.223 ^{**}	.283 ^{**}	225 (48.4)
2. Medical Problems ^a		-.092 [*]	.045	.025	.064	.008	-.025	.001	.028	137 (29.5)
3. AUDIT total ^a			.195 ^{**}	.244 ^{**}	.059	.212 ^{**}	-.114	.090	.047	6.2 (6.02)
4. Cannabis Use (% Y) ^a				.075	.018	.060	-.058	-.002	-.110 [*]	259 (55.7)
5. PANAS-NA ^a					.382 ^{**}	.630 ^{**}	.055	.371 ^{**}	.369 ^{**}	19.1 (7.07)
6. Emotional DX (% Y) ^b						.354 ^{**}	.128 ^{**}	.171 ^{**}	.261 ^{**}	158 (34.0)
7. ASI-3-Total ^c							.133 ^{**}	.319 ^{**}	.379 ^{**}	15.2 (12.30)
8. FTND-Total ^d								.197 ^{**}	.181	5.2 (2.27)
9. BCS-Total ^d									.511 ^{**}	24.9 (11.05)
10. Quit Problems ^d										2.0 (.67)

Note:

* $p < .05$;

** $p < .01$;

^a Covariates;

^b Predictor;

^c Mediator;

^d Criterion Variables

Gender = % listed are females; 0 = male; 1 = female; Medical Problems = Tobacco-related medical problems as indicated by the a medical history form; AUDIT Total = Alcohol Use Disorders Identification Test; Cannabis Use = Past 30 days cannabis use status per the Marijuana Smoking History Questionnaire; PANAS-NA = Positive and Negative Affect subscale; ASI-III = Anxiety Sensitivity Index-III; Emotional DX = Current (past year) anxiety or depressive disorder per the Structured Clinical Interview of DSM-IV-TR Disorders (SCID-I/NP); FTND = Fagerström Test for Nicotine Dependence – total score; BCS-Total = Barriers to Cessation Scale – Total score; # Quit Attempts = Number of lifetime serious quit attempts per the Smoking History Questionnaire; Quit Problems = Mean severity of problems experienced while quitting per the Smoking History Questionnaire (range 1–5); Columns numbers 2 – 10 correspond to the variables numbers in the far left column.

Table 2

Regression results for the mediation models ($n = 465$).

Y	Model	b	SE	t	p	CI (lower)	CI (upper)
1	EMO → ASI3 (a)	3.552	1.017	3.494	.0005	1.555	5.550
	ASI3 → FTND (b)	.029	.011	2.638	.009	.007	.051
	EMO → FTND (c')	.529	.243	2.177	.030	.052	1.001
	EMO → FTND (c)	.632	.241	2.621	.009	.158	1.106
	EMO → ASI3 → FTND (a*b)	.104	.050			.030	.235
2	ASI3 → BCS (b)	.130	.050	2.615	.009	.032	.228
	EMO → BCS (c')	-.273	1.097	-.249	.803	-2.429	1.882
	EMO → BCS (c)	.189	1.089	.173	.863	-1.952	2.329
	EMO → ASI → BCS (a*b)	.462	.230			.111	1.034
3	ASI3 → PROB (b)	.013	.003	4.411	<.0001	.007	.019
	EMO → PROB (c')	.107	.064	1.671	.095	-.019	.233
	EMO → PROB (c)	.152	.064	2.366	.018	.026	.279
	EMO → ASI3 → PROB (a*b)	.046	.018			.017	.089

Note. Path a is equal across all model; therefore, it presented only in the model with Y₁ to avoid redundancies. The standard error and 95% CI for a*b are obtained by bootstrap with 10,000 re-samples. EMO (Emotional Disorder) independent variable (X), ASI3 (anxiety sensitivity) is the mediator (M), and FTND (Nicotine dependence total score; Y₁), BCS (Barriers to Smoking Cessation total score; Y₂), and PROB (Number of quit problems experienced; Y₃) are the outcomes. CI (lower) = lower bound of a 95% confidence interval; CI (upper) = upper bound; → = affects.