Original Investigation

Anxiety and Smoking Cessation Outcomes in Alcohol-Dependent Smokers

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Abstract

Introduction: Anxiety-related characteristics, including anxiety sensitivity and trait anxiety, are elevated in individuals with alcohol and nicotine dependence and associated with greater difficulties with quitting smoking. However, little is known about how anxiety-related characteristics are related to smoking cessation outcomes in alcohol-dependent smokers. The present study, part of a larger smoking cessation clinical trial, examined associations between anxiety sensitivity, trait anxiety, nicotine withdrawal symptoms, smoking urges, and smoking cessation outcomes in a sample of 83 alcohol-dependent smokers.

Methods: Participants were enrolled in concurrent alcohol and tobacco treatment as part of a substance-abuse intensive outpatient program. Smoking cessation treatment was administered in a 3-week cognitive-behavioral format that included 8 weeks of open-label nicotine patch treatment. Information on nicotine withdrawal, smoking urges, and CO-confirmed smoking consumption rates was collected at baseline, quit date, end of behavioral treatment, and at a 1-month follow-up.

Results: Higher levels of anxiety sensitivity were associated with more smoking urges due to anticipation of negative affect relief at quit date. Higher levels of trait anxiety were associated with more smoking urges due to positive reinforcement and anticipation of relief of negative affect at quit date, as well as more severe nicotine withdrawal symptoms at the end of treatment. Levels of anxiety sensitivity and trait anxiety were not associated with Cox regression survival times to relapse.

Conclusion: These results indicate that for alcohol-dependent smokers, levels of anxiety sensitivity and trait anxiety are important to consider in the assessment and treatment of nicotine dependence.

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attitudes (Mullane et al., 2008; Zvolensky et al., 2007; Zvolensky, Bonn-Miller, Bernstein, & Marshall, 2006), one study did not find this relationship (Zvolensky et al., 2009).

Some research has suggested that alcohol-dependent individuals have higher levels of anxiety sensitivity compared with a nonclinical population (McNally, 1996). Elevated levels of anxiety sensitivity have been associated with drinking to cope with negative affect in nonclinical populations (DeMartini & Carey, 2011; Stewart & Zeitlin, 1995; Stewart, Zvolensky, & Eifert, 2001, 2002) and predict the development of alcohol-use disorders (Schmidt, Buckner, & Keough, 2007). In addition, individuals who drink alcohol and smoke report that they drink to cope with negative affect more than individuals who drink and who do not smoke, demonstrating that smoking may be an important affect regulation strategy for individuals who both drink and smoke (Novak et al., 2003). Because higher levels of anxiety sensitivity are predictive of alcohol and tobacco use, it follows that this factor may negatively impact smoking cessation efforts for persons suffering from both alcohol- and tobacco-use disorders.

Another anxiety-related factor, trait anxiety, has been associated with nicotine dependence and smoking behavior in some studies. Trait anxiety is conceptualized as the general tendency associated with nicotine dependence and smoking behavior in some tobacco-use disorders. Trait anxiety is conceptualized as the general tendency associated with nicotine dependence and smoking behavior in some tobacco-use disorders. To our knowledge, no studies have compared associations between anxiety sensitivity and trait anxiety to smoking cessation outcomes and smoking-related characteristics in alcohol-dependent smokers, such as nicotine withdrawal symptoms and smoking urges. One recent study by Johnson and colleagues evaluated whether state anxiety and anxiety sensitivity predicted acute nicotine withdrawal symptoms in the first 14 days of a smoking cessation attempt (Johnson, Stewart, Rosenfield, Steeves, & Zvolensky, 2012). The results of this study showed that both state anxiety, a temporary state of anxious responding, and anxiety sensitivity were associated with nicotine withdrawal symptoms over the period of the quit attempt. In those with higher levels of anxiety sensitivity, state anxiety was more strongly associated with nicotine withdrawal symptoms during the first couple of weeks of quitting than those with lower levels of anxiety sensitivity. However, to date, no studies have evaluated the relationships between anxiety sensitivity and trait anxiety, a longer standing pattern of anxious responding, to smoking cessation outcomes and characteristics in alcohol-dependent smokers.

The present study examined a) associations among anxiety sensitivity, trait anxiety, and smoking-related characteristics including urges to smoke, severity of nicotine dependence, and nicotine withdrawal; and b) associations between anxiety sensitivity, trait anxiety, and smoking cessation outcomes. Because difficulties with quitting smoking for those with elevated anxiety sensitivity appears to happen within the first few weeks of quit attempts (Brown et al., 2001; Zvolensky et al., 2006, 2007, 2009), we evaluated outcomes within the first few weeks of subjects' quit attempts. Given that anxiety sensitivity and trait anxiety are both associated with a higher likelihood of relapsing, it was expected that subjects with higher levels of anxiety sensitivity and trait anxiety would have a shorter time to relapse compared with subjects with lower levels of anxiety sensitivity and trait anxiety. In addition, it was expected that both anxiety sensitivity and trait anxiety would be associated with more nicotine withdrawal symptoms and smoking urges, particularly related to relief of negative affect, at the targeted quit date, end of treatment, and one-month follow-up. Because few data are available that examine how anxiety sensitivity and trait anxiety are associated with smoking outcomes and characteristics, we did not have specific hypotheses that one measure would differentially predict smoking outcomes or characteristics in alcohol-dependent smokers.

**Methods**

**Participants**

Participants consisted of 83 alcohol- and nicotine-dependent smokers who were enrolled in a three-week VA intensive outpatient substance-abuse treatment program (IOP). The IOP was comprised of 25h/week of treatment activities for 3 weeks and included the following components: coping skills training, motivational enhancement, life skills training, daily planning for sober living, individually tailored addictions medications, as well as assistance with psychiatric, vocational, legal, and medical issues. As part of a larger trial investigating concurrent alcohol and tobacco treatment, participants in the IOP, who were interested in quitting smoking and participating in a smoking cessation treatment study, also received 120 min of
manualized individual cognitive-behavioral smoking cessation treatment delivered during the three-week IOP; in addition to 8 weeks of the nicotine patch (21 mg x 4 weeks, 14 mg x 2 weeks, and 7 mg x 2 weeks). The mean age of participants was 49.82 (SD = 9.88), and participants included 80 men and 3 women. The breakdown of the sample by race is 56 (67.5%) Caucasian, 23 (27.7%) African American, 3 (3.6%) Hispanic, and 1 (1.2%) identified as other. About 56 (67.5%) were unemployed, 8 (9.6%) were disabled, 9 (10.8%) were competitively employed, 3 (3.6%) had sheltered employment, and 7 (8.4%) were retired. Fifty participants (60.2%) denied current drug use at the time of admission, 25 (30.1%) were being treated for cocaine abuse or dependence, 6 (7.2%) were being treated for cannabis abuse or dependence, and 2 (2.4%) were being treated for both cocaine and cannabis abuse and dependence. This study was approved by the VA Connecticut Institutional Review Board.

**Measures**

The Structured Clinical Interview for DSM-IV Axis I Disorders, Patient edition, version 2.0 (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1995), is an interview that assesses DSM-IV diagnostic criteria. The SCID Substance Use Disorders section was used to determine whether subjects meet inclusion/exclusion criteria for alcohol abuse/dependence, as well as drug abuse/dependence.

The Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1993; Reiss, Peterson, Gursky, & McNally, 1986) is a 16-item self-report questionnaire to assess fear of anxiety-related symptoms. The ASI has adequate test–retest reliability (r = 0.71–0.75; Peterson & Reiss, 1993), satisfactory internal consistency (α = 0.82–0.91; Peterson & Reiss, 1993), and good construct and criterion validity (Peterson & Reiss, 1993; Peterson & Heilbronner, 1987).

The Spielberger State-Trait Anxiety Inventory Form Y (STAI-S-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a well-known and psychometrically sound instrument, consisting of two 20-item scales assessing state and trait anxiety. Research on the concept of trait anxiety, using the State-Trait Anxiety Inventory (Spielberger et al., 1983), indicates that the trait anxiety scale not only measures anxiety but also broadly measures the trait-based tendency to experience negative affect (Bados, Gómez-Benito, & Balaquer, 2010; Biedling, Antony, & Swinson, 1998).

The questionnaires possess good internal consistency (α = 0.86–0.90; Spielberger et al., 1983) and good test–retest reliability (r = 0.76–0.86; Spielberger et al., 1983).

The Questionnaire for Smoking Urges-Brief (QSU-Brief; Cox, Tiffany, & Christen, 2001; Tiffany & Drobies, 1991) is a 10-item measure that evaluates the structure and function of smoking urges. The QSU scale characterizes urges to smoke in response to two separate affective systems: a) positive affect related to expectancy of reinforcement (QSU 1) and b) negative affect related to relief of withdrawal (QSU 2). The QSU-Brief has very good reliability for its two-factor model (α = 0.78–0.89).

The Fagerström Test for Nicotine Dependence (FTND; Payne, Smith, McCracken, McSherry, & Antony, 1994) is a six-item self-report measure of nicotine dependence. The FTND has shown good internal consistency and test–retest reliability (Heatherton, Kozlowski, Frecker, & Fagerström, 1991; Payne et al., 1994).

The Minnesota Nicotine Withdrawal Scale (MNWS; Hughes & Hatsukami, 1986) is a measure of nicotine withdrawal symptoms. It has good psychometric properties and convergent validity with other measures of nicotine withdrawal (Etter & Hughes, 2006).

Smoking abstinence was measured by self-reported cigarette abstinence, verified by carbon monoxide (CO) breath tests of ≤10 ppm, using a Vitalograph Carbon Monoxide monitor. CO-confirmed smoking outcomes were obtained at the targeted quit date, end of treatment, and one-month follow-up.

**Procedures**

About 83 alcohol- and nicotine-dependent smokers who were enrolled in a three-week intensive outpatient alcohol treatment program were invited to participate in a cognitive-behavioral smoking cessation treatment study. Half of the participants were randomized to a standard care CBT treatment (CBT) and half were randomized to receive additional financial incentives contingent on CO-confirmed tobacco abstinence following quit day (Frequent Brief Behavioral Intervention + Contingency Management; FBBI + CM). The CBT group received three 40-min sessions and the FBBI group received 12 ten-min sessions. Individuals in the FBBI + CM condition also received a contingency management intervention on and following their identified smoking quit date. The FBBI and CBT sessions were matched in content and total time (120 min), varied in session frequency and length. Treatment was manual guided, based on tobacco treatment clinical practice guidelines (Fiore et al., 2000; Fiore, Jaen, & Baker, 2008) and previous smoking cessation clinical trials (Cooney et al., 2003; Liss, McFetridge, Cooney, & Krishnan-Sarin, 2004). Information on treatment outcome for CBT vs. FBBI + CM conditions has been more extensively described in a separate report (Cooney et al., 2010); however, FBBI + CM was superior to CBT in predicting abstinence at the end of treatment, Nagelkerke $R^2$ = 0.12, but not at the one-month follow-up, Nagelkerke $R^2$ = 0.03. Approximately 78% of participants were adherent to the nicotine patch protocol, and only one participant was not adherent to counseling sessions.

All smoking cessation sessions were concurrent with IOP treatment. All tobacco treatment sessions were administered by a substance-abuse specialist (BA level or higher) with experience in behavioral smoking cessation treatments and training in the treatment manual. For both clinical interventions, breath CO and alcohol breath tests were assessed at every clinical session by the therapist to evaluate for tobacco and alcohol use, respectively.

**Statistical Analyses**

Means and standard deviations were calculated, and a series of bivariate correlations were employed to analyze associations between baseline ASI and STAI-T scores, and smoking-related measures (FTND, MNWS, QSU) at baseline, the targeted quit date, end of treatment, and one-month follow-up. Cox regression analyses were used to examine whether anxiety sensitivity and trait anxiety predicted survival time to relapse. Relapse was defined as smoking for seven consecutive days or for one day per week over two consecutive weeks (SRNT, 2002). Regression analyses examined whether levels of anxiety sensitivity and trait anxiety were associated with nicotine withdrawal symptoms.
at quit date, end of treatment, and one-month follow-up, controlling for smoking status (smoking or not smoking) and treatment condition (CBT or FBBI+CM). Baseline scores of each dependent variable were entered into the regression analyses as covariates for all prospective analyses. In the first step of regression analyses, all covariates were entered. In the second step, anxiety sensitivity or trait anxiety was entered, in addition to the covariates, and change in variance was calculated. In addition, to explore any potential relationships between different components of anxiety sensitivity and dependent variables, analyses were repeated using the two-factor taxonic model of anxiety sensitivity (AS psychological and AS physical concerns) discussed by Bernstein and colleagues (2007).

**Results**

**Correlations**

Means and standard deviations of study measures are presented in Table 1 and correlations of smoking-related measures with anxiety sensitivity and trait anxiety are in Table 2. Anxiety sensitivity and trait anxiety were positively associated with each other ($r = 0.51$, $p < .001$), and both were also positively associated with levels of nicotine dependence (see Table 2). In addition, levels of anxiety sensitivity and trait anxiety were not related to co-occurring drug abuse/dependence, ($r = -0.13$, $p = .248$ and $r = -0.03$, $p = .796$, respectively) or nicotine patch adherence ($r = 0.01$, $p = .937$ and $r = 0.06$, $p = .628$, respectively).

Anxiety sensitivity and trait anxiety scores were associated with more severe prequit nicotine withdrawal symptoms and smoking urges in response to relief of negative affect, but not smoking urges in response to positive reinforcement. At quit date, anxiety sensitivity and trait anxiety were positively associated with nicotine withdrawal symptoms, but not smoking urges. Finally, at the one-month follow-up, higher levels of anxiety sensitivity and trait anxiety were associated with nicotine withdrawal symptoms, but not smoking urges. Additionally, anxiety sensitivity and trait anxiety were related to positive reinforcement, but not anxiety sensitivity.

**Smoking Cessation Outcomes**

At quit date, 63.4% of participants were CO-confirmed smoking abstinence. At the end of treatment, 45.1% of participants were...
CO-confirmed smoking abstinent, and at the one-month follow-up, 35.0% of participants were CO-confirmed smoking abstinent. Treatment outcomes varied by condition (see Cooney et al., 2010). After controlling for treatment group (CBT vs. FBBI + CM), levels of anxiety sensitivity and trait anxiety did not predict Cox regression survival times to relapse (both \( p = .452 \)).

**Anxiety Sensitivity Regression Analyses**

**Smoking Urges in Relation to Positive Reinforcement**

Anxiety sensitivity was not significantly related to smoking urges at quit date, end of treatment, or the one-month follow-up (see Table 3).

**Smoking Urges in Anticipation of Negative Affect Relief**

At quit date, anxiety sensitivity was positively associated with smoking urges related to negative affect relief and accounted for 5% additional variance above baseline smoking urges, treatment group, or smoking status. However, no significant associations were observed between anxiety sensitivity and smoking urges related to relief of negative affect at the end of treatment and at 1 month after accounting for covariates (see Table 3).

**Nicotine Withdrawal Symptoms**

Anxiety sensitivity was not significantly related to nicotine withdrawal symptoms at quit date, end of treatment, or at one-month follow-up (see Table 3).

**Trait Anxiety Regression Analyses**

**Smoking Urges in Relation to Positive Reinforcement**

Trait anxiety was positively associated with smoking urges related to positive reinforcement at quit date, and explained an additional 7% of variance after accounting for baseline smoking urges, treatment group, and smoking status. However, trait anxiety was not a significant predictor of smoking urges related to positive reinforcement at the end of treatment or one-month follow-up (see Table 4).

**Smoking Urges in Anticipation of Negative Affect Relief**

At quit date, trait anxiety explained an additional 7% of variance after accounting for baseline smoking urges, treatment group, and smoking status (see Table 4). Individuals with higher levels of trait anxiety had more smoking urges related to negative affect relief. However, trait anxiety was not significantly related to smoking urges related to relief of negative affect at the end of treatment or at the one-month follow-up.

**Nicotine Withdrawal Symptoms**

Trait anxiety was not significantly related to nicotine withdrawal symptoms at quit date or at one-month follow-up (see Table 4). However, trait anxiety was significantly associated with nicotine withdrawal symptoms at the end of treatment, explaining an additional 6% of variance on top of treatment group, study condition, and smoking status. Participants with greater trait anxiety reported having more nicotine withdrawal symptoms at the end of treatment.

**Taxonic Model of Anxiety Sensitivity**

Cox regression analyses and linear regression analyses were repeated independently for the two AS taxonic model factors (AS physical and AS psychological concerns). Neither AS psychological or AS physical concerns predicted Cox regression survival times to relapse (\( p = .806 \) and \( p = .275 \), respectively). There were no significant regression analyses with the AS psychological concerns factor or the AS physical concerns factor at the quit date or at the end of treatment. At the one-month follow-up, elevated AS physical concerns were positively associated (\( p = .036 \)) with smoking urges related to relief of negative affect (\( R^2 = 0.29 \), \( F(4,71) = 7.21, p < .001, \Delta R^2 = .046, p = .036 \)).

**Discussion**

For alcohol-dependent smokers, anxiety sensitivity and trait anxiety were significantly associated but also appeared separate anxiety-related constructs which retained unique characteristics. Participants’ levels of anxiety sensitivity were only 0.6 SD units higher than the mean of a nonclinical sample (Peterson & Reiss, 1993), whereas levels of trait anxiety were 1.3 SD units higher than a community sample (Spielberger et al., 1983). Thus, levels of trait anxiety appeared particularly elevated in this sample of alcohol-dependent smokers. In addition, anxiety sensitivity and trait anxiety were both positively associated with level of nicotine dependence, which is consistent with previous research (Audrain et al., 1998; Difranza et al., 2004; Novak et al., 2003; Zvolensky et al., 2009).

Neither anxiety sensitivity nor trait anxiety was associated with smoking cessation outcomes in the present study. Research has shown that anxiety sensitivity may play a role in early lapse and relapse (Ameringer & Leventhal, 2010; Zvolensky et al., 2009), and individuals with elevated anxiety often have greater difficulty with quitting smoking (Lopes et al., 2002). It is possible that the intensive tobacco treatment administered during this trial may have attenuated early relapse rates, as short-term tobacco outcomes were fairly high. However, similar to the results in the present study, the relationship between anxiety-related characteristics and elevated risk of relapse has not always been consistently observed (e.g., Zvolensky et al., 2009). Zvolensky and colleagues (2009) postulated that anxiety disorders or symptoms rather than anxiety-related characteristics (e.g., anxiety sensitivity) may be a more effective clinical target during smoking cessation attempts. Future research should focus on identifying clinical targets for smoking cessation, particularly in populations who show significant difficulty with quitting, such as alcohol-dependent smokers.

Anxiety sensitivity and trait anxiety were both positively associated with many smoking-related characteristics, including levels of nicotine withdrawal symptoms and nicotine dependence. Of particular note are the strong relationships between prequit nicotine withdrawal symptoms and anxiety sensitivity, and most especially the relationship between trait anxiety and prequit nicotine withdrawal symptoms. As anxiety symptoms are a
Table 3. Regression Analyses of Anxiety Sensitivity, Smoking Urges, and Nicotine Withdrawal Symptoms

<table>
<thead>
<tr>
<th></th>
<th>Quit date</th>
<th>End of treatment</th>
<th>1-month follow-up</th>
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<tbody>
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<td></td>
<td>B</td>
<td>SE</td>
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<tr>
<td><strong>Step 1</strong></td>
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<tr>
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<td><strong>Step 2</strong></td>
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Note. ASI = The Anxiety Sensitivity Index; STAI-T = Spielberger State-Trait Anxiety Inventory Form Y Trait Anxiety Scale; QSU-1 = Questionnaire for Smoking Urges-Brief, Factor 1: Desire and Intention to Smoke with an Anticipation of Pleasure from Smoking; QSU-2 = Questionnaire for Smoking Urges-Brief, Factor 2: Anticipation of Immediate Relief from Negative Affect; MNWS = Minnesota Nicotine Withdrawal Scale.
Table 4. Regression Analyses of Trait Anxiety, Smoking Urges, and Nicotine Withdrawal Symptoms

<table>
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</table>

Note. ASI = The Anxiety Sensitivity Index; STAI-T = Spielberger State-Trait Anxiety Inventory Form Y Trait Anxiety Scale; QSU-1 = Questionnaire for Smoking Urges-Brief, Factor 1: Desire and Intention to Smoke with an Anticipation of Pleasure from Smoking; QSU-2 = Questionnaire for Smoking Urges-Brief, Factor 2: Anticipation of Immediate Relief from Negative Affect; MNWS = Minnesota Nicotine Withdrawal Scale.
common nicotine withdrawal symptom, it is not surprising to observe a significant relationship between nicotine withdrawal symptoms and measures of anxiety at both prequit and early postquit timepoints. These results support previous research that showed a relationship between severity of nicotine withdrawal and anxiety sensitivity (Johnson et al., 2012; Marshall, Johnson, Bergman, Gibson, & Zvolensky, 2009), and the results are consistent with other literature showing that individuals with higher levels of anxiety sensitivity have difficulty tolerating bodily sensations related to nicotine withdrawal or emotional states (Mullane et al., 2008; Zvolensky, Baker et al., 2004).

After accounting for baseline nicotine withdrawal symptoms, treatment group, and smoking status, the relationship between trait anxiety and nicotine withdrawal symptoms was only significant at the end of treatment (although at quit date, a positive relationship between trait anxiety and nicotine withdrawal symptoms was observed at a trend level). Because nicotine withdrawal symptoms are greatly reduced one-month postquit, it is expected that trait anxiety and nicotine withdrawal symptoms would not be significantly associated. However, surprisingly, anxiety sensitivity was not significantly related to postquit nicotine withdrawal symptoms at any timepoint in regression analyses. Because levels of anxiety sensitivity in the current sample appeared only slightly more elevated than the mean of a nonclinical sample (Peterson & Reiss, 1993), anxiety sensitivity may not be as important as trait anxiety in smoking cessation attempts for alcohol-dependent smokers.

Both trait anxiety and anxiety sensitivity were positively associated with smoking urges related to relief of negative affect on the targeted quit date after accounting for treatment group, smoking status, and baseline smoking urges. Smoking has been shown to relieve negative affect associated with abstinence from cigarettes (Parrott, Garnham, Wesnes, & Pincock, 2004), but not negative affect due to stress or other sources (Conklin & Perkins, 2005; Kassel, Stroud, & Paronis, 2003). The trait anxiety form of the STAI has also been found to be a broader measure of the tendency to experience negative affect, and therefore, the positive association between a measure of smoking urges related to the relief of negative affect and a measure of negative affect are consistent. It is unclear whether the participants felt that smoking could relieve negative affect due to nicotine withdrawal or stress. Relationships between smoking urges and anxiety measures did not hold up at the end of treatment or at the one-month follow-up. Overall, the lack of associations between smoking urges and anxiety measures at later timepoints may indicate that relief of negative affect due to acute nicotine withdrawal had an effect on smoking urges in those with elevated levels of anxiety. One exception to this pattern was the significant positive relationship between AS physical concerns and smoking urges related to relief of negative affect at the one-month follow-up. It is interesting that AS physical concerns are associated with urges to smoke related to relief of negative affect at the one-month follow-up, because a significant amount of time had elapsed since the experience of major physical symptoms of nicotine withdrawal. Further research using the taxonic model of anxiety sensitivity and smoking urges might help elucidate reasons for this association.

Elevated trait anxiety was positively associated with smoking urges related to positive reinforcement at the targeted quit date, but not anxiety sensitivity. In addition, the relationship between trait anxiety and smoking urges related to positive reinforcement was no longer significant at the end of treatment or the one-month follow-up. Thus, alcohol-dependent smokers with elevated levels of trait anxiety may show a heightened sensitivity for cigarettes as a reward than those with lower levels of trait anxiety at the very early stages of a quit attempt, whereas the same effect may not be prominent for individuals with elevated anxiety sensitivity. Because anxiety sensitivity is defined as the fear or intolerance of anxiety-related symptoms and sensations, it most closely maps onto cravings due to relief of these sensations elicited by nicotine withdrawal and smoking urges after quitting. Trait anxiety is a broader pattern of anxious responding, as well as negative affect, than anxiety sensitivity, and elevated levels of trait anxiety in alcohol-dependent smokers may be important to consider for cravings related to both reward and relief of negative affect in alcohol-dependent smokers. Overall, little research has evaluated the relationship between measures of anxiety, including trait anxiety and anxiety sensitivity, and different types of smoking urges (Ameringer & Leventhal, 2010). More research is needed to understand the relationship between anxiety and smoking urges in smokers, including alcohol-dependent smokers.

The present study supports the importance of targeting anxiety-related factors in quit attempts for alcohol-dependent smokers, particularly in the early stages of their quit attempts. Individuals with alcohol dependence are often concerned about quitting smoking, in part, because of fears that they will be anxious and have difficulty managing urges to smoke (Asher et al., 2003). This research supports that notion—the more anxious they generally are the more likely they are to have smoking urges related to positive reinforcement, anticipation of relief of negative affect, and more severe nicotine withdrawal symptoms. Though elevated trait anxiety or anxiety sensitivity may not increase risk of relapse in the first month following the end of treatment, it appears that for alcohol-dependent smokers, anxiety-related factors are associated with greater distress when quitting smoking. Because lifetime prevalence rates of smoking for individuals with alcohol use disorders are particularly high compared with individuals without a psychiatric disorder (65.9% vs. 39.1%) and quit rates for individuals with alcohol-use disorders are lower than those without a psychiatric disorder (34.0% vs. 42.5%; Lasser et al., 2000), specialized treatments for alcohol-dependent smokers that target factors that make it more difficult to quit smoking may improve success rates. Specialized smoking cessation interventions that target general patterns of anxious responding, and to a lesser extent, fear of anxiety-related bodily sensations, may make quit attempts easier for alcohol-dependent smokers in the early stages of recovery. For instance, cognitive-behavioral and acceptance and mindfulness-based strategies focused on reducing anxious responding during a concurrent attempt at abstinence from tobacco and alcohol may make it easier for alcohol-dependent smokers to tolerate nicotine withdrawal and smoking urges, thereby increasing their likelihood of adhering to their quit attempt in early recovery.

In the present study, we did not assess presence of other psychiatric disorders, including anxiety disorders, which are highly comorbid with alcohol- and tobacco-use disorders (Hasin, Stinson, Ogburn, & Grant, 2007; Lasser et al., 2000; Le Strat, Ramoz, & Gorwood, 2010), and associated with higher levels of nicotine dependence, nicotine withdrawal symptoms, and a lower likelihood of quitting smoking (Piper et al., 2011). However,
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recent research shows that having a comorbid psychiatric disorder, including anxiety disorders or substance-use disorders, does not increase the severity of nicotine withdrawal symptoms or relapse (Weinberger et al., 2010). Second, the present study followed participants for 1 month following the end of treatment, and alcohol-dependent smokers with higher levels of trait anxiety and/or anxiety sensitivity may be at elevated risk for relapse as more time passes. Future research should investigate the relationship between anxiety-related characteristics and smoking cessation outcomes over longer intervals. Furthermore, the present study focused on individuals with alcohol dependence with recent sobriety. It is unclear how anxiety-related factors may influence the outcomes of quit attempts either before abstinence from alcohol or with longer periods of abstinence. Research on how anxiety interacts with the length of sobriety may provide more important information on how targeting anxiety-related factors in treatment can help improve smoking cessation treatment for this specific population. Differences in how treatment was conducted, including the presence of incentives for half of the participants, could have affected observed results of the present study; however, we included study condition as a covariate in all analyses except bivariate correlations. Finally, a lack of significance in some regression analyses may be due to somewhat limited statistical power, and further research on the associations between trait anxiety and anxiety sensitivity with smoking outcomes and related characteristics is necessary with larger samples of alcohol-dependent smokers.

In summary, results from the present study indicate that for alcohol-dependent smokers, levels of anxiety sensitivity and, in particular, trait anxiety are important to consider in the assessment and treatment of nicotine dependence in individuals with alcohol dependence. Future research may be useful to study whether managing these anxiety characteristics during smoking cessation can assist alcohol-dependent smokers reduce craving and nicotine withdrawal. Such research could shed light on new treatment approaches to improve smoking cessation outcomes for alcohol-dependent smokers, including the development of smoking cessation treatments that specifically target fear or distress associated with anxiety-related sensations and coping skills training for anxiety.

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Declaration of Interests

None declared.

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