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Anxiety Sensitivity in Relation to Quit Day Dropout among Adult Daily Smokers Recruited to Participate in a Self-Guided Cessation Attempt

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Abstract

Anxiety sensitivity (AS; fear of anxiety and internal sensations) has been implicated in a variety of aspects of smoking, including difficulties achieving and maintaining abstinence during tobacco cessation. However, research has yet to evaluate whether AS impacts premature termination of initiating a quit attempt. Therefore, the aim of the present investigation was to explore the extent to which AS was associated with tobacco cessation dropout, as indexed by attendance on the scheduled quit day visit. Participants included 84 adult daily cigarette smokers (61.7% male; $M_{age} = 34.6$ years, $SD = 13.9$), who were recruited to participate in a self-guided quit attempt (an attempt to quit smoking without professional or pharmacological aid). Results indicated that after controlling for the effects of participant sex, race, current (past month) psychological disorder, cigarettes smoked per day, number of years as a regular smoker, and pre-quit levels of motivation to quit, AS significantly predicted increased odds of study dropout prior to attending the scheduled

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Contributors

Drs. Langdon and Zvolensky designed the study and wrote the protocol. Ms. Farris, Dr. Hogan, and Dr. Grover provided ongoing input on the conceptualization of findings. Dr. Langdon conducted the statistical analysis and wrote the first draft of the manuscript. All authors commented on and edited the manuscript throughout, and approved the final version.

Conflict of Interest

All authors declare that they have no conflicts of interest.

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quit day. These findings suggest that AS may be a mechanism involved with challenges in the initiation of quitting.

Keywords

Smoking; Cessation; Quitting; Anxiety Sensitivity

1. Introduction

In order to more fully understand why certain smokers may fail to engage in treatment and/or undergo a quit attempt, research has begun to examine the concept of “premature termination,” which reflects to those individuals who drop out of study participation prior to entering treatment or initiating a quit attempt (Namenek Brouwer & Pomerleau, 2000). These investigations indicate that characteristics such as being male, younger age, less education, less readiness to quit, history of psychotropic medication usage, and concerns regarding weight gain are associated with increased risk for dropout (Ahluwalia et al., 2002; Copeland, Marin, Geiselman, Rash & Kendzor, 2006; Curtin, Brown & Sales, 2000; Pawlina, Rondina, Espinosa, Botelho, 2016). A related body of work suggests that ethnic minorities, particularly African-American individuals, evidence higher rates of treatment dropout (Diaz, Woods, Rosenheck, 2005; Lesser et al., 2011). Yet, there presently is little attention focused on exploring what cognitive-affective processes may influence the decision to prematurely terminate cessation attempts. To our knowledge, only one study examined distress intolerance (perceived and/or actual behavioral inability to withstand exposure to aversive experiential states; Simons & Gaher, 2005), documenting that higher intolerance for distress was associated with greater likelihood of dropout from smoking cessation treatment (MacPherson, Stipelman, Duplinsky, Brown, & Lejuez, 2008).

Anxiety sensitivity (AS), defined as the fear of anxiety and internal sensations (McNally, 2002; Reiss & McNally, 1985), is a cognitive factor that be useful in understanding cessation dropout. Research suggests that AS is related to motivation to quit smoking (Zvolensky et al., 2004), greater perceived barriers to quitting smoking (Zvolensky, Vujanovic et al., 2007), and greater odds of early smoking lapse (Brown, Kahler, Zvolensky, Lejuez & Ramsey, 2001) and relapse (Assayag, Bernstein, Zvolensky, Steeves, & Stewart, 2012; Zvolensky, Bernstein et al., 2007; Zvolensky, Bonn-Miller, Bernstein, & Marshall, 2006; Zvolensky, Stewart, Vujanovic, Gavric, & Steeves, 2009). Other work has documented that AS may be related to negative expectancies about anticipated short-term psychological and physiological consequences of abstaining from smoking (Abrams, Zvolensky, Dorman, Gonzalez, & Mayer, 2011; Farris, Langdon, DiBello, & Zvolensky, 2015). Drawing from AS-smoking models (Leventhal & Zvolensky, 2015; Zvolensky & Bernstein, 2005), smokers higher in AS, compared to lower, may be more apt to excessively worry about the stress of quitting and the expected aversive internal experiences associated with smoking deprivation (e.g., nicotine withdrawal, negative emotional states). Thus, higher AS smokers may be more prone to terminate a smoking quit attempt even before they formally initiate it (Lejuez et al., 2008).

The aim of the present investigation was to examine the extent to which AS was related to quit day dropout. We hypothesized that participants characterized by higher baseline levels of AS, relative to lower, would be significantly more likely to drop out of the study prior to engaging in a self-guided quit attempt (i.e., an attempt to quit smoking without professional or pharmacological aid).

2. Method and Materials

2.1 Participants

Participants included 84 adult daily cigarette smokers (61.7% male; $M_{age} = 34.6$ years, $SD = 13.9$) who were recruited to participate in a self-guided quit attempt. Regarding ethnic background, 82.1% of participants identified as Caucasian, 9.5% identified as African-American, 4.8% identified as “more than one race,” 1.2% identified as Asian, 1.2% identified as American Indian, and 1.2% identified as “other.” Prior to initiating a quit attempt, participants reported smoking an average of 16.2 cigarettes ($SD = 10.3$) per day and endorsed low levels of nicotine dependence ($M = 3.6$, $SD = 1.9$). Participants reported initiating smoking daily at a mean age of 17.7 years ($SD = 4.1$) and smoking regularly for an average of 14.9 years ($SD = 13.1$). Participants reported an average of 3.2 ($SD = 2.5$) ‘serious’ lifetime quit attempts. Approximately 40.7% of the sample met criteria for current (past month) psychological disorder.

Study inclusion criteria included: (1) being between 18 and 65 years of age; (2) being a regular daily smoker (minimum of 8 cigarettes per day) for at least one year; (3) motivation to quit smoking of at least 5 on a 0–10 point scale; and (4) not having decreased the number of daily cigarettes smoked by more than half in the past six months. Exclusion criteria included: (1) limited mental competency and the inability to give informed consent; (2) pregnancy; (3) current use of nicotine replacement therapy and/or smoking cessation counseling; (4) current or past history of psychotic-spectrum symptoms or disorders; (5) current substance dependence; (6) suicidality; and, (7) any current use of psychotropic medication, taken PRN.

2.2 Measures

Anxiety Sensitivity Index - III (ASI-III)—The ASI-III is an 18-item self-report measure which assesses sensitivity to, and discomfort with, physical sensations (Taylor et al., 2007). Participants are instructed to rate the degree to which they believe the 18 statements apply to them (e.g., “It scares me when my heart beats rapidly”) on a Likert-type scale from 0 (“very little”) to 4 (“very much”). Recent research has noted that when utilizing a continuous measurement of AS, it is optimally derived from the combined scores on the physical and cognitive subscales, while omitting the items related to the social subscale (Bernstein et al., 2010). Thus, the present investigation utilized a composite score derived from these two subscales ($\alpha = .93$).

Fagerstrom Test for Nicotine Dependence (FTND)—The FTND is a six-item scale designed to assess gradations in tobacco dependence (Heatherton et al., 1991). Although the FTND has demonstrated questionable psychometric properties, including poor internal

consistency (Burling & Burling, 2003; Sledjeski et al., 2007; Steinberg et al., 2005), it remains one of the most commonly used measures of nicotine dependence ($\alpha = .56$).

Motivation to Quit Smoking (MTQ)—The MTQ measure is based on the stages of change research conducted by Prochaska and colleagues (Rundmo, Smedslund, & Gotestam, 1997) to determine a participant's pre-cessation motivation to quit smoking.

Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Non-Patient Version (SCID-I/NP)—Diagnostic exclusions and incidence of current (past month) psychological disorders were assessed via the SCID-I/NP (First et al., 1995). Interviews were audio-taped and the reliability of a random selection of 10% of interviews was checked for accuracy. No disagreements were observed between the SCID interviewer and outside rater regarding diagnoses.

Smoking History Questionnaire (SHQ)—The SHQ is a self-report measure used to collect descriptive information regarding smoking history and pattern (Brown, Lejuez, Kahler, & Strong, 2002)

2.3 Procedure

Participants were recruited to take part in a larger study examining barriers to successful smoking cessation (Langdon, Farris, Øverup, & Zvolensky, in press). Individuals who responded to advertisements for a research study on “quitting smoking” were screened by telephone to determine initial eligibility. Potentially eligible participants ($n = 193$) were then scheduled for an in-person appointment to determine final eligibility and collect baseline data. Upon arrival at the laboratory, participants provided informed consent and were administered the SCIDI-I/NP by a trained graduate student ($n = 122$). Participants biochemically verified their smoking status by expired carbon monoxide analysis of breath samples and completed a packet of self-report questionnaires. All participants, regardless of eligibility, were compensated \$20 for participating in the baseline session. Eligible participants were then invited to complete a self-guided quit attempt, and were scheduled for a quit day to take place approximately 14 days following the baseline session ($n = 84$). On quit day, participants were scheduled to come back to the laboratory to verify abstinence and to complete self-report measures. Participants were compensated an additional \$10 for completing the quit day assessment. Study recruitment occurred at two sites -- University of Vermont, Burlington, VT, USA ($n = 69$) and University of Houston, Houston, TX, USA ($n = 15$) -- at which identical procedures were executed.¹ The procedures followed were in accord with the standards of the Committee on Human Experimentation of the institution in which the experiments were done.

¹The two recruitment sites—University of Vermont and University of Houston—were compared via independent samples t-tests and Chi Square analyses on descriptive and baseline variables. With regard to race, participants recruited from the University of Houston were more likely to classify their race as minority (i.e., non-Caucasian) as compared to participants recruited from the University of Vermont (75.6% and 4.7%, respectively; $\chi^2 = 32.87, p < .001$). Additionally, participants recruited from the University of Houston endorsed a significantly greater number of past week cigarettes smoked per day as compared to those recruited from the University of Vermont ($M = 24.58, SD = 22.72$ and $M = 15.91, SD = 6.92$, respectively; $t(80) = -2.62, p < .01$). Given these observed differences between recruitment sites, race and number of cigarettes per day were included as covariates in the present analyses.

2.4 Data Analytic Strategy

Zero-order correlations were first obtained to examine relations between the predictor and criterion variables. Subsequently, the two groups (i.e., dropout vs. attended) were compared via independent samples t-tests and Chi Square analyses on descriptive and baseline variables. Finally, a hierarchical logistic regression analysis was performed to test the association between AS and quit day attendance status. At step 1 of the model, participant sex (0 = Male; 1 = Female), race (0 = Caucasian; 1 = Minority), current psychological disorder (0 = No; 1 = Yes), average number of cigarettes per day, total number of years as a regular smoker, and pre-quit levels of motivation to quit smoking were included as covariates. At step 2 of the model, the composite score of AS was entered.

3. Results

As predicted, quit day attendance was significantly (negatively) associated with AS ($r = -.30, p < .01$) as well as minority race ($r = -.22, p < .05$). Additionally, as expected, AS was significantly (positively) associated with female sex ($r = .27, p < .01$) and the presence of a current Axis I diagnosis ($r = .34, p < .01$). Regarding smoking characteristics, average cigarettes smoked per day was significantly (positively) related to total number of years as a regular smoker ($r = .28, p < .01$). Finally, minority race was significantly (positively) associated with the presence of a current Axis I diagnosis ($r = .18, p < .05$) and average cigarettes smoked per day ($r = .28, p < .05$), as well as negatively associated with pre-quit motivation to quit ($r = -.34, p < .01$).

The two groups differed significantly as a function of race, pre-quit levels of motivation to quit smoking, as well as AS. Specifically, those who dropped out of the study prematurely: a) were more likely to report that they were a racial minority; b) endorsed lower levels of motivation to quit prior to cessation; and c) endorsed higher levels of AS (see Table 1).

Regression results are presented in Table 2. At level 1 of the model, none of the proposed variables were significantly related to quit day attendance status. However, at level 2 of the model, as expected, AS significantly predicted quit day attendance status above and beyond the covariates. Here, higher levels of AS were uniquely associated with increased odds of quit day dropout.

4. Discussion

As hypothesized, results indicated that AS was significantly related to increased risk of terminating study participation prior to quit day. Notably, the observed AS effect was evident even after controlling for a wide range of other factors (e.g., race, sex, current psychological disorder, average number of cigarettes per day, total number of years as a regular smoker, motivation to quit). Previous studies have suggested that a cut-off score of >13 (based upon the combined scores on the physical and cognitive subscales of the AS) represents a “high risk” class, while scores <13 represents a “low-risk” class. Inspection of the mean levels of AS in the two groups revealed that participants in the dropout group endorsed clinically-significant levels of AS ($M = 13.38$), yet participants in the attended group did not ($M = 7.12$). These findings are consistent with past work documenting that AS

may be an important cognitive mechanism involved with substance use treatment dropout (Lejuez et al., 2008), and uniquely extends this work to quit day dropout among adult daily smokers. Additionally, the current study extends previous premature termination findings, which have largely focused on treatment-seeking smokers recruited to engage in psychosocial-pharmacological therapy (Ahluwalia et al., 2002; Copeland et al., 2006; Curtin et al., 2000), to smokers attempting to quit on their own. This detail is noteworthy given that only 31.7% of current smokers report using counseling and/or medications to facilitate cessation (CDC; 2011).

At least four study limitations warrant comment. First, although participants were recruited from both northeastern and southern cities, the sample was still relatively limited with regard to race/ethnicity (approximately 82% Caucasian). Second, quit day dropout was quantified by whether or not a participant attended the quit day assessment. While we theorized that the majority of participants made the decision to terminate participation due to concerns over quitting (e.g., greater perceived barriers), this model was not directly evaluated. Third, the current investigation was comprised of a relatively small sample size ($n = 84$), and inspection of the confidence interval (.89-.99) suggests that although this test reached statistical significance, the magnitude of findings may be small. Replication of these findings in studies with larger sample sizes is recommended to more adequately quantify how AS impacts cessation dropout. Finally, past work has identified a variety of factors being related to dropout of initiating cessation despite expressing a previous desire to quit, including less education, less readiness to quit, distress tolerance, and related variables (Ahluwalia et al., 2002; Copeland et al., 2006; Curtin et al., 2000; MacPherson et al., 2008). We controlled for a wide range of potential factors that could be related to early dropout from a quit attempt. However, we naturally could not adjust for all possible predictors of dropout. Future work could continue to build multi-risk factor models of cessation dropout by incorporating other promising cognitive-affective variables, such as distress tolerance.

5. Conclusions

The present data suggest that high AS smokers interested in quitting may benefit from initial adjunctive Motivational Interviewing-based intervention or social support to bolster 'follow-through efforts' for quitting. These types of interventions may help to promote self-efficacy for change, thereby increasing interest and confidence in smoking cessation.

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Highlights

- Anxiety sensitivity is associated with increased odds of tobacco cessation dropout.
- Anxiety sensitivity may be an important mechanism involved with challenges in the initiation of quitting.
- Smokers characterized by high levels of anxiety sensitivity may benefit from initial adjunctive Motivational Interviewing-based intervention or social support to bolster follow-through efforts for quitting.

Table 1

Baseline Characteristics as a Function of Quit Day Attendance Status

Baseline Variables	Dropout (<i>n</i> = 26)	Attended (<i>n</i> = 58)
Age	34.00 (13.46)	34.83 (14.22)
Sex (% Male)	53.8%	65.5%
Race (% Caucasian)*	67.9%	86.2%
Axis I (% Yes)	50%	37.9%
Live/Smok (% Yes)	42.3%	43.1%
Cig/Day	19.92 (13.52)	15.98 (9.54)
Yrs/Smok	15.33 (11.11)	16.89 (13.97)
Past Quit	3.00 (2.60)	3.28 (2.48)
MTQ*	7.18 (1.12)	7.28 (.89)
AS*	13.38 (11.44)	7.12 (8.11)

*Note:**
 $p < .05$,**
 $p < .01$.

Age = participant age at baseline assessment; *Sex* = participant sex (0 = male, 1 = female); *Race* = participant race (0 = Caucasian, 1 = Minority); *Axis I* = current Axis I diagnosis (0 = no diagnosis, 1 = meets criteria for diagnosis within past month; SCID-NP; First et al., 1995); *Live/Smok* = whether participant lived with a smoker at the time of baseline assessment (0 = no, 1 = yes; SHQ; Brown et al., 2002); *Cig/Day* = past week average cigarettes smoked per day (SHQ; Brown et al., 2002); *Yrs/Smok* = total number of years as a regular smoker (SHQ; Brown et al., 2002); *Past Quit* = total number of past “serious” quit attempts (SHQ; Brown et al., 2002); *MTQ* = level of motivation to quit smoking endorsed at baseline (MTQ; Rundmo et al., 1997); *AS-HR* = composite score of the physical and cognitive subscales of the Anxiety Sensitivity Index-III (ASI-III; Taylor et al., 2007).

Table 2

Logistic Regression Analysis: Anxiety Sensitivity Predicting Quit Day Attendance Status

	<i>Exp(β)</i>	95% CI	Wald	<i>p</i>
<i>Level 1</i>				
Sex	1.45	.47–4.46	.43	ns
Race	.94	.21 – 4.19	.01	ns
Axis I	1.14	.36 – 3.59	.05	ns
Cig/Day	.97	.92 – 1.02	1.68	ns
Yrs/Smok	1.02	.98 – 1.07	.74	ns
MTQ	.88	.49 – 1.59	.17	ns
<i>Level 2</i>				
AS	.94	.89 – .99	3.95	<.05

Sex = participant sex (0 = male, 1 = female); *Race* = participant race (0 = Caucasian, 1 = Minority); *Axis I* = current Axis I diagnosis (0 = no diagnosis, 1 = meets criteria for diagnosis within past month; SCID-NP; First et al., 1995); *Cig/Day* = past week average cigarettes smoked per day (SHQ; Brown et al., 2002); *Yrs/Smok* = total number of years as a regular smoker (SHQ; Brown et al., 2002); *MTQ* = level of motivation to quit smoking endorsed at baseline (MTQ; Rundmo et al., 1997); *AS* = composite score of the physical and cognitive subscales of the Anxiety Sensitivity Index-III (ASI-III; Taylor et al., 2007).