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Respiratory problems and anxiety sensitivity in smoking lapse among treatment seeking smokers

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HIGHLIGHTS

- Lower respiratory symptoms and anxiety sensitivity predicted risk for lapse.
- Interactive model between lower respiratory symptoms and greater anxiety sensitivity
- Greater respiratory symptoms and high anxiety sensitivity may relate to early lapse.

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ABSTRACT

Purpose: The current study examined whether the interaction of lower respiratory symptoms and anxiety sensitivity is related to smoking lapse in the context of smoking cessation.
Method: Participants were adult daily smokers ($N = 60$) exposed to the World Trade Center (WTC) disaster who were in a smoking cessation treatment program (75.0% male, 50.6 years old [$SD = 9.2$], and current smoking rate was 17.6 cigarettes per day ($SD = 10.6$).
Results: Results indicated that the interaction between lower respiratory symptoms and anxiety sensitivity was a significant predictor of greater risk for lapse (i.e., lower survival time; $B = 0.005$, $OR = 1.01$, $p = 0.039$). Follow-up analysis showed that greater respiratory symptoms were a significant predictor of lapse risk among those with high ($B = 0.116$, $OR = 1.12$, $p = 0.025$), but not those with low ($B = -0.048$, $OR = 0.95$, $p = 0.322$), levels of anxiety sensitivity.
Discussion: The findings from the current study suggest that smokers with greater respiratory symptoms and higher levels of anxiety sensitivity may be associated with early lapse to smoking following smoking cessation treatment. Future work has the potential to inform the development of tailored cessation interventions for smokers who experience varying levels of lower respiratory symptoms and anxiety sensitivity.

1. Introduction

Respiratory illness is a hallmark physical health problem among people exposed to the 2001 World Trade Center (WTC) disaster. For example, research suggests > 40% of individuals exposed to WTC report lower respiratory symptoms (e.g., shortness of breath, chest tightness, wheezing) years after 9/11 (Kotov et al., 2015). Smoking is more common among individuals with respiratory illness compared to those without (Gwynn, 2004; McLeish, Cougle, & Zvolensky, 2011). Smoking is also overrepresented among WTC responders and other trauma-exposed individuals (Nandi, Galea, Ahern, & Vlahov, 2005; Vlahov et al., 2002). Smoking negatively impacts respiratory symptoms and illness, as it is related to greater severity, poorer symptom control, more frequent healthcare utilization, and decreased effectiveness of commonly used respiratory medications (e.g., inhaled corticosteroids; Althuis, Sexton, & Prybylski, 1999; Chaudhuri et al., 2008; Eisner & Iribarren, 2007; Lazarus et al., 2007; McLeish & Zvolensky, 2010; Siroux, Pin, Oryszczyn, Le Moual, & Kauffmann, 2000). Yet, there

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is limited empirical data focused on the role of respiratory symptoms in terms of smoking behavior during quit attempts, and of the available work, the data are inconsistent (Fennerty, Banks, Ebden, & Bevan, 1987; Gratziou et al., 2014).

Inconsistent findings in past work on respiratory symptoms and smoking cessation outcome may suggest that there are other factors that help explain success in quitting. One such factor might be anxiety sensitivity, the fear of anxiety-relevant sensations (Leventhal & Zvolensky, 2015). This individual difference factor is potentially important because a smoker with respiratory symptoms who has greater compared to lower anxiety sensitivity is more likely to be emotionally reactive to somatic sensations or stressors (e.g., managing medical regimes; Zvolensky, Eifert, Feldner, & Leen-Feldner, 2003). This type of perspective would suggest that respiratory symptoms may be related to earlier smoking behavior (i.e., lapse) in attempts to quit when anxiety sensitivity levels are higher compared to lower. The prediction of early lapse behavior is centrally important from a public health perspective, as a significant percentage of smokers attempting cessation lapse to smoking within a matter of days (e.g., > 50%) and few of these individuals recover to achieve abstinence (e.g., Brown et al., 2001). Past work has found that women report higher levels of anxiety sensitivity (e.g., Schmidt & Koselka, 2000).

The present study examined anxiety sensitivity in the context of examining associations between respiratory symptoms and smoking cessation in a sample of treatment-seeking smokers exposed to the WTC disaster. Greater respiratory problems were expected to be related to smoking lapse among those with high, but not those with low, levels of anxiety sensitivity.

2. Methods

Adult daily smokers (n = 60) were enrolled into a smoking cessation treatment study for individuals exposed to the WTC disaster (Gonzalez et al., 2016). Participants were recruited from the WTC Health Program, the New York City Department of Health WTC Health Registry, local newspapers and Craigslist-New York. Study inclusion criteria were smoking five or more cigarettes per day, motivation to quit smoking, interest in smoking cessation treatment, direct exposure to the WTC disaster (e.g., responding to the event or witnessing it in person), and scoring at least in the intermediate range (30 or greater; Andrykowski, Cordova, Studts, & Miller, 1998) on the Post-traumatic Stress Disorder Checklist (PCL-S; Weathers, Litz, Herman, Huska, & Keane, 1993). Participants were ineligible for the study if they were currently participating in other smoking cessation treatment, or were suffering from psychosis, mania, or alcohol dependence.

The sample was mostly (n = 45; 75.0%) male, with an average age of 50.6 (SD = 9.2). Regarding race, 66.7% (n = 40) identified as White, 26.7% (n = 16) Black/African American, 1.7% (n = 1) Asian, and 5.0% (n = 3) "other/multi-racial." Additionally, 16.7% (n = 10) identified ethnically as Hispanic. The current smoking rate was 17.6 cigarettes per day (SD = 10.6). On average, moderate levels of nicotine dependence were reported, as indicated by the Fagerström Test for Cigarette Dependence (FTCD; Fagerström, 1978; M = 5.5; SD = 1.7).

2.1. Measures

2.1.1. Structured clinical interview for DSM-IV disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 2007)

The SCID is a clinician-administered diagnostic assessment used to assess the presence of psychopathology. It was administered by a trained clinical psychologist at baseline.

2.1.2. Posttraumatic Stress Disorder Checklist, specific version (PCL-S; Weathers et al., 1993)

The PCL-S is a self-report measure of PTSD symptom severity. For the current study, instructions were tailored to capture symptoms "in relation to 9/11." Baseline PCL-S scores were used in the current study (α = 0.90).

2.1.3. Fagerstrom Test of Cigarette Dependence (FTCD; Fagerström, 1978)

The FTCD is a 6-item measure of "cigarette dependence" (Fagerström, 2012; Heatherton, Kozlowski, Frecker, & Fagerström, 1991).

2.1.4. Time line follow-back for daily cigarette use (TLFB; Sobell & Sobell, 1996)

Retrospective self-report of cigarettes smoked per day was collected from participants, beginning with the period 2 weeks prior to baseline assessment and continuing weekly throughout treatment, and at follow-ups. A lapse was defined as any smoking, even a single puff and relapse was defined as smoking, at least five cigarettes, during 3 consecutive days (Shiffman, 1986; Shiffman et al., 2006).

2.1.5. Biochemical verification

Self-reported abstinence on the TLFB was verified using two assays. Saliva cotinine was assessed at 2-weeks post-quit day (session 8) and at each follow-up. Saliva samples were frozen and analyzed by an outside laboratory for cotinine level using radioimmune assay. Carbon monoxide (CO) analysis of breath samples with a Vitalograph Breathco CO monitor (Jarvis, Tunstall-Pedoe, Feyerabend, Vesey, & Saloojee, 1987) was used to assess abstinence at quit day, sessions 7 and 8, and at each follow-up assessment. Detected CO values > 5 ppm or cotinine levels > 15 ng/ml indicated current smoking (Benowitz et al., 2002; Perkins, Karelitz, & Jao, 2013).

2.1.6. Anxiety sensitivity index-3 (ASI-3; Taylor et al., 2007)

The ASI-3 is an 18-item self-report measure of anxiety sensitivity (Reiss & McNally, 1985). The ASI-3 was administered at baseline (α = 0.93).

2.1.7. Lower respiratory symptoms (LRS)

The severity of six lower respiratory symptoms (shortness of breath, chest tightness, wheezing, dry cough, productive cough, and overall difficulty breathing) was measured using a scale employed successfully in past work (Waszczuk et al., 2017). Participants rated the degree to which each symptom was a problem in the past week on a 5-point Likert-type scale ranging from 0 (*none*) to 4 (*almost a constant problem*). For LRS, past work suggests test-retest reliability is high (r = 0.79 for one week retest) and inter-item correlation of r = 0.40 suggests that the items are not redundant (Waszczuk et al., 2017). The LRS scale was administered at baseline (α = 0.80).

2.2. Procedures

See Gonzalez et al. (2016) for a detailed description of the procedure. Participants were compensated as follows: $50 for completing the baseline assessment; $50 bonus for attending all sessions; $30 for each follow-up; and $50 bonus for completing all follow-up assessments (i.e., up to $300). The study was approved by the Stony Brook University Institutional Review Board. The current tests represent a secondary analysis of the larger investigation.

2.3. Data analytic approach

A continuous variable (days to lapse) was created based on the numbers of days (via TLFB) from quit-day to first lapse (if present) and from lapse day to relapse day (if present) between baseline and 26-week follow-up. A dependent dichotomous variable was coded for the presence of a lapse after quit day (0 = no lapse; 1 = lapse). The prediction of "survival time" (number of days) before a lapse event occurred was evaluated by a hierarchal Cox proportional-hazard regression model. In the first step, the following covariates were entered: participant sex,