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Main and Interactive Effects of Anxiety Sensitivity and Physical Distress Intolerance with regard to PTSD Symptoms among Trauma-Exposed Smokers

Samantha G. Farris, M.A.^{1,*}, Anka A. Vujanovic, Ph.D.², Julianna Hogan, M.Ed.^{1,3}, Norman B. Schmidt, Ph.D.⁴, and Michael J. Zvolensky, Ph.D.^{1,5}

¹University of Houston, Department of Psychology

²University of Texas Health Science Center at Houston, Department of Psychiatry and Behavioral Sciences

³University of Vermont, Department of Psychology, University of Vermont

⁴Florida State University, Department of Psychology

⁵The University of Texas MD Anderson Cancer Center, Department of Behavioral Science

Abstract

The present study examined the roles of anxiety sensitivity (AS; the tendency to misinterpret physical internal sensations of harmful) and distress tolerance (the capacity to tolerate aversive stimuli) in terms of the expression of posttraumatic stress disorder (PTSD) symptoms among a sample of trauma-exposed, treatment-seeking tobacco smokers ($n = 137$; $M_{age} = 37.7$, 48.2% female). It was hypothesized that higher AS and lower physical distress tolerance would interact to predict greater PTSD avoidance and hyperarousal symptoms. Results were partially consistent with prediction. Specifically, there was a significant interactive effect of AS by physical distress tolerance in terms of PTSD hyperarousal symptom cluster severity. The form of the interaction was in the expected direction, with the highest levels of PTSD hyperarousal symptoms reported among smokers with higher levels of AS and lower capacity to tolerance physical distress. Findings underscore the importance of considering AS and physical distress tolerance in terms of better understanding mechanisms underlying the expression of PTSD symptoms among trauma-exposed smokers.

Keywords

Trauma; PTSD; Smoking; Tobacco; Stress; Comorbidity

*Corresponding author: Ms. Samantha G. Farris, at The University of Houston, Department of Psychology, 126 Fred J. Heyne Building, Suite 104, Houston, Texas 77204-5502, United States. sgfarris@uh.edu.
 Dr. Anka A. Vujanovic, at University of Texas Health Science Center at Houston, Department of Psychiatry and Behavioral Sciences, 2800 South MacGregor Way, Houston, TX 77021, United States. anka.a.vujanovic@gmail.com;
 Ms. Julianna Hogan, at The University of Houston, Department of Psychology, 126 Fred J. Heyne Building, Suite 104, Houston, Texas 77204-5502, United States. jbdhogan@gmail.com;
 Dr. Norman B. Schmidt, at Florida State University, Department of Psychology, Florida State University, 1107 W. Call Street, Tallahassee, FL 32306, United States. schmidt@psy.fsu.edu;
 Dr. Michael J. Zvolensky, at The University of Houston, Department of Psychology, 126 Fred J. Heyne Building, Suite 104, Houston, Texas 77204-5502, United States. mjzvolen@central.uh.edu;

Prevalence rates of smoking are significantly higher among trauma-exposed individuals (with or without posttraumatic stress disorder [PTSD]¹) in comparison to non-psychiatric or non-trauma exposed individuals. Trauma-exposed individuals (with or without PTSD) are more likely to be smokers, and tend to smoke more heavily and have higher levels of nicotine dependence (see review by Feldner, Babson, & Zvolensky, 2007). Greater smoking rates and higher levels of nicotine dependence are related to the development of PTSD and increased PTSD symptom severity (Feldner et al., 2007), especially avoidance and hyperarousal symptoms (Beckham et al., 1997). Additionally, rates of trauma exposure are significantly higher among smokers than non-smokers (Gantz, 2000). Despite the documented co-occurrence and clinically significant relations between trauma exposure and cigarette smoking, there is little understanding of the mechanisms underlying the expression of PTSD symptoms among this group.

In regard to smoking-trauma co-occurrence, there is an increased recognition that how one responds to various aversive internal affective and physiologic states impact the expression of PTSD symptoms. In this domain, anxiety sensitivity (AS), a relatively stable cognitive factor reflecting the extent to which individuals believe anxiety or anxiety-related sensations have harmful consequences (McNally, 2002), has emerged as an important factor. For example, trauma-exposed individuals report higher levels of AS compared to non-trauma-exposed persons (e.g., Lang, Kennedy, & Stein, 2002). Moreover, higher levels of AS are related to greater PTSD symptom severity among trauma-exposed persons (Marshall, Miles, & Stewart, 2010). In terms of smoking, there is evidence that AS is related to several cognitive factors including beliefs that smoking will reduce negative affect, coping motives, and more problems while quitting (Johnson, Farris, Schmidt, Smits, & Zvolensky, 2013), and is also related to more intense acute nicotine withdrawal severity (e.g., Langdon et al., 2013). Additionally, AS is related to the greater increase in positive affect post-cigarette smoking (Wong et al., in press) and reductions in negative affect during a stressful laboratory task (e.g., public speech preparation; Perkins, Karelitz, Giedgowd, Conklin, & Sayette, 2010). Importantly, AS is predictive of less success quitting (e.g., increased odds of early lapse and relapse; Brown, Kahler, Zvolensky, Lejuez, & Ramsey, 2001; Zvolensky, Stewart, Vujanovic, Gavric, & Steeves, 2009). These observed relations are not explained by nicotine dependence, gender, other substance use (alcohol, cannabis), panic attacks, or trait-like negative mood (Johnson et al., 2013; Zvolensky et al., 2009). Overall, although past work suggests AS may be a common explanatory mechanism among trauma-exposed smokers, no work to date has explored the role of AS in terms of PTSD symptoms among this population (i.e., trauma-exposed smokers).

A second gap regarding the AS literature among trauma-exposed smokers is distinguishing the role and interplay of other factors that similarly reflect how one responds to aversive internal stimuli. Recently, there has been increased attention focused on distress tolerance, defined as the perceived and/or actual behavioral capacity to withstand exposure to aversive or threatening experiential states (Leyro, Zvolensky, & Bernstein, 2010). In terms of PTSD,

¹The current study uses the term “PTSD symptom severity” refers to all levels of posttraumatic stress, including clinical and non-clinical (mild) symptomology. It is important to note that the 10% of the current sample met criteria for current PTSD.

recent work has found that lower *perceived* tolerance of emotional distress is associated with greater global and sub-cluster-level PTSD symptom severity among trauma-exposed persons (Marshall-Berenz, Vujanovic, Bonn-Miller, Bernstein, & Zvolensky, 2010). Theoretically, persons with lower levels of distress tolerance may be particularly prone to seek out negative reinforcement opportunities in order to escape/avoid or reduce distressing experiential states in the form of substance use (i.e., coping oriented drug use; Leyro et al., 2010). In fact, daily smokers with lower levels of physical distress tolerance, as indexed by breath-holding duration, are reported to have shorter durations of abstinence from smoking (Hajek, Belcher, & Stapleton, 1987; West, Hajek, & Belcher, 1989). Similarly, daily smokers who relapse faster than their counterparts demonstrate lower levels of distress tolerance on laboratory-based stress tasks (e.g., Brown, Lejuez, Kahler, & Strong, 2002; Brown et al., 2009). Other work indicates that the perceived capacity to tolerate emotional distress is uniquely related to smoking motives aimed at mood and addiction management (Leyro et al., 2008). Yet, existing work has not explored the association of distress tolerance and PTSD symptoms among trauma-exposed smokers or distinguished such effects from AS.

There is one study of AS and distress tolerance among trauma-exposed persons. Berenz, Vujanovic, Coffey, and Zvolensky (2012) found that physical distress intolerance (breath-holding duration) significantly moderated the association between AS and PTSD Avoidance symptom severity, such that shorter breath-holding duration (lower physical distress tolerance) exacerbated the effect of heightened AS with regard to PTSD Avoidance symptoms. As applied to smoking-trauma comorbidity, it is plausible that trauma-exposed smokers high in AS may learn to be particularly reactive or “tuned-in” to smoking-relevant cues (e.g., nicotine withdrawal symptoms), misinterpreting such cues (e.g., increased somatic arousal) as personally dangerous (Vujanovic, Marshall-Berenz, Beckham, Bernstein, & Zvolensky, 2010). In the context of a relatively poorer ability to withstand aversive physical states, such tendencies may promote PTSD symptoms among trauma-exposed smokers via increased avoidance-oriented affect regulation strategies (Vujanovic, Bonn-Miller, Potter, Marshall, & Zvolensky, 2011). Based on elevated base-rates of emotional vulnerability processes among trauma-exposed tobacco smokers (Vujanovic, Marshall, Gibson, & Zvolensky, 2010), these individuals may be especially prone to hyperarousal, and avoidance-based strategies for managing such aversive states.

The current investigation sought to replicate and extend the Berenz et al. (2012) model to a community sample of trauma-exposed smokers seeking smoking cessation treatment. First, it was hypothesized that higher levels of AS and high physical distress intolerance would both independently and incrementally predict greater PTSD symptom severity above and beyond the variance accounted for by theoretically-relevant covariates. Second, it was expected that AS and physical distress intolerance would interact to significantly predict PTSD symptom severity, namely hyperarousal and avoidance symptoms. Specifically, higher levels of physical distress intolerance were expected to significantly moderate the association between AS and PTSD symptom severity, such that shorter breath-holding duration (lower physical distress tolerance) would intensify the effect of heightened AS with regard to PTSD symptom severity. Theoretically-relevant covariates included gender, level

of nicotine dependence, negative affectivity, and number of trauma exposure types, which were selected based on previously documented inter-relations with the criterion variables (e.g., Berenz et al., 2012; Vujanovic et al., 2011).

Method

Participants

Participants ($n = 137$) were adult daily smokers ($M_{age} = 37.7$, $SD = 12.54$; 48.2% female). Participants primarily identified as White (86.1%), while fewer identified as African-American (9.5%), Asian (1.5%), Hispanic (1.5%), and other (1.5%). Participants were well-educated with 70.8% indicating that they completed at least part of college. In terms of relationship status, approximately 40.9% reported marital status as never married, 36.5% as married/cohabitating, and 20.4% as divorced/separated. The average daily smoking rate of this sample was 16.9 ($SD = 10.62$) cigarettes per day, and on average, subjects reported daily smoking for 19.8 years ($SD = 12.91$). Average level of nicotine dependence was in the moderate range based on the Fagerström Test for Nicotine Dependence ($M = 4.82$, $SD = 2.30$).

Participants were selected from a larger study (see Procedure section below for details) on the basis of (1) endorsement of at least one Criterion A trauma and (2) a score on the Posttraumatic Diagnostic Scale (PDS) of ≥ 1 (i.e., all participants reported experiencing at least some posttraumatic stress symptomatology). PTSD severity was in the mild range (see Table 1 for descriptive details). Participants reported an average of 3.2 ($SD = 1.82$) lifetime traumatic events including: serious accident (66.4%), non-sexual assault by family member (43.1%), natural disaster (40.9%), non-sexual assault by stranger (38.7%), childhood sexual assault (32.8%), life-threatening illness (23.4%), sexual assault by stranger (20.4%), sexual assault by family member (19.7%), imprisonment (e.g., prison inmate, prisoner of war, hostage; 15.3%), torture (8.0%), military combat (7.3%), or “other” traumatic event (e.g., sudden loss of a significant other; 21.2%). Of the sample, 44.8% met criteria for at least one current Axis I diagnosis, and the most common diagnoses included social anxiety disorder (21.7%) and major depression (13.3%), with 10.0% of participants meeting diagnostic criteria for PTSD.

Measures

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)—The SCID-I (Non-Patient Version; First, Spitzer, Gibbon, & Williams, 2007) was used to yield *DSM-IV-TR* diagnoses for current Axis I disorders. Interviews were administered by trained research assistants or doctoral level staff and supervised by independent doctoral-level professionals. Rates of current Axis I psychopathology are reported in the *Participant Section* (above) for descriptive purposes.

Smoking History Questionnaire (SHQ)—The Smoking History Questionnaire (Brown et al., 2002) assesses smoking rate, age of onset of initiation, years of being a daily smoker, and other characteristics. This measure was used for descriptive purposes in the current study.

Fagerström Test for Nicotine Dependence (FTND)—The Fagerström Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerström, 1991) is a six-item scale that assesses gradations in tobacco dependence. The FTND has adequate internal consistency, positive relations with key smoking variables, and high test-retest reliability (Heatherton et al., 1991; Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994). Internal consistency in the current study was acceptable (Cronbach's $\alpha = .64$). The FTND total score was used as a covariate in the current analysis.

Posttraumatic Diagnostic Scale (PDS)—The PDS is a four-part, 49-item self-report assessment that corresponds with the *DSM-IV-TR* symptoms of PTSD (Foa, Cashman, Jaycox, & Perry, 1997). First, respondents indicate if they have experienced any of 12 traumatic event types, including an “other” category, and then indicate which event, if applicable, was most disturbing. In the current study, only those participants indicating that they (1) experienced, witnessed, or were confronted with a traumatic event that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others and (2) responded with involved intense fear, helplessness, or horror, were included in the sample (i.e., met criteria for a *DSM-IV-TR* defined criterion A trauma). In addition to trauma exposure, the PDS assesses the severity of 17 PTSD symptoms, as experienced in the past month, rated on a frequency scale, ranging from 0 (“not at all” or “only one time”) to 3 (“five or more times a week/almost always”), based on the most disturbing traumatic event endorsed. The 17 symptom ratings are summed to create a total severity score (range 0 - 51) and three subscale (cluster) scores: Re-experiencing (range 0 - 15), Avoidance/Numbing (range 0 - 21), and Hyperarousal (range 0 - 15). The PDS also assesses interference related to PTSD symptoms. The PDS has strong psychometric properties, including excellent internal consistency, good test-retest reliability, and convergent validity (Foa et al., 1997). Internal consistency in the current study was very good: PDS-Total ($\alpha = .92$), PDS-Re-experiencing ($\alpha = .84$), PDS-Avoidance ($\alpha = .84$), and PDS-Hyperarousal ($\alpha = .82$).

Anxiety Sensitivity Index-III (ASI-III)—The ASI-III is an 18-item self-report measure in which respondents rate the degree to which they are concerned about anxiety-related symptoms on a 5-point likert-type scale ranging from 0 “very little” to 4 “very much” (Taylor et al., 2007). The ASI-III yields a total, global, summed score ranging from 0 to 72, and three subscale scores (physical, cognitive, and social concerns). The ASI-III has strong documented psychometric properties including convergent, discriminant, and criterion validity (Taylor et al., 2007). The total (global) score was used as the primary predictor variable. Internal consistency was excellent in the current study (Cronbach's $\alpha = .94$).

Breath-Holding Task—The breath-holding task is an experimenter-guided assessment of tolerance of physical distress, or one's ability to withstand physical distress (i.e., the build-up of carbon dioxide in the lungs). The task involves a standardized script, which is read to the participant by the experimenter, and each participant is first instructed to inhale deeply, exhale, and then inhale and hold the breath as long as possible (Asmundson & Stein, 1994). The duration of breath-holding is measured with a digital stopwatch. Latency to discontinue the task is measured in seconds, with shorter times indicating lower tolerance of physical distress, a behavioral measure of distress tolerance. This task has been frequently used as

measure of physical distress tolerance among smoking samples (Brown et al., 2009; Hajek et al., 1987), and while no standard norms exists for this measure, this procedure has strong test-retest reliability (Zvolensky, Feldner, Eifert, & Brown, 2001) and concurrent validity with other behavioral measures of tolerance of distress (e.g., enriched carbon dioxide air inhalation challenge, mirror-tracking task; Brown et al., 2009; Marshall-Berenz et al., 2010).

Positive and Negative Affect Scale (PANAS)—The Positive and Negative Affect Scale (Watson, Clark, & Tellegen, 1988) is a self-report measure that requires respondents to rate the extent to which they feel each of 20 different feelings and emotions (e.g., nervous, interested) based on a likert-type 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, used as a covariate here, had excellent internal consistency in the current study (Cronbach’s $\alpha = .92$).

Procedure

Daily smokers (ages 18-65) were recruited from the community (via flyers, newspaper ads, radio announcements) to participate in a larger randomized controlled panic disorder prevention trial examining the efficacy of two smoking cessation interventions. Inclusion criteria for the parent study included daily cigarette use (average 8 cigarettes per day for at least 1 year) and reported motivation to quit smoking of at least 5 on a 10-point scale. Exclusion criteria were comprised of: inability to give informed consent, current use of smoking cessation products or treatment, past-month suicidality, history of psychotic-spectrum disorders, or history of panic disorder (due to the nature of the parent study; i.e., panic prevention). The parent study took place at two sites (University of Vermont, Burlington, VT, and Florida State University, Tallahassee, FL). Participants provided informed consent and the study protocol was approved by the respective Institutional Review Boards. The current study is based on secondary analyses of baseline (pre-treatment) data for a sub-set of the sample, as described above. 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 (First et al., 1997) and completed an on-line survey. Smoking status was biochemically verified (Carbon Monoxide ppm 10).

Data Analytic Plan

First, data were checked for illogical inconsistencies and normality. Next, bivariate correlations were examined among all predictor and criterion variables. Then, four hierarchical multiple regression analyses were conducted in order to examine the main and interactive effects of AS (measured by the ASI-III) and behavioral distress intolerance (measured by breath-holding duration) on PTSD symptom severity – as measured by PTSD total severity (PDS-Total) and severity of each of three symptom clusters: PTSD – Re-Experiencing symptom severity (PDS-Re-experiencing), PTSD – Avoidance symptom severity (PDS-Avoidance), and PTSD – Hyperarousal symptom severity (PDS-Hyperarousal). Covariates were entered in the first step of each regression model (gender,

nicotine dependence, negative affectivity, and number of traumatic event exposure types). In the second step, the mean-centered ASI-III (total score) and breath-holding duration (in seconds) were entered simultaneously in order to test the main effects. In the final step, the interaction term of ASI-III total and breath-holding duration was entered. Post-hoc analyses were used to examine the forms of any significant interactions (Cohen & Cohen, 1983; Holmbeck, 2002).

Results

Descriptive Statistics and Zero-Order (Bivariate) Correlations

Descriptive information and correlations are presented in Table 1. AS and number of trauma exposure types were significantly positively associated with PDS-Total and symptom cluster scores. Breath-holding duration and nicotine dependence were not significantly associated with any criterion variables. Female gender was significantly correlated only with breath-holding duration. Negative affectivity was significantly related to number of trauma exposure types, AS, and PDS-Total score and symptom cluster scores.

Hierarchical Multiple Regressions

Please see Table 2 for regression results. Regarding the PDS-Total score, the model accounted for a significant 31.6% of the overall variance, largely explained by negative affectivity and number of trauma exposure types. In contrast to prediction, AS and breath-holding were not significantly independently or interactively related to PDS-Total score above the variance accounted for by the covariates.

Regarding PDS-Avoidance symptoms, results were significant and explained 24.5% of the total variance. Negative affectivity and number of trauma exposures were significantly related to Avoidance symptom severity. As expected, AS was uniquely and significantly related to Avoidance symptom severity above and beyond the covariates. However, in contrast to prediction, there was no main effect for breath-holding duration. There also was no significant interaction between AS and breath-holding duration for PTSD Avoidance symptoms.

In terms of PDS-Hyperarousal symptoms, the model accounted for a significant 39.5% of the overall variance. Negative affectivity and number of trauma exposure types emerged as significant predictors. There was no main effect for AS or breath-holding duration. As expected, the interaction between AS and breath-holding accounted for significant variance in Hyperarousal symptom severity. In order to examine the form of the interaction, two conditional variables were calculated as the respective breath-holding duration value ± 1 SD: low (short) breath-holding duration (breath-holding duration + 22.41) and high (long) breath-holding duration (breath-holding duration - 22.41). Interaction terms were created to include the new conditional variables, by multiplying each by the ASI-III scores. *Post hoc* regression analyses were conducted to include ASI-III, the conditional variable (low/high Breath-Holding duration scores), and their interaction. As seen in Figure 1, PDS-Hyperarousal symptom severity was highest among those with high AS and low breath-

holding duration ($t = 4.73$, $\beta = .128$, $p < .001$), and was lowest among those with low AS and high breath-holding duration ($t = 6.15$, $\beta = .73$, $p < .001$)².

In terms of Re-Experiencing symptom severity, a significant 13.4 % of the overall variance was explained by the model. Negative affectivity and number of trauma exposure emerged as the only significant predictors; as expected, neither AS, breath-holding duration, nor their interaction were significantly related to Re-Experiencing symptom severity.

Discussion

The overall pattern of results that emerged was partially consistent with expectation. Namely, after controlling for gender, level of nicotine dependence, negative affectivity, and number of trauma exposure types, the interaction of AS and breath-holding duration (low physical distress tolerance) was significantly predictive of greater levels of PTSD hyperarousal symptoms, but not other symptom clusters. That is, lower physical distress tolerance moderated (i.e., exacerbated) the association between higher levels of AS and greater PTSD symptom severity. This finding is in line with theoretical perspectives that trauma-exposed smokers high in AS may learn to be particularly reactive to smoking-relevant cues (e.g., nicotine withdrawal symptoms), misinterpreting such cues (e.g., increased somatic arousal) as personally dangerous (e.g., trauma-related; Vujanovic, Marshall et al., 2010). However, there was no significant interaction effect, as originally expected, that was found among trauma-exposed non-smokers (Berenz et al., 2012) for PTSD avoidance symptoms. Thus, the interplay between AS and distress tolerance may vary among smoking and non-smoking trauma-exposed populations.

There was a significant main effect of AS in predicting PTSD avoidance symptoms, which is generally consistent with previous research on non-smoking samples (Berenz et al., 2012; Marshall et al., 2010). This effect, in conjunction with the lack of evidence for re-experiencing symptoms, highlights that AS may be differentially relevant to PTSD symptoms; a finding that is consistent with other AS-trauma work (Lang et al., 2002). It is also possible that the lack of documented associations between AS and PTSD re-experiencing symptoms is due to the nature of the sample, as clinical PTSD populations might manifest differential patterns of relations. These findings add to a growing literature suggesting the importance of AS in terms of PTSD symptoms (Marshall et al., 2010).

There was no evidence of significant main effects for distress tolerance, as measured by breath-holding duration, on PTSD symptoms. This set of findings is in contrast to work that has shown that the perceived distress tolerance is related to PTSD symptom expression (Vujanovic et al., 2011). This work, considered in the larger context of distress tolerance theory and research, suggests that perceived compared to objective (behavioral) indices of distress tolerance may indeed function differently (Leyro et al., 2010). As applied to the present investigation of trauma-exposed smokers, it is possible a lower capacity to actually tolerate physical distress may indirectly exacerbate PTSD symptoms via further amplifying

²Exploratory analyses indicated that two subscales of the ASI-III (physical concerns and cognitive subscales) interacted uniquely with Breath-Holding to predict PDS-Hyperarousal symptoms.

AS. Future work would benefit by simultaneously exploring how perceived and behavioral indices of distress tolerance relate to the expression of PTSD symptoms among trauma-exposed smokers.

It is notable that AS and distress tolerance shared 0% of variance with one another. Thus, these constructs, as assessed by the ASI-III and breath-holding duration, are theoretically and empirically distinguishable among trauma-exposed smokers. Second, the present study found that negative affectivity was significantly and consistently related to PTSD symptoms among the present sample of smokers. This work adds to the large literature on the role of negative affectivity in terms of PTSD (Feldner, Babson, Zvolensky, Vujanovic et al., 2007) and extends it to a trauma-exposed sample of smokers.

There are a number of interpretative caveats that warrant consideration in the interpretation of the present findings. First, the present sample was fairly homogenous and was comprised of adults who volunteered to participate in the study for compensation. It will be important to examine other populations and utilize recruitment tactics other than those used here. Second, the level of nicotine dependence among this sample was of moderate severity; thus, it may useful to replicate and extend the present findings to heavier smoking samples. Similarly, it would be important to examine mechanisms related to PTSD symptom expression among smoking versus non-smoking samples to better explicate the unique effects of tobacco. Third, the sample consisted of individuals with and without clinical PTSD diagnoses, who overall reported overall low levels of PTSD symptom severity ($M_{PDS} = 10.5$, $SD = 9.09$). Although these levels of PTSD symptom severity are comparable to previous studies of non-clinical trauma-exposed samples of non-smokers ($M_{PDS} = 12.5$, $SD = 10.54$; Foa et al., 1997) and smokers ($M_{PDS} = 11.8$, $SD = 12.06$; Vujanovic, Marshall, et al., 2010), it will be important to examine this model in other clinical samples. Fourth, the present study used cross-sectional data. Prospective methodologies would be helpful to clarify the relative stability of the observed effects between AS and distress tolerance in relation to the criterion variables. Further, prospective data would permit investigation of the temporal relations between trauma onset and initiation or change smoking behavior. Fifth, the present model focused on tobacco smokers. However, it is possible that this same type of model could be relevant to other types of substance use among trauma-exposed populations. Thus, future work could explore similar processes for other substance use behavior. Finally, it is possible breath-holding may be influenced by several underlying factors, including baseline lung functioning, fitness level, and other health-relevant variables (e.g., Rassovsky, Kushner, Schwarze, & Wangenstein, 2000). Thus, it may not be a 'pure' index of behavior distress tolerance.

Overall, the present findings suggest that it may be necessary to understand and clinically address AS and distress tolerance in terms of the management of certain PTSD symptoms. For example, trauma-exposed smokers who have higher levels of AS and lower levels of distress tolerance may benefit from cognitive-behavioral strategies aimed at increasing awareness and acceptance of anxiety-based and somatic symptoms in an effort to promote greater degrees of psychological health and foster a better ability to manage tobacco use. It is also possible that by quitting smoking, physical distress tolerance and sensitivity of bodily sensations (i.e., AS) will improve as a function of overall better health (e.g., lung

functioning), which may, in turn, reduce trauma-related hyperarousal. Further research is needed to empirically examine the impact of tobacco cessation on hyperarousal symptoms. Indeed, assessing levels of AS and distress tolerance may be useful in terms of identifying, and perhaps, clinically assisting trauma-exposed adult smokers in their efforts to successfully quit smoking and/or manage certain PTSD symptoms via integrated protocols for trauma-smoking (e.g., Feldner, Smith, Monson, & Zvolensky, 2013).

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Figure 1.

Interaction of Anxiety Sensitivity and Breath-Holding Duration on PTSD Hyperarousal Symptom Severity

Table 1
Zero-Order (or Bivariate) Correlations between Predictor and Criterion Variables

Variable	Mean (SD) or %	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Gender	42.6% female	1	-.047	.130	.044	-.005	-.246**	.125	.075	.102	.143
2. FTND	4.82 (2.30)		1	.099	.148	-.019	-.060	-.028	.002	-.026	-.044
3. Negative Affect	19.81 (7.74)			1	.251**	.595**	-.080	.473**	.278**	.415**	.506**
4. Number Traumas	3.16 (1.82)				1	.158	-.058	.339**	.258**	.267**	.354**
5. Anxiety Sensitivity	17.00 (13.75)					1	-.031	.393**	.197*	.371**	.414**
6. Breath Holding	49.47 (22.41)						1	-.035	-.107	.033	-.047
7. PDS-Total	10.50 (9.09)							1	.756**	.935**	.867**
8. PDS-Re-Experiencing	2.79 (2.73)								1	.598**	.452**
9. PDS-Avoidance	3.94 (4.29)									1	.739**
10. PDS-Arousal	3.77 (3.48)										1

Note.

Gender dummy coded as 0 = male, 1 = female, percent represented is of females; FTND = level of nicotine dependence per the Fagerstrom Test for Nicotine Dependence; Negative Affect = Positive and Negative Affect Scale – Negative Affect scale (PANAS); Number Traumas = Number of traumas experienced as reported on the Posttraumatic Diagnostic Scale (PDS); Anxiety Sensitivity = Anxiety Sensitivity Index – 3 (ASI-III); Breath Holding = Breath-Holding Task; PDS = Posttraumatic Diagnostic Scale (Foa et al., 1997).

*
 $p < .05$

**
 $p < .01$

 $p < .001$.

Table 2

Hierarchical Multiple Regression Analyses

DV	Predictor variables	R^2	t	P	sr^2	P
PDS-Total Score	1. Gender	.290	.756	.056	.055	.451
	FTND		-1.384	-.103	-.102	.169
	PANAS - NA		5.400	.413	.396	.001
	# Trauma		3.243	.248	.238	.001
	2. ASI-III	.018	1.835	.168	.134	.069
	Breath Holding		.310	.023	.023	.757
	3. ASI-III $\times$ Breath-Holding	.008	-1.227	-.090	-.089	.222
PDS-Avoidance Subscale	1. Gender	.210	.532	.042	.041	.596
	FTND		-1.115	-.088	-.086	.267
	PANAS - NA		4.600	.371	.356	.000
	# Trauma		2.298	.185	.178	.023
	2. ASI-III	.030	1.986	.191	.152	.049
	Breath Holding		1.086	.086	.083	.279
	3. ASI-III $\times$ Breath-Holding	.006	-.985	-.076	-.075	.327
PDS-Hyperarousal Subscale*	1. Gender	.331	.948	.068	.067	.345
	FTND		-1.701	-.123	-.121	.091
	PANAS - NA		5.979	.444	.426	.000
	# Trauma		3.466	.257	.247	.001
	2. ASI-III	.018	1.904	.169	.135	.059
	Breath Holding		.209	.015	.015	.835
	3. ASI-III $\times$ Breath-Holding	.046	-3.125	-.216	-.214	.002
PDS-Re-Experiencing Subscale	1. Gender	.119	.415	.034	.034	.678
	FTND		-.590	-.049	-.048	.556
	PANAS - NA		2.657	.227	.217	.009
	# Trauma		2.425	.206	.198	.017
	2. ASI-III	.007	.431	.044	.035	.667
	Breath Holding		-.902	-.077	-.074	.369
	3. ASI-III $\times$ Breath-Holding	.009	1.143	.094	.094	.255

Note. Note. β = standardized beta weight; sr^2 = squared semi-partial correlation