

DIFFERENTIAL EXPLANATORY EFFECTS OF ANXIETY SENSITIVITY IN THE
RELATION BETWEEN EMOTIONAL NON-ACCEPTANCE AND POSTTRAUMATIC
STRESS SYMPTOMS AMONG TRAUMA-EXPOSED TREATMENT-SEEKING SMOKERS

A Thesis

Presented to

The Faculty of the Department

of Psychology

University of Houston

In Partial Fulfillment

of the Requirements for the Degree of

Master of Arts

By

Jafar Bakhshaie

December, 2014

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ABSTRACT

Anxiety sensitivity, defined as the extent to which individuals believe anxiety-related sensations have harmful consequences, may play an important explanatory role in the relation between emotional non-acceptance and the expression of traumatic stress symptoms among trauma-exposed smokers. The current investigation examined whether lower-order facets of anxiety sensitivity (cognitive, physical, and social concerns) differentially explain the relation between emotional non-acceptance and posttraumatic stress symptom clusters (re-experiencing, avoidance, arousal) among trauma-exposed daily smokers ($N = 169$, 46% female; $M_{\text{age}} = 41$, $SD = 12.3$). Anxiety sensitivity and its lower order facets of cognitive and social concerns were found to explain the relations between emotional non-acceptance and avoidance and arousal posttraumatic stress symptoms. Moreover, anxiety sensitivity cognitive concerns explained these relations above and beyond the other two facets. The present findings suggest cognitive-based anxiety sensitivity concerns may play a mechanistic role in the expression of certain posttraumatic stress symptoms among trauma-exposed daily smokers.

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BACKGROUND AND SIGNIFICANCE

Smoking/PTSD comorbidity: Prevalence and Global Impact

Approximately one in ten smokers have a lifetime history of posttraumatic stress disorder (PTSD; Lasser et al., 2000) and significantly more are trauma-exposed (Feldner, Babson, & Zvolensky, 2007). Smoking rates are alarmingly high among clinical samples with PTSD disorder (40%–86%) as well as nonclinical populations with PTSD symptoms (34%–61%; Fu et al., 2007). The odds of a positive relationship between PTSD and smoking and nicotine dependence range between 2.04 and 4.52% (Fu, et al. 2007).

The relation between smoking and posttraumatic stress symptoms (PTS) is bi-directional and clinically-relevant. For example, trauma-exposed individuals compared to individuals without clinical or subclinical PTSD are more likely to be current smokers (Acierno, Kilpatrick, Resnick, Saunders, & Best, 1996), smoke at higher rates (Beckham et al., 1995), and maintain greater levels of nicotine dependence (McClernon, Hiott, Huettel, & Rose, 2005). Conversely, higher smoking rates and nicotine dependence levels are related to an increased risk for PTS symptoms among trauma-exposed people (Beckham et al., 1997). Specific PTSD symptoms may contribute to smoking and disrupt cessation attempts. A small, but growing body of work has examined psychological factors related to smoking initiation, maintenance and the overlapping neurobiology of PTSD and nicotine dependence (Fu, et al., 2007). In general, the evidence points to a relationship between PTSD and smoking that may be bidirectional. Translational investigations that lead to behavioral and pharmacological interventions designed specifically for use in smokers with PTS symptoms are needed to reduce morbidity and mortality in this population (Gabert-Quillen, Selya, & Delahanty, 2014).

Emotional Vulnerability Factors and Smoking

In the current and the next two sections of the proposal, key sources of scientific evidence supporting a linkage between smoking/PTS symptoms and negative psychological vulnerability factors and distress are briefly summarized. This work broadly informs and serves as the explanatory context for the current study and its hypotheses.

Regarding the relation between cognitive-emotional vulnerability factors and smoking, at a broader symptom level, anxiety and depressive symptoms often co-occur with smoking. However, due to high correlation between anxiety and depressive symptoms, research in this area is limited by specificity. The tripartite model of anxiety and depression (Ameringer & Leventhal, 2010) identifies negative affect (NA), anhedonia and low positive affect (PA), and anxious arousal (AA) as “characteristic traits” for heterogeneity of emotional symptoms among individuals (Ameringer & Leventhal, 2010). This model is an attempt to answer to the need for a specialized approach to the underlying factor of anxiety/depression and smoking comorbidity. An emerging literature has examined the relation between the affective constructs in the tripartite model and smoking. All of the three tripartite dimensions of affect are suggested to be associated with smoking status (McLeish, Zvolensky, Del Ben, & Burke, 2009; Wills, Sandy, Shinar, & Yaeger, 1999). Moreover, there is evidence for low PA (anhedonia) as a factor in failure to remain abstinent after a quit attempt (Leventhal, Waters, Kahler, Ray, & Sussman, 2009). Regarding AA, despite some existing evidence (Zvolensky, Bonn-Miller, Bernstein, & Marshall, 2006; Zvolensky et al., 2007), more research is needed to determine its probable role as a risk factor for relapse.

In general, emotional vulnerability factors tend to apply their own effects (i.e., high NA and low PA, Wills et al., 1999; high NA and high AA, McLeish et al., 2009) which may result in disproportionate increases in smoking risk. Importantly, low-PA or anhedonia has an effect

above and beyond the other two risk factors (Leventhal, Ramsey, Brown, LaChance, & Kahler, 2008; Zvolensky, Johnson, Leyro, Hogan, & Tursi, 2009). Accordingly, low-PA or anhedonic individuals should perhaps be targeted as a high-risk group in prevention and cessation interventions. Interventions which raise the individual's level of hedonic capacity can be of value as relapse prevention strategies. The tripartite model also could help to shed light on the relation between some prevalent emotional disorders and smoking. For example, in anxiety disorders, preliminary evidence suggests that either the symptoms or fear of AA may account for a significant portion of the relationship between anxiety and aspects of smoking, above and beyond the role of NA in this relationship (McLeish et al., 2009; Zvolensky et al., 2007).

Other types of emotional vulnerability factors such as anxiety sensitivity, distress tolerance, and emotion regulation capacity have been also proposed as risk factors of smoking behavior (Zvolensky, Feldner, Eifert, & Brown, 2001). Evidence for the relation between anxiety sensitivity (fear of fear) and smoking is growing in the literature (Brown, Kahler, Zvolensky, Lejuez, & Ramsey, 2001). AS plays role in onset (Brown et al., 2001), maintenance (Zvolensky et al., 2004), and relapse (Zvolensky et al., 2007) processes of smoking. Furthermore, the effects of anxiety sensitivity on smoking expectancies seem to be through emotional regulatory (Johnson, Farris, Schmidt, & Zvolensky, 2012) and cognitive-based process of smoking (i.e. smoking expectancies and motivations). Distress tolerance (i.e. the capacity to experience and withstand negative psychological and bodily experiences) has also been proposed as one of the major risk factors of smoking relapse (Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005). Individuals with lower breath holding capacities or lower scores on task persistence (as lab-based proxies for physical distress tolerance) have shorter durations of previous abstinence status (Brown et al., 2005) and higher rates of early dropouts from cessations studies (Daughters et al.,

2005). Emotion dysregulation is another important facet that is relevant to tobacco craving (Szasz, Szentagotai, & Hofmann, 2012) and cognitive processes of smoking (Johnson et al., 2012), as well as smoking relapse (Lee, Kim, Cho, & Lee, 2014). All proposed facets of emotion dysregulation like impulse control (Spillane, Combs, Kahler, & Smith, 2012) lack of strategy (Piper & Curtin, 2006), lack of emotional clarity/awareness (Lee et al., 2014), difficulty engaging in goal-directed behaviors (Satpute, Ochsner, & Badre, 2012), and emotional nonacceptance (Adams, Tull, & Gratz, 2012; Bakhshaie et al., 2014) have shown association with smoking processes. Among these, emotional nonacceptance is the target of “recently growing” acceptance-based smoking cessation programs (Brewer et al., 2011; Gifford et al., 2004; Hernández-López, Luciano, Bricker, Roales-Nieto, & Montesinos, 2009). Applying a translational research framework, by incorporating acceptance-based therapies within the curriculum of standard cessation interventions, these programs have reported improving rates of successful abstinence among different sub-types of smokers.

Emotional Vulnerability Factors and Post traumatic Stress symptoms

The literature on the emotional-cognitive predictors of post-traumatic stress symptoms is fairly robust (Elwood, Hahn, Olatunji, & Williams, 2009; Ferreri, Lapp, & Peretti, 2011). For example, a meta-analysis of 476 potential candidate works on the predictors of PTSD or PTS symptoms found prior psychological adjustment and peritraumatic emotional responses are the important predictors of these problems; with the latter showing the strongest relationship with these symptoms (Ozer, Best, Lipsey, & Weiss, 2008). The types of peritraumatic problems were pretrauma emotional problems (Ehlers, Mayou, & Bryant, 2003), use of mental health treatment (Carlier, Lamberts, & Gersons, 1997; Jeavons, Greenwood, & Horne, 2000), pretrauma anxiety or affective disorders (Blanchard, Hickling, Taylor, & Loos, 1995; Resnick,

Kilpatrick, Best, & Kramer, 1992; Solomon, Oppenheimer, Elizur, & Waysman, 1990), and antisocial personality disorder (Cottler, Compton, Mager, Spitznagel, & Janca, 1992). Two other prospective studies have found pre-combat neuroticism and neurotic predispositions to be predictive of PTS symptoms among combat veterans (Lee, Vaillant, Torrey, & Elder, 1995; Schnurr, Rosenberg, & Friedman, 1993). Interestingly, the strength of the relationship between prior adjustment problems and PTS symptoms or diagnosis did not vary according to the type of sample studied, type of traumatic event, the amount of time elapsed, and the method of assessing PTS symptoms.

The aforementioned findings are in line with the Diathesis-stress models of the development of PTSD (Bowman & Yehuda, 2004; McKeever & Huff, 2003) which proposes that individual's differences in the level of "pre-traumatic psychological well-being" play an important role in development of PTS symptoms and individuals with higher levels of psychological vulnerabilities are at greater risk of PTS symptoms. Regarding the specific types of emotional-cognitive vulnerability factors involved in post-traumatic symptoms processes, a diverse list of factors has been proposed, including: negative attribution style (individual's malicious interpretations of experienced negative events; Abramson, Metalsky, & Alloy, 1989; Alloy et al., 2000), looming cognitive style (individuals' tendency to make predictions about future bad events that could lead to the perception of ongoing threat and maintenance of PTS symptoms; Riskind, 1997; Williams, Shahar, Riskind, & Joiner, 2005), rumination tendency (to think repetitively and passively about negative emotions, its precipitators, and worry about the meaning of one's own distress; Nolen-Hoeksema, 1991), negative affect (Watson, Clark, & Tellegen, 1988), neuroticism (Eysenck, 1967), disgust sensitivity (a type of emotional processing that occurs both during the trauma or as a retrospective re-experiencing process after the trauma;

Fairbrother & Rachman, 2004; Olatunji, Elwood, Williams, & Lohr, 2008; Power & Dalgleish, 1999), affect instability (Kashdan, Uswatte, Steger, & Julian 2006), difficulties in emotion regulation (i.e. lack of awareness, lack of clarity, lack of emotional strategy, lack of impulse control, lack of emotional acceptance and difficulties in goal-directed behaviors; Tull, Barrett, McMillan, & Roemer, 2007), and anxiety sensitivity (fear of anxiety and anxiety-related bodily sensations and a belief about their harmful consequences; Reiss, Freund, Tseng, & Joshi, 1991; Taylor et al., 2007). These vulnerability factors have been reported as risk and maintenance factors of PTS symptoms. In regard to anxiety sensitivity and emotional nonacceptance, more detailed information will be introduced within their specified sections.

Relevance of Cognitive-Affective Risk Factors for Post-traumatic Stress Psychopathology in the Smoking Population

Although smoking and PTS symptoms commonly co-occur and influence one another, there has been little work focused on factors that may underlie the expression of PTS symptoms among trauma-exposed smokers. Existing work has uncovered a link between trauma-exposure, anxiety/mood psychopathology, and smoking behavior. However, there is a lack of research identifying the explanatory processes that may underlie such psychopathologies among smokers. This lack of research is surprising given the associations that have been made in the general population between these processes and smoking. Yet, there has been little investigation on cognitive-affective factors related to PTS symptoms among smokers. Research examining such cognitive vulnerability factors in other populations including drug users (Daughters et al., 2005) and those with chronic pain (e.g., musculoskeletal pain; Asmundson, Peluso, Carleton, Collimore, & Welch, 2011) suggest that potential explanatory factors could also exist for these constructs among the smokers.

In an attempt to fill the existing gap in the literature, a small number of studies have begun to examine such cognitive-emotional vulnerability factors in the smoking population. However, most of these works have been focused on the role of smoking-related cognitive processes (e.g. nicotine dependency or smoking expectancies) as the predictors of PTS symptoms among smokers. For example, Palm and colleagues found that adolescent smokers with higher levels of nicotine dependency show higher levels of PTS symptoms (Palm, Abrantes, Strong, Ramsey, & Brown, 2009). In two separate systematic reviews on the bidirectional relationship between smoking and PTS symptoms, Felender and colleagues and Fu and colleagues have demonstrated the “rate of smoking” as an independent predictor of PTS symptoms among smokers (Feldner et al., 2007; Fu et al., 2007). Subjective reduction in negative affect following smoking is also associated with PTS symptoms in smokers (Beckham et al., 2008). In a study on female smokers with the history of intimate partner violence, Ashare and colleagues found positive associations between stimulation and enhancement expectancies from smoking and posttraumatic avoidance/numbing symptoms among women exposed to intimate partner violence (Ashare, Weinberger, McKee, & Sullivan, 2011).

In one of the few studies relevant to the role of emotional vulnerability factors on PTS symptoms of the smokers, Feldner and colleagues has been reported a positive association between anxiety sensitivity and PTS symptoms of trauma exposed smokers (Feldner et al., 2008). In line with this finding, a recent interventional study using a nonconcurrent, multiple-baseline treatment design, has shown a dramatic reduction in the PTS symptoms of the adult smokers following exposure-focused component of the intervention (Feldner, Smith, Monson, & Zvolensky, 2013). Bernstein and colleagues have also proposed mindfulness and emotional awareness as transdiagnostic resilience factors on the severity of PTS symptoms among smokers

(Bernstein, Tanay, & Vujanovic, 2011). In line with this finding, Kelly and colleagues, using a modified acceptance and commitment therapy (ACT), combined with smoking cessation intervention for veteran smokers (ACT-smoking cessation) found a significant short term decrease in the level of PTS symptoms (Kelly, Forsyth, Ziedonis, & Cooney, 2013).

In general, underlying process of concurrent PTSD among smokers has been understudied and knowledge about effective methods to overcome PTS symptoms among smokers is lacking.

Emotional nonacceptance: Conceptualization and Operational Definition, Measurement, and Relation to Psychopathology

Emotional nonacceptance has been defined as “evaluation of emotions as bad or wrong,” subsequent development of secondary emotions (e.g. fear or shame) and unwillingness to re-experience these negative emotional experiences (Gratz, Bornovalova, Delany-Brumsey, Nick, & Lejuez, 2007, p. 257). It is also associated with different types of anxiety and depressive symptoms (Gratz et al., 2007). Specifically, disgust feelings toward negative emotional symptoms can cause the exacerbation of these symptoms through fear/avoidance processes. Literature on the role of emotional nonacceptance for different types of anxiety disorders is not so diverse yet, but the existing evidence is supportive of the association between emotional nonacceptance and PTS and depressive symptoms. For example, a study on the role of emotional nonacceptance on post PTS symptoms of individuals with the history of child abuse showed a significant association between emotional nonacceptance and these symptoms above and beyond the effect of negative affect (Taylor, Koch, & McNally, 1992).

Measurement. There is generally limited work on measurement methods of emotional nonacceptance. The small body of research substantiates emotional nonacceptance as a factor in

emotion regulation difficulties (Tull & Roemer, 2007) and anxiety psychopathology (Mennin, Heimberg, Turk, & Fresco, 2005; Salters-Pedneault, Tull, & Roemer, 2004; Tull & Roemer 2007). The most common measurement method of emotional non acceptance is by using “lack of emotional acceptance” sub-scale of the Difficulties in Emotional Regulation Scale (DERS). This sub-scale consists of 6 items enquiring about the individual’s feelings during the experience of negative affects (e.g. “It upsets me when I feel sad”). Items are rated on a 5-point Likert scale (0 = Almost never, 1=Sometimes, 2=About half of the times, 4=Most of the times, 5=Almost always). Adequate levels of internal consistency and test-retest reliability has been reported for this subscale (Tull & Roemer, 2007).

Relations to Psychological Symptoms and Disorders. Emotional nonacceptance has shown significant correlation with negative affect (Bakhshaie et al., 2014), neuroticism (Craske et al., 2014), anxiety sensitivity (Bakhshaie et al., 2014), and trait anxiety (Zvolensky & Forsyth, 2002). As expected, Emotional nonacceptance is negatively correlated with mindfulness skills (Coffey, Hartman, & Fredrickson, 2010). In terms of anxiety and depressive symptoms, individuals with higher levels of emotional nonacceptance have significantly higher levels of panic, social phobic and depressive symptoms (Bakhshaie et al., 2014). Experimental studies have also revealed association between lack of emotional acceptance and panic attacks (Tull & Roemer, 2007), and PTS symptoms (Badour & Feldner, 2013).

Emotional nonacceptance has also been proposed as the vulnerability risk and maintenance factor of PTS symptoms. For example, expressive suppression has shown association with posttraumatic stress disorder (PTSD) symptoms in a trauma-exposed community sample (Moore, Zoellner, & Mollenholt, 2008). A recent study also found that PTS symptom severity is associated with lack of emotional acceptance, difficulty engaging in goal-

directed behavior when upset, impulse-control difficulties, limited access to effective emotion regulation strategies, and lack of emotional clarity (Tull et al., 2007). Importantly, this association retained even after controlling for negative affect. In terms of casual relationships, one study has proposed an explanatory role for emotional nonacceptance in the relation between traumatic experience and PTS symptoms (Burns, Jackson, & Harding, 2010). Most importantly, a recent cross lagged design study has provided prospective evidence for the role of emotional nonacceptance in development of PTS symptoms among trauma exposed individuals (Wirtz, Hofmann, Riper, & Berking, 2014).

Individuals with the history of childhood abuse who are less accepting of their negative emotions are more likely to respond to such sensations with escaping from the situations that could cause them (i.e. experiential avoidance); the latter in turn play a role as a major risk and maintenance factor for PTS symptoms (Boeschen, Koss, Figueredo, & Coan, 2013; Shenk, Putnam, & Noll, 2012). In line with these findings, studies examining the efficacy of acceptance-based treatments on PTS symptoms of psychiatric patients have shown promising evidence in terms of symptoms reduction (Batten & Hayes, 2005; Dixon-Gordon, Tull & Gratz, 2014; Orsillo & Batten, 2005). However, evidence in this area is preliminary and needs further exploration. Among smokers, emotional nonacceptance is also associated with panic, social anxiety, and depressive symptoms (Bakhshaie et al., 2014). To our knowledge, no study has examined the role of emotional nonacceptance in the development of PTS symptoms among smokers. Past works on the relations between emotional non-acceptance and PTS symptom clusters among non-smokers have demonstrated significant associations between emotional nonacceptance and “avoidance” and “arousal” PTS symptom clusters of trauma-exposed

individuals. However, in regard to “re-experiencing” symptoms, reports has been inconsistent (Kearney et al., 2013; Meyer, Morissette, Kimbrel, Kruse, & Gulliver, 2013; Moore et al., 2008).

In sum, there is a need for more investigations on the role of emotional nonacceptance in development and maintenance of posttraumatic stress psychopathology. Research also could benefit from examinations of possible change processes and/or more optimal measures of emotional nonacceptance among traumatized individuals. For example, one of the formative next research steps could be to evaluate the possible explanatory variables in the relationship between emotional nonacceptance and PTS symptoms.

Anxiety Sensitivity: Conceptualization and Operational Definition, Measurement, and Relation to PTS Psychopathology

Anxiety sensitivity (AS) has been defined as an individual difference factor on the fear of anxiety and anxiety-related sensations (Reiss et al., 1991). AS reflects a stable, trait-like characteristic that serve as a risk factor for developments of anxiety and depressive symptoms (Otto, Pollack, Fava, Uccello, & Rosenbaum, 1995; Schmidt, Lerew, & Jackson, 1999). Factor analytical studies has proposed three factors within the AS construct (i.e. physical, cognitive and social concerns of anxiety-related symptoms; Taylor & Cox, 1998; Taylor et al., 2007; Zinbarg, Mohlman, & Hong, 1999). Notification of anxiety symptoms in people with high levels of AS could cause the increased focus on the symptoms and further increase in these symptoms due to fear processes. Among anxiety disorders, scientific attention has increasingly been focused on panic disorder that has the strongest relation with AS. However, AS has also been proposed as an important risk factor candidate of PTS symptoms. For example, in a study on the role of AS across anxiety disorders, panic attacks and PTS symptoms demonstrated the strongest

associations with AS compared to other anxiety diagnoses, even after controlling for trait anxiety (Taylor et al., 1992).

Measurement. Traditionally, AS has been measured using the 16-item Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986). Items are relevant to concerns about the experience of anxious symptoms (e.g. “It scares me when my heart beats rapidly”) rated on a 5-point Likert scale (0 = very little to 4 = very much). Acceptable levels of internal consistency and test-retest reliability has been reported for AS (Maller & Reiss, 1992; Peterson & Reiss, 1993; Peterson & Plehn, 1999; Schmidt, Lerew, & Jackson, 1997). In a four-year longitudinal study measuring AS at several time points, it was shown that levels of AS are usually stable within individuals. However, a sub-group of population showed fluctuations in their levels of AS (Weems, Hayward, Killen, & Taylor, 2002). In contrast to the traditional 3 factor model of AS, some recent investigations support an AS taxon (using 8 items from the ASI; Bernstein, Zvolensky, Feldner, Lewis, & Leen-Feldner, 2005). This view tries to conceptualize categorical rather than dimensional nature of the AS among individuals. In other words, there seems to be a subgroup of population with clinically significant higher levels of AS who are more prone to the consequences of this emotional vulnerability factor. However, report on this taxonomic nature of the AS construct is not yet consistent (Broman-Fulks & Storey, 2008). A more recent interpretation of the AS factor structure has led to ASI-3 with 18 items and similar sub-factors (physical, cognitive, social) that has more robust psychometric properties (Taylor et al., 2007). Moreover, a cross-cultural examination of the AS across 6 countries has led to 2 factor format of AS (ASI-revised; Zvolensky et al., 2003).

Relations to psychological symptoms and disorders. Anxiety sensitivity shows significant correlation with negative affect (Kilic, Kilic, & Yilmaz, 2008; Leen-Feldner, Feldner, Reardon,

Babson, & Dixon, 2008; McKee, Zvolensky, Solomon, Bernstein, & Leen-Feldner, 2007), neuroticism (Zvolensky, Kotov, Antipova, & Schmidt, 2003) and trait anxiety (Plehn & Peterson, 2002; Schmidt, Zvolensky, & Maner, 2006). Anxiety sensitivity has negative correlation with mindfulness skills (McKee et al., 2007). Moreover, in a study on different types of anxiety and depressive symptoms, agoraphobic patients endorsed higher levels of AS than other anxiety disorders while the other anxiety disorders endorsed higher levels of AS than the control group (Reiss et al., 1986).

Using a longitudinal design, AS has been supported as the predictor of panic symptoms and panic attacks over and above the role of trait anxiety (Plehn & Peterson, 2002). AS has also been proposed as a vulnerability-based risk and maintenance factor of PTS symptoms (Fedoroff, Taylor, Asmundson, & Koch, 2000). Fear of “harm from rejection by others” and fear of “post traumatic re-experiences” are the common mechanisms that exacerbate the symptoms of PTSD among high AS individuals (Fedoroff et al., 2000). The fear caused by these harmful consequences could lead to avoidance of experiencing the PTS symptoms, which in turn can cause the exacerbation of these symptoms. Literature on the association between AS and PTS symptoms are abundant (Asmundson & Stapleton, 2008; Collimore, McCabe, Carleton, & Asmundson, 2008; Feldner, Lewis, Leen-Feldner, Schnurr, & Zvolensky, 2006; Keogh, Ayers, & Francis, 2002; Lang, Kennedy, & Stein, 2002; Stewart, Conrod, Samoluk, Pihl, & Dongier, 2000; Wald & Taylor, 2008). Individuals with PTS symptoms has shown higher levels of AS (Bonin, Norton, Asmundson, Dicurzio, & Pidlubney, 2000; Bryant & Panasetis, 2001; Nixon & Bryant, 2005). On the other hand, AS has been shown to predict the development of PTS symptoms over time (Feldner, Zvolensky, Schmidt, & Smith, 2008). These associations mostly remained significant even after controlling for other emotional vulnerability factors such as

negative affect and trait anxiety (Feldner, et al., 2008; Feldner, et al., 2006; Leen-Feldner et al., 2008; Stewart et al., 2000; Vujanovic, Zvolensky, & Bernstein, 2008). AS moderates the relation between frequency of experienced traumatic event and posttraumatic stress symptomatology (Feldner et al., 2006). Furthermore, AS has been proposed as one of the mechanisms for the reduction of PTS symptoms through CBT-based psychotherapies for PTSD (Fedoroff et al., 2000). AS is also the moderator of the relation between smoking and PTS symptoms (Feldner et al., 2008).

Inconsistent reports exist on the differential associations of AS with PTS symptom clusters. Both cognitive (Lang et al., 2002; Vujanovic et al., 2008), and social (Keogh et al., 2002) concerns of AS have shown the strongest relationship with PTS symptoms in different studies. AS taxon has also been presented as an independent vulnerability factor for PTS symptoms (Bernstein et al., 2005). In general, more work is required on the differential relations of the AS facets and PTS symptoms clusters and the optimal methods to measure and track these relationships.

Present Study: Aims and Hypotheses

Together, the current study aims to test the hypotheses that among trauma-exposed adult treatment-seeking daily smokers, greater levels of AS would significantly explain the relation between emotional non-acceptance and PTS symptom clusters (see Figure 1). Moreover, it is hypothesized that the three facets of AS (physical, cognitive, social) would play different roles in this proposed explanatory pathway. All effects are expected to be evident above and beyond the variance accounted for by gender, number of traumatic event exposure types, negative affectivity, number of cigarettes smoked per day, and alcohol use problems. These particular criterion variables were chosen because (1) there are elevated rates of PTS symptoms among

people living with smoking (Lasser et al., 2000), and (2) empirical work suggests that PTS symptoms are each associated with higher levels of nicotine dependence (Fu, et al., 2007) and worse smoking behavior (Beckham et al., 1997). Indices of PTS symptoms clusters were chosen specifically because of their direct relevance to the smoking population. For example, smoking status and PTS symptoms can reciprocally predict each other (Dedert, Calhoun, McClernon, & Beckham, 2014). In terms of the proposed covariates, specifically, number of cigarettes smoked per day was chosen to control for smoking status, while gender and number of traumatic event exposure types were included to adjust for common demographic factors/events that covary with post-traumatic stress psychopathology among this population (Gratz et al., 2007). Alcohol use problems was added as a covariate to control for overarching study design. Finally, negative affect was controlled for to ensure that the possible models/relations that show up are above and beyond this very common risk factor of mental illness.

Methodology

Sample

The data for the current study was taken from a larger study examining the efficacy of two smoking cessation interventions: a 4-session smoking cessation behavioral intervention that focused on vulnerability to panic (Panic-Smoking Program), and a standard smoking cessation program (Johnson, Farris, Schmidt, Smits, & Zvolensky, 2013). Participants were recruited at two sites (Vermont and Florida). Interested persons responding to community-based advertisements (e.g., flyers, newspaper ads, radio announcements) contacted the research team and were provided with a detailed description of the study via phone. Participants were then initially screened for eligibility and, if eligible, scheduled for an appointment. After providing

written informed consent, participants were interviewed using the SCID-I/NP and completed a computerized self-report assessment battery as well as biochemical verification of smoking status. All participants provided informed consent. All study procedures were approved by the Vermont University and Florida State University review board. For inclusion in the study, participants had to be (3) 18-64 years old, (2) daily smoker (currently smoking at least 8 cigarettes per day), (2) being smoker during the past year, and (4) Endorsing a lifetime history of a DSM-IV Criterion A traumatic event (APA, 2000).

Participants included 169 adult trauma-exposed daily smokers (46% female; $M_{age} = 41$, $SD = 12.3$) who responded to study advertisements (e.g. flyers, newspaper ads, radio announcements). In terms of ethnic background, 88.1% of participants identified as Caucasian, 6% identified as African-American, 3% identified as Hispanic, 1.1% identified as Asian, and 1.1% identified as “other.” Participants reported smoking an average of 18.7 cigarettes per day ($SD = 9.3$), smoking their first cigarette at 14.5 years of age ($SD = 3.3$), and initiating regular (daily) smoking at 17.3 years of age ($SD = 3.5$). The average score on the Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker & Fagerstrom, 1991) was 4.9 ($SD = 2.4$) - indicating moderate levels of nicotine dependence.

As determined by the Structured Clinical Interview for DSM-IV Axis I Disorders-Non-Patient Version (SCID-I/NP; First, Spitzer, Gibbon, & Williams, 1994), 39% of the sample met criteria for current (past year) Axis I psychopathology. Among participants with current psychopathology, the average number of diagnoses per participant was 1.7 ($SD = .9$). Specifically, diagnostic prevalence rates among the total sample were as follows: social anxiety disorder (11.8%), specific phobia (8.9%), PTSD (6.5%), generalized anxiety disorder (5.9%), obsessive-compulsive disorder (3.5%), panic disorder with or without agoraphobia (2.9%),

anxiety disorder not otherwise specified (2.9%), major depressive disorder (8.9%), dysthymia (3.5%), other depression related disorders (e.g., bipolar disorder) (1.2%), alcohol abuse or dependence (2.9%), cannabis abuse or dependence (2.9%), and other substance abuse or dependence (.6%).

Participants met criteria for an average of 3.1 traumatic event types, as reported on the Posttraumatic Stress Diagnostic Scale (PDS; Foa, 1995). In terms of the nature of traumatic events, 65% of participants reported experiencing a serious accident, explosion, or fire; 40.9% of participants reported experiencing a natural disaster; 36.1% of participants reported experiencing non-sexual assault by a family member or someone known; 34.9% of participants reported experiencing non-sexual assault by a stranger; 30.2% of participants reported experiencing sexual contact with someone 5 or more years older before the age of 18; 26% of participants reported experiencing a life-threatening illness; 26% of participants reported experiencing an “other” traumatic event (e.g., unexpected death of a loved one); 17.2% of participants reported experiencing sexual assault by a family member or someone known; 17.2% of participants reported experiencing sexual assault by a stranger; 13% of participants reported experiencing imprisonment; 5.3% of participants reported experiencing military combat or a war zone; and 5.3% of participants reported experiencing torture.

Measures

Structured Clinical Interview-Non-Patient Version for DSM-IV (SCID-N/P; First, Spitzer, Gibbon, & Williams, 1994). Diagnostic assessments were performed using the SCID-N/P. The interviews were administered by trained staff and supervised by independent doctoral-level psychologists. All Interviews were audio-taped and the reliability of a random selection of

approximately 12.5% of interviews were checked (MJZ) for accuracy. No cases of diagnostic coding disagreement were noted.

The Smoking History Questionnaire (SHQ; Brown, Lejuez, Kahler, & Strong, 2002). The SHQ is a self-report questionnaire used to assess smoking history and pattern (e.g. smoking rate, age of onset of initiation). It has been successfully used in previous studies as a measure of smoking history (Zvolensky, Lejuez, Kahler, & Brown, 2004). The present study utilized the following variables from the SHQ: average number of cigarettes smoked per day, age of onset of first cigarette, and age at onset of regular (daily) cigarette smoking.

Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). The FTND is a well-established six-item scale designed to assess gradations in tobacco dependence. This measure exhibits good internal consistency, high degrees of test-retest reliability (C. Pomerleau, Carton, Lutzke, Flessland, & O. Pomerleau, 1994), and positive relations with key smoking variables (e.g., salivary cotinine; Heatherton et al., 1991; Payne, Smith, McCracken, McSherry, & Anthony, 1994). FTND demonstrated typical-range internal consistency among the present study sample (Cronbach's $\alpha = .57$).

Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, Fuente, & Grant, 1993). The AUDIT was employed to measure alcohol use problems. Developed by the World Health Organization, the AUDIT is a well-established brief screening tool for assessing harmful and hazardous drinking behaviors. It also consistently demonstrates good psychometric properties (Saunders et al., 1993). In the present study, the AUDIT total score was utilized to index alcohol problems. Internal consistency of the AUDIT in the current sample was good ($\alpha = .81$).

Posttraumatic Diagnostic Scale (PDS; Foa, 1995). The PDS is a 49-item self-report instrument designed to assess trauma exposure and the presence of PTS symptoms based on *DSM-IV* criteria (APA, 2000). Respondents report if they have experienced any of 13 traumatic events (e.g., “natural disaster“, “sexual or non-sexual assault by a stranger”), including an “other” category, and then indicate which event was most disturbing. The PDS assesses Criterion A trauma exposure as well as the frequency of 17 past-month PTSD symptoms for the most disturbing event endorsed (scored 0-3, with 0 signifying “not at all/only once” and 3 signifying “5 or more times a week/almost always”). The severity score of PTSD symptoms for PDS and its defined symptom clusters are calculated by summing their items (score ranges of 0–51; 0-15; 0-21; 0-15 for PDS Total, PDS Re-Experience, PDS Avoidance, and PDS Hyperarousal, respectively). The PDS has shown generally excellent psychometric properties (Foa, Cashman, Jaycox, & Perry, 1997), including high internal consistency ($\alpha = .92$) and high test-retest reliability ($\kappa = .74$). The PDS was found to have 82% agreement with the SCID-I with regard to PTSD diagnosis (Foa et al., 1997) and good convergent validity (α s = .73,.79) with related measures of depression and anxiety (Foa, 1995). The PDS was utilized to (a) index traumatic event exposure consistent with PTSD Criterion A, (b) establish the total number of trauma exposure types (derived by summing the number of traumatic event types endorsed), and (c) assess PTS symptom severity as well as the severity of each PTS symptom cluster (i.e., re-experiencing symptoms, avoidance symptoms, and hyperarousal symptoms). In the current study, internal consistency was good (Cronbach's α s ranged from .82 to .92 for PDS Total and PDS-defined symptom clusters).

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The DERS is a multidimensional 36-item measure of difficulties in emotion regulation. Its subscales assess six

dimensions of emotional difficulties, including: non-acceptance of emotional responses, limited access to emotion regulation strategies, difficulties engaging in goal-directed activities, lack of emotional clarity, lack of emotional awareness, and impulse control difficulties. Items are rated on a 5-point Likert-type scale (ranging from “1” = *almost never* to “5” = *almost always*). In the present investigation, we used the non-acceptance subscale of the DERS (DERS-nonacceptance). This subscale addresses the degree to which a person demonstrates difficulty in being open to negative emotional experiences and the intensity of negative “secondary responses” toward them. Sample items on this subscale include: “When I’m upset, I feel angry/irritated with myself for feeling that way,” and “When I’m upset, I feel guilty/weak for feeling that way.” Range of scores for this subscale is from 6 to 30, with higher scores indicating greater emotional non-acceptance. This subscale has demonstrated good internal consistency (Cronbach's alpha = .85), acceptable test-retest reliability ($r = .7$, $p < .01$) and construct and predictive validity (Gratz & Roemer, 2004). In the current sample, the non-acceptance subscale demonstrated excellent internal consistency (Cronbach's alpha = .90).

Anxiety Sensitivity Index-III (ASI-3; Taylor, et al., 2007). The ASI-3 is an 18-item self-report measure of the sensitivity to and fear of the potential negative consequences of anxiety-related symptoms and sensations. Respondents are asked to indicate on a 5-point Likert-type scale (0 = “very little” to 4 = “very much”), the degree to which they are concerned about these possible negative consequences. The ASI-3 consists of one higher order factor (ASI-3 Total) and three lower-order factors: ASI-3 Physical concerns (e.g. “It scares me when my heart beats rapidly”), ASI-3 Cognitive concerns (e.g. “When I feel spacey or spaced out, I worry that I may be mentally ill”), and ASI-3 Social Concerns (e.g., “It scares me when I blush in front of people”). The ASI-3 and its defined facets of AS have demonstrated sound internal consistency,

test-retest reliability, and convergent validity relative to other measures of psychiatric symptoms as well as strong and improved discriminant, criterion, and factorial validity relative to previous measures of the construct (Taylor et al., 2007). In the present study, the latent factor of scores for all 18 ASI-3 items, as well as the three latent factors out of items in each ASI-3 subscale (each subscale's score ranges from 0 to 24) were used as the explanatory variables. Internal consistency for ASI-3 and its defined facets of AS for the current study were good (Cronbach's alphas for ASI-3 Total and its subscales range from .84 to .94).

Positive and Negative Affect Scale (PANAS; Watson et al., 1988). The PANAS is a 20-item measure consists of two 10-item mood scales that assess two global dimensions of (negative and positive) affect. Respondents are instructed to read each feeling/emotion (e.g., "hostile", "nervous") mentioned in the instrument, and indicate the extent to which they generally feel these feelings and emotions, using a 5-point Likert-type scale ranging from 1 = not at all /very slightly to 5 = extremely. For the purposes of the present study, only the negative affectivity subscale (NA; sum of the 10 items) was used. Previous research has demonstrated convergent and discriminant validity and reliability of the PANAS and its subscales (Watson et al., 1988). Internal consistency of the NA subscale in the present sample was excellent (Cronbach's alpha = .91).

Data Analytic Plan

The present data have not been previously reported. Structural equation models were conducted using Mplus version 5.1 (Muthén & Muthén, 1998-2008) to examine whether the ASI-3 Total and the ASI-3 lower-order facets of AS explain the effects of DERS-nonacceptance on the PDS Total and the lower-order PDS-defined symptom clusters. Models were conducted using maximum likelihood estimation with bootstrapped confidence intervals for indirect effects.

Overall model fit was assessed using the χ^2 , the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). A nonsignificant χ^2 generally indicates an excellent fitting model. The CFI and RMSEA are approximate test statistics and therefore cutoff values should only be interpreted as a rule of thumb across multiple fit indices (Kline, 2011). CFI values between .90 and .95 indicate an adequate fit, and values greater than .95 indicate good fit. RMSEA values greater than .08 indicate a poor fit, values less than .08 indicate an adequate fit, and values less than .05 indicate a good fit (Hu & Bentler, 1999; MacCallum, Browne, & Sugawara, 1996).

To examine potential explanatory effects, first, a model was introduced in which higher-order ASI-3 Total was the proposed explanatory factor in the relation between the DERS-nonacceptance subscale and the higher-order PDS Total. The next three models examined the same mediational pathways across the specific PDS-defined symptoms clusters (PDS Re-Experience, PDS Avoidance, PDS Hyperarousal,) to determine whether the explanatory effect is specific to particular symptoms cluster defined by the PDS. Explanatory effect was then examined for each ASI-3 lower-order facets of AS (i.e., ASI-3 Physical Concerns, ASI-3 Cognitive Concerns, and ASI-3 Social Concerns), again, between the DERS-nonacceptance subscale and the higher-order PDS Total, and then, between the DERS-nonacceptance subscale and the lower-order PDS-defined symptom clusters. Finally, multiple mediation (Preacher & Hayes, 2008) was conducted including all three ASI-3 lower-order facets of AS in the model at once to determine the unique explanatory effects for each facet of AS. Gender, number of traumatic event exposure types, negative affectivity, number of cigarettes smoked per day, and alcohol use problems, were included as covariates across all models. A significant indirect effect, from the independent variable, through the explanatory variable, to the dependent variable, is the

only requirement necessary to demonstrate mediation (Preacher & Hayes, 2008; Zhao, Lynch, & Chen, 2010).

As the analyses were conducted among cross-sectional data, there was a need to provide additional analyses indicating that among the two emotional vulnerability factors in this model, anxiety sensitivity does indeed explain the relationship between emotional nonacceptance and PTS symptoms. As such, additional analyses were conducted for each significant model where the proposed explanatory variable and predictor variable were replaced (Shrout & Bolger, 2002). Specifically, for each significant analysis, it was evaluated whether emotional nonacceptance explains the relation between anxiety sensitivity and PTS symptoms total score and each respective PTS symptom clusters. This additional test helps improve confidence in the directionality of the observed relations (Shrout & Bolger, 2002).

Results

Descriptive Statistics

Descriptive statistics and correlations are provided in Table 1. Although latent variables for the PDS, DERS Non-acceptance subscale, and ASI-3 were used in further analysis, scale scores were used for descriptive purposes. All variables of primary interest to the analysis were significantly related.

Higher- and Lower-Order ASI-3 Factors Explaining the Relations between the DERS Non-Acceptance Subscale and the Higher- and Lower-Order PDS Factors

A model including the higher-order ASI-3 Total explaining the relation between the DERS Non-acceptance subscale and the higher-order PDS Total provided adequate fit to the data ($\chi^2 = 1769.12, p > .05, CFI = .93, RMSEA = .05$), as did models for PDS Hyperarousal ($\chi^2 = 850.19, p > .05, CFI = .90, RMSEA = .04$), PDS Avoidance ($\chi^2 = 1067.30, p < .05, CFI = .92, RMSEA = .04$), and PDS Re-Experience ($\chi^2 = 874.10, p > .05, CFI = .90, RMSEA = .05$). In

these models (see Table 3), the higher-order ASI-3 Total significantly explained the relations between the DERS Non-acceptance subscale and the PDS Total ($B = .15$, 95% CI [.06, .29]), PDS Hyperarousal ($B = .20$, 95% CI [.05, .42]), and PDS Avoidance ($B = .17$, 95% CI [.05, .34]), but not PDS Re-Experience ($B = .06$, 95% CI [-.08, .21]).

Importantly, the alternative model including the DERS Non-acceptance explaining the relation between the higher-order ASI-3 Total and the higher-order PDS Total provided poor fit to the data ($\chi^2 = 1769.12$, $p < .05$, CFI = .83, RMSEA = .09), as did models for PDS Hyperarousal ($\chi^2 = 850.19$, $p < .05$, CFI = .85, RMSEA = .09), and PDS Avoidance ($\chi^2 = 1067.30$, $p < .05$, CFI = .82, RMSEA = .08). In these models (see Table 3), the indirect effect of DERS Non-acceptance subscale on PDS Total and Hyperarousal, and Avoidance subscales through ASI-3 Total were all non-significant ($B = .35$, 95% CI [-.16, .74]), PDS Hyperarousal ($B = .32$, 95% CI [-.17, .52]), and PDS Avoidance ($B = .07$, 95% CI [-.22, .34]).

In terms of lower order facets of AS, mediation models were examined for each of the ASI-3 lower-order facets of AS independently (see Table 3). A model including the ASI-3 Physical Concerns explaining the relation between the DERS Non-acceptance subscale and the higher-order PDS Total provided adequate fit to the data ($\chi^2 = 974.73$, $p > .05$, CFI = .95, RMSEA = .05), as did models for PDS Hyperarousal ($\chi^2 = 321.75$, $p > .05$, CFI = .93, RMSEA = .04), PDS Avoidance ($\chi^2 = 445.73$, $p > .05$, CFI = .90, RMSEA = .07), and PDS Re-Experience ($\chi^2 = 326.37$, $p > .05$, CFI = .92, RMSEA = .05). There were no significant indirect effects for the ASI-3 Physical Concerns.

A model including the ASI-3 Cognitive Concerns explaining the relation between the DERS Non-acceptance subscale and the higher-order PDS Total provided marginal to adequate fit to the data ($\chi^2 = 1038.42$, $p > .05$, CFI = .94, RMSEA = .03), as did models for PDS

Hyperarousal ($\chi^2 = 355.23, p > .05, CFI = .92, RMSEA = .04$), PDS Avoidance ($\chi^2 = 483.98, p > .05, CFI = .89, RMSEA = .05$), and PDS Re-Experience ($\chi^2 = 351.20, p > .05, CFI = .92, RMSEA = .04$). The ASI-3 Cognitive Concerns explained the relations between the DERS Non-acceptance subscale and the higher-order PDS Total ($B = .10, 95\% CI .03, .21$), the PDS Hyperarousal ($B = .12, 95\% CI .03, .26$), and the PDS Avoidance ($B = .12, 95\% CI .03, .22$).

A model including the ASI-3 Social Concerns explaining the relation between the DERS Non-Acceptance subscale and the higher-order PDS Total provided adequate fit to the data ($\chi^2 = 961.23, p > .05, CFI = .94, RMSEA = .05$), as did models for PDS Hyperarousal ($\chi^2 = 312.34, p > .05, CFI = .92, RMSEA = .05$), PDS Avoidance ($\chi^2 = 431.86, p > .05, CFI = .91, RMSEA = .03$), and PDS Re-Experience ($\chi^2 = 318.69, p > .05, CFI = .92, RMSEA = .04$). The ASI-3 Social Concerns explained the relations between the DERS Non-acceptance subscale and the higher-order PDS Total ($B = .09, 95\% CI .03, .21$), the PDS Hyperarousal ($B = .13, 95\% CI .02, .28$), and the PDS Avoidance ($B = .10, 95\% CI [.01, .22]$).

Multiple Mediation Including the Lower-Order ASI-3 Factors on the Relations between the DERS Non-acceptance Subscale and the Higher- and Lower-Order PDS Factors

Finally, multiple mediation models were examined with all three lower-order ASI-3 factors in the models simultaneously. A model including the ASI-3 lower-order facets of AS explaining the relation between the DERS Non-acceptance subscale and the higher-order PDS Total provided an adequate model fit ($\chi^2 = 1864.54, p > .05, CFI = .91, RMSEA = .04$), as did models for PDS Hyperarousal ($\chi^2 = 946.05, p > .05, CFI = .97, RMSEA = .03$), PDS Avoidance ($\chi^2 = 1160.63, p > .05, CFI = .94, RMSEA = .05$), and PDS Re-Experience ($\chi^2 = 969.90, p > .05, CFI = .96, RMSEA = .05$). Path estimates and indirect effects are displayed in Figures 1-3 (the model with PDS Re-Experience is not illustrated due to the non-significant results yielded in both simple and multiple mediation analyses). Across all models, the only significant indirect

effect was for the ASI-3 Cognitive Concerns explaining the relation between the DERS Non-acceptance subscale and the PDS Avoidance ($B = .11$, 95% CI [.003, .24]).

Discussion

The overall pattern of results that emerged was generally consistent with expectation. Namely, after controlling for gender, number of trauma exposure types, negative affectivity, number of cigarettes smoked per day, and alcohol consumption, AS and its lower order factors of cognitive and social concerns were found to explain the relations between emotional non-acceptance and PTS total as well as avoidance and arousal symptom clusters among trauma-exposed treatment-seeking smokers. However, there was no explanatory effect for the PTS re-experiencing symptoms. Despite the existing reports on the role of emotional nonacceptance in development of anxious arousal and avoidance symptoms (possibly through shame and guilt-related processes; Tangney, Stuewig, & Mashek, 2007), past work in regard to emotional non-acceptance and re-experiencing PTS symptoms has been inconsistent (Kearney et al., 2013; Meyer, et al., 2013; Moore, et al., 2008). Additionally, there have been mixed support for the role of AS for re-experiencing PTS symptoms more generally (Asmundson, & Stapleton, 2008; Collimore, et al., 2008; Stephenson, Valentiner, Kumpula, & Orcutt, 2009). These differences may be, in part, attributable to distinct methodological factors across extant work (e.g., sample types, measurement approach). Importantly, we attempted to strengthen confidence in this observation by evaluating an alternative model, wherein emotional nonacceptance explained the relation between anxiety sensitivity and each of the criterion variables. No support was found for such a model. Thus, the present findings suggest specificity in terms of the potential explanatory role of anxiety sensitivity.

The present findings also provided empirical evidence of an incremental explanatory effect of AS cognitive concerns for the relations between emotional non-acceptance and PTS avoidance symptoms of smokers; an effect evident above and beyond the explanatory effect of social and physical AS concerns. Although no previous study has compared these AS mediational effects in a simultaneous fashion, studies examining the differential relations between the three lower order factors of AS and PTS symptoms have found cognitive concerns (Elwood, et al., 2009; Khawaja, Brooks, & Armstrong, 2008; Lang, Kennedy, & Stein, 2002; Olatunji, & Wolitzky-Taylor, 2009; Vujanovic, Zvolensky, & Bernstein, 2008) and social concerns (Keogh, et al., 2002; Olatunji, & Wolitzky-Taylor, 2009) to have the strongest relations with PTS symptoms. Thus, our study seems to be in line with the similar studies in terms of pattern of influence of different factors of AS. This incremental mediatational effect may be useful in regard to informing the development of specialized AS reduction treatments for sub-population of trauma-exposed smokers.

Although not the primary focus of the present study, it is noteworthy to highlight that AS and negative affect are related, but distinct constructs (see Table 1). Indeed, these two constructs shared a moderate degree of shared variance between one another. This observation provides further support to the construct validity of these two affective vulnerability factors in tobacco smoking research.

There are a number of limitations to the present study that warrant further consideration. First, due to the cross-sectional nature of the methodological design, these analyses cannot isolate and shed light on the temporal relationships between the examined constructs. Future investigations are needed to determine the directional effects of these relations. Second, the present study sample consisted of community-recruited, trauma-exposed

smokers with moderate levels of nicotine dependence. Future work might extend the current model to lighter and heavier smoking populations to ensure the generalizability of the findings to other segments of the smoking population. Third, the current study used self-report instruments as the primary assessment strategy. Future work could, therefore, benefit by including a multi-method assessment approach, thereby reducing concerns about the role of method variance in the observed relations. For example, It would be useful to examine the present relations in response to emotional states elicited in real time via emotion provocation tasks. Finally, the sample used for the present study was comprised of a relatively homogenous group of treatment-seeking smokers. To increase the generalizability of these findings, future research is needed to evaluate these processes among an ethnically/racially diverse sample of smokers.

Overall, the present findings uniquely extend past work and provide support for of the differential mediational role of AS and its lower order factors for the relation between emotional non-acceptance and PTS symptom clusters among trauma-exposed smokers. Such findings can conceptually guide the development of specialized intervention strategies for smokers with the history of exposure to traumatic events and elevated risk for posttraumatic stress psychopathology (Lang et al., 2012). Specifically, the present findings suggest that it may be necessary to understand and clinically address emotional non-acceptance via changing AS (especially its cognitive factor) among trauma exposed tobacco users in order to facilitate more successful mood management, and perhaps, greater quit success.

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Graphs and Figures

Table 1.

Descriptive Statistics and Correlations for Study and Control Variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Mean	SD
1. PDS	1	.81**	.94**	.89**	.39**	.48**	.37**	.47**	.43**	.21**	.39**	.50**	-.01	.02	8.10	9.06
2. PDS Re-		1	.68**	.57**	.31**	.30**	.22**	.30**	.28**	.19*	.31**	.34**	-.04	.07	2.17	2.61
3. PDS Avoid			1	.77**	.38**	.47**	.35**	.46**	.42**	.19*	.35**	.44**	.01	-.04	3.06	4.08
4. PDS Hyperarousal				1	.35**	.48**	.38**	.46**	.42**	.20*	.38**	.52**	-.01	.04	2.85	3.47
5. DERS					1	.60**	.46**	.56**	.55**	.13	.14	.57**	.03	.12	12.18	5.38
6. ASI-3 Total						1	.87**	.87**	.89**	.08	.17*	.60**	.11	.14	15.05	12.66
7. ASI-3 Physical							1	.65**	.62**	.10	.15	.45**	.08	.08	4.60	4.88
8. ASI-3 Cognitive								1	.67**	.08	.18*	.58**	.06	.09	3.1	4.32
9. ASI-3 Social									1	.03	.12	.56**	.14	.19*	7.35	5.28
10. Gender(% female)										1	.06	.16*	-.10	-.14	46.20%	-
11. Traumas											1	.20**	.04	.01	3.15	1.74
12. NA												1	.00	.13	18.86	7.11
13. CSD													1	.13	18.74	9.39
14. AUDIT														1	5.46	5.07

Note: PDS = Post-Traumatic Diagnostic Scale (PDS; Foa, 1995). DERS = Difficulties in Emotion Regulation Scale Non-acceptance Subscale (DERS; Gratz & Roemer, 2004). ASI-3 = Anxiety Sensitivity Index-3(ASI-3; Taylor, et al., 2007). Traumas = Number of Trauma Exposure Types Reported on PDS (out of 13 options). NA = Positive and Negative Affectivity Subscale (PANAS; Watson, Clark, & Tellegen, 1988). Cigarettes = Cigarettes Smoked Daily. AUDIT = Alcohol Use Disorders Identification Test. * $p < .05$; ** $p < .01$.

Table 2.

Structural Equation Models of the Higher-order Anxiety Sensitivity Index-3 Total and the ASI-3 Lower-Order Facets of AS explaining the Relations between the Difficulties Regulating Emotions Scale Non-acceptance Subscale and the Higher-Order Post-Traumatic Diagnostic Scale Total and Its Lower-Order Symptom Clusters

	PDS Total			PDS Hyperarousal			PDS Avoid			PDS Re-Experience		
	Indirect	95% CI		Indirect	95% CI		Indirect	95% CI		Indirect	95% CI	
		Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
ASI-3	.15	.06	.29	.20	.05	.42	.17	.05	.34	.06	-.08	.21
Physical	.04	.00	.10	.07	-.01	.17	.04	-.01	.11	.01	-.04	.10
<i>Cognitive</i>	.10	.03	.19	.12	.03	.26	.12	.03	.22	.03	-.07	.15
Social	.09	.03	.21	.13	.02	.28	.10	.01	.22	.04	-.05	.15

Note. PDS = Post-Traumatic Diagnostic Scale(PDS; Foa, 1995). ASI-3 = Anxiety Sensitivity Index-3(ASI-3; Taylor, et al., 2007). Gender, Number of trauma exposure types, and the Negative Affect Subscale from the Positive and Negative Affect Schedule(PANAS; Watson, Clark, & Tellegen, 1988) were included as control variables. All significant effects are in bold.

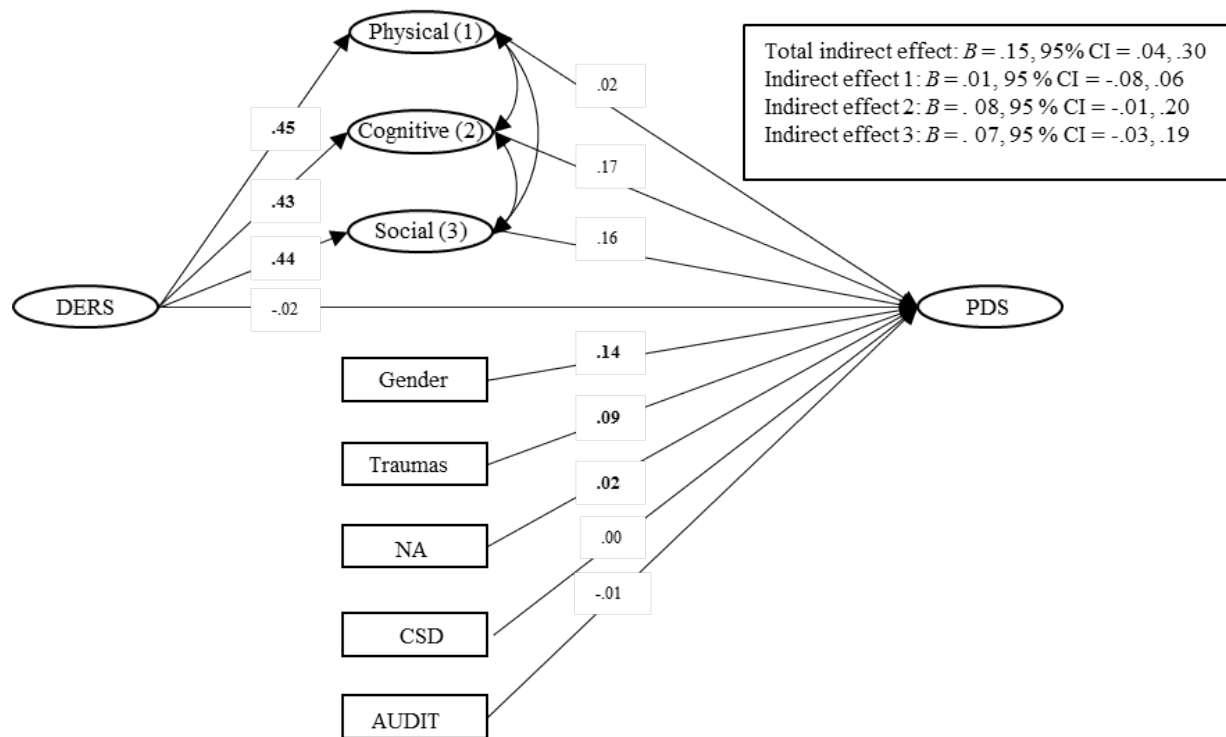


Figure 1. ASI-3 lower-order facets(ASI-3; Taylor, et al., 2007) of AS explaining the relation between the DERS Non-acceptance subscale(DERS; Gratz & Roemer, 2004) and the higher-order PDS Total(PDS; Foa, 1995). As per convention, latent variables are included as ovals and indicators are included as rectangles. Item-level data and factor covariances are omitted from the figure for clarity. Indirect effects for ASI-3 Physical Concerns, Cognitive Concerns, and Social Concerns are labeled within each factor, respectively.

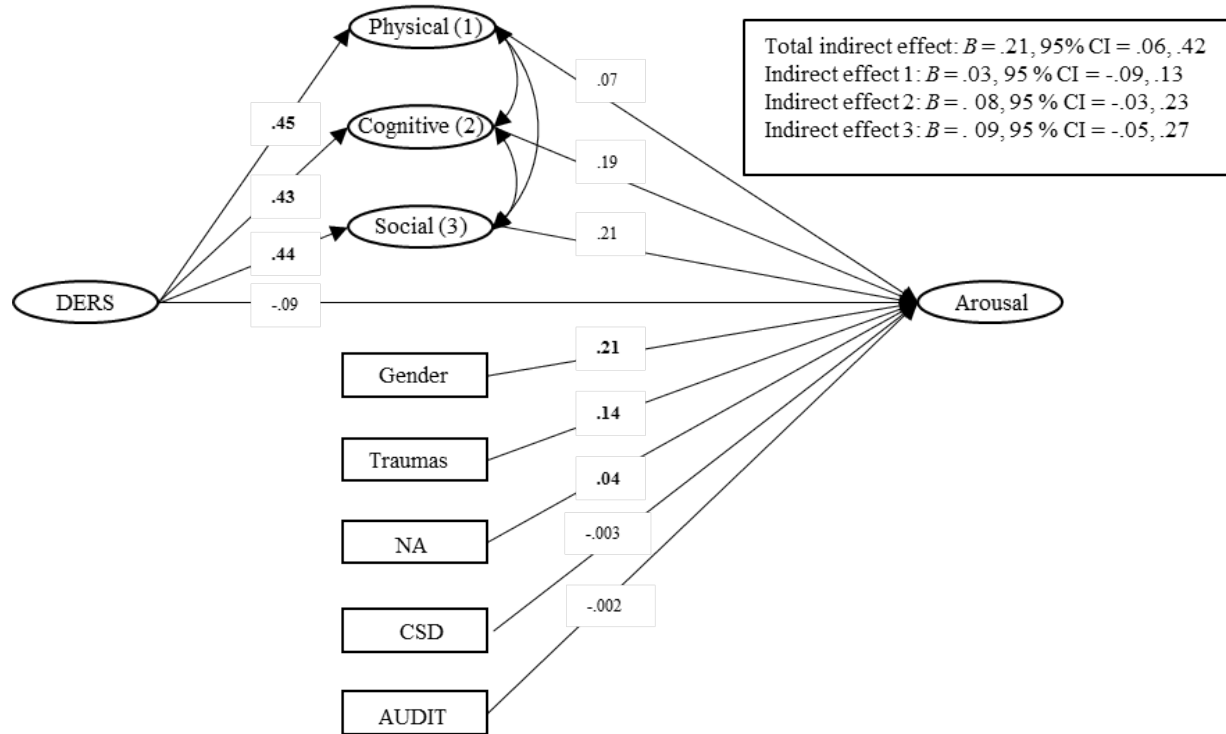


Figure 2. ASI-3 lower-order facets(ASI-3; Taylor, et al., 2007) of AS explaining the relation between the DERS Non-acceptance subscale (DERS; Gratz & Roemer, 2004) and the PDS Hyperarousal (PDS; Foa, 1995). As per convention, latent variables are included as ovals and indicators are included as rectangles. Item-level data and factor covariances are omitted from the figure for clarity. Indirect effects for ASI-3 Physical Concerns, Cognitive Concerns, and Social Concerns are labeled within each factor, respectively.

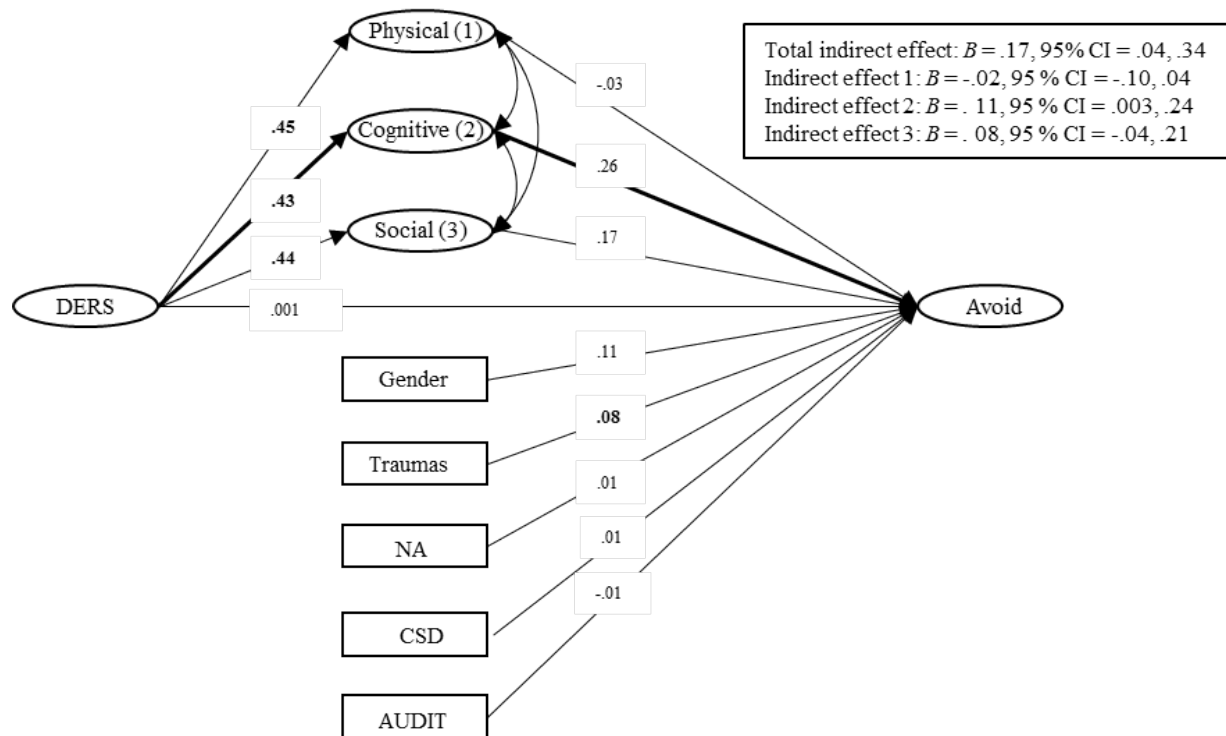


Figure 3. ASI-3 lower-order facets (ASI-3; Taylor, et al., 2007) of AS explaining the relations between the DERS Non-acceptance subscale (DERS; Gratz & Roemer, 2004) and the PDS Avoidance (PDS; Foa, 1995). As per convention, latent variables are included as ovals and indicators are included as rectangles. Item-level data and factor covariances are omitted from the figure for clarity. Indirect effects for ASI-3 Physical Concerns, Cognitive Concerns, and Social Concerns are labeled within each factor, respectively. Significant indirect effects are in bold.