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Evaluation of Smoking Characteristics among Community-Recruited Daily Smokers with and without Posttraumatic Stress Disorder and Panic Psychopathology

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Abstract

The present investigation compared 123 community-recruited daily smokers with posttraumatic stress disorder (PTSD), panic disorder (PD), nonclinical panic attacks (PA), or no current Axis I psychopathology (controls; C) in terms of nicotine dependence, smoking rate, quit history, severity of symptoms during past quit attempts, and motivation for and expectancies about smoking. No differences were observed between groups in regard to smoking rate or nicotine dependence. The PTSD group reported making more lifetime quit attempts than the other groups, and the PTSD and PD groups perceived more severe symptoms during past quit attempts. The PD and PTSD groups reported greater motivation to smoke to reduce negative affect. Individuals with PTSD endorsed a stronger expectation that smoking would alleviate negative mood states and would produce negative consequences. Overall, results suggest that smokers with PD or PTSD differ from other smoking groups in a number of clinically significant ways.

Keywords

Smoking; Panic; PTSD; Anxiety Disorders; Smoking Motives and Expectancies

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There is an increasing empirical recognition that tobacco use and dependence are elevated among those with psychopathology compared to those without psychiatric conditions (Kalman, Morissette, & George, 2005). For example, persons with, relative to those without, psychiatric disorders are approximately twice as likely to be current smokers (Lasser et al., 2000). Moreover, it is estimated that although smokers with psychiatric disorders represent approximately 20% of persons in the United States (U.S.), they consume over 40% of the cigarettes in the nation (Lasser et al., 2000). Such high rates of smoking among those with psychiatric disorders may play a clinically significant role in the high rates of diagnostic comorbidity and mortality observed in people with psychiatric disorders (Kalman et al., 2005).

Recent studies have found important linkages between smoking and certain anxiety disorders (Feldner, Babson, & Zvolensky, 2007a; Morissette, Tull, Gulliver, Kamholz, & Zimering, 2007; Patton, Carlin, Coffey, Wolfe, Hibbert, & Bowes, 1998; Zvolensky, Feldner, Leen-Feldner, & McLeish, 2005). Some of the most robust, clinically-significant relations documented between smoking and anxiety conditions have been evident for panic psychopathology (panic attacks [PA], panic disorder [PD], and agoraphobia) and posttraumatic stress disorder (PTSD). In the case of panic psychopathology, studies suggest that smoking co-occurs at higher rates among those with PA and PD than that found in the general population (Himle, Thyer, & Fischer, 1988; Lasser et al., 2000; McCabe et al., 2004; Pohl, Yeragani, Balon, Lycaki, & McBride, 1992). Additionally, cigarette smoking, particularly at higher rates, has been shown to be concurrently and prospectively associated with an increased risk of more severe panic attack symptoms and life impairment related to such symptoms (Breslau & Klein, 1999; Breslau, Novak, & Kessler, 2004; Johnson et al., 2000; McLeish, Zvolensky, & Bucossi, in press; Zvolensky, Schmidt, & McCreary, 2003). Other work suggests panic psychopathology is related to decreased success in quitting smoking (Lasser et al., 2000; Zvolensky & Bernstein, 2005; Zvolensky, Lejuez, Kahler, & Brown, 2004). Similarly, smoking rates are significantly greater among persons with, compared to those without, PTSD (Acierno et al., 2000; Acierno, Kilpatrick, Resnick, Saunders, & Best, 1996; Beckham et al., 1995; Buckley, Mozley, Bedard, Dewulf, & Greif, 2004). Investigations also have found that exposure to traumatic life events, particularly for those individuals with a PTSD diagnosis, is associated with an increase in smoking behavior (e.g., increasing the amount of cigarettes smoked per day; Breslau, Davis, & Schultz, 2003; Joseph, Yule, Williams, & Hodgkinson, 1993; Koenen et al., 2005; Perkonig, Kessler, Storz, & Wittchen, 2000). Although less is empirically known about the role of PTSD in cessation success per se, scholars have suggested that this clinical condition may (theoretically) be associated with poor cessation outcome (Beckham et al., 1995; Breslau et al., 2003; Buckley et al., 2004; Feldner et al., 2007a). Recent controlled work supports the contention that PTSD is associated with earlier relapse compared to persons with no psychopathology (Zvolensky, Gibson et al., in press).

Although extant work is promising, research on smoking in relation to panic and PTSD is still in its infancy. There are many basic questions that remain unanswered regarding how these clinical conditions relate to smoking. First, we lack empirical knowledge regarding the nature of smoking among those with PTSD and panic psychopathology compared to those without any axis I psychiatric history. The absence of such information hinders efforts to understand the disposition of central features of smoking among these populations, such as number of cigarettes smoked per day, severity of nicotine dependence, number of quit attempts (lifetime), and the perceived severity of symptoms during quit attempts. The existing, albeit limited, research has indicated that persons with PD smoke at higher rates than persons with obsessive-compulsive disorder and social anxiety disorder (McCabe et al., 2004) and that persons with PTSD smoke at greater rates than persons without PTSD (Beckham et al., 1997; Koenen et al., 2003). However, no studies to date have focused specifically on comparing individuals with PTSD and panic psychopathology, the two anxiety disorders most strongly linked to smoking,

on these smoking-relevant factors (Feldner et al., 2007; Zvolensky & Bernstein, 2005). It is also notable that almost all of the studies on PTSD are limited to combat veterans; we therefore have little knowledge about PTSD-smoking relations among community PTSD members more generally.

Second, we lack knowledge regarding the nature of quit behavior among those with PTSD, panic psychopathology, and those without any axis I psychopathology. In particular, we know little about the number of lifetime quit attempts or perceived severity of problematic symptoms during a quit attempt for either of these psychiatric conditions, including comparisons to non-psychiatric controls. Theoretical models of anxiety-smoking comorbidity predict that persons with these particular anxiety disorders, compared to persons without such disorders, would report more efforts to quit unsuccessfully and perceive symptoms to be relatively more severe during a quit attempt (Beckham et al., 1997; Zvolensky & Bernstein, 2005). For example, some conceptualizations have posited that individuals with PD and PTSD, as compared to other anxiety disorders, may use smoking to cope with feared interoceptive sensations experienced during acute nicotine withdrawal, in an attempt to avoid panic and posttraumatic stress-relevant symptoms triggered by such internal sensations (Beckham, 1999; Zvolensky & Bernstein, 2005).

Third, limited study has evaluated how PTSD and panic psychopathology are associated with motivation to smoke (reasons or motives for smoking) and beliefs about the effects of smoking (outcome expectancies). Smoking motives and smoking outcome expectancies are related although distinct constructs (Brandon, Juliano, & Copeland, 1999; Ikard, Green, & Horn, 1969). Whereas motivation to smoke reflects the degree to which one is interested in smoking to achieve a certain effect, outcome expectancies reflect anticipated consequences of smoking (e.g., smoking will increase the risk of developing cancer or emphysema; Brandon, 1994). Given the affective vulnerability that characterizes PTSD and panic psychopathology, in conjunction with preliminary evidence of heavier rates of smoking and nicotine dependence among persons with such conditions (Beckham et al., 1997; McCabe et al., 2004), it is possible individuals with, compared to those without, these disorders would be apt to have greater motivation to smoke for negative affect reduction reasons and maintain more addictive as well as habitual patterns of use. Of the available data that is relevant to this domain of inquiry for panic psychopathology, one study found treatment-seeking persons with PD report greater negative affect reduction smoking motives than smokers without PD (Zvolensky et al., 2005). Beckham and colleagues (1997) also reported PTSD was related to addictive, automatic, and tension reduction motives among a treatment-seeking sample of combat veterans, and Feldner and colleagues (2007b) noted higher levels of posttraumatic stress symptoms among a trauma-exposed nonclinical sample were associated with smoking to reduce negative affect (but not other smoking motives). It remains unclear, however, the extent to which motives vary comparatively as a function of PTSD and PD and in relation to those without such problems.

A final area in need of further study pertains to the idea that smokers with PTSD and PD may be more apt to *expect* smoking to alleviate negative moods and believe that smoking will yield more negative personal consequences compared to other groups. This perspective is supported by available theory and research suggesting that individuals' mood states influence their outcome expectancies related to cigarette smoking (Brandon, 1994). Specifically, individuals experiencing a negative mood state, via mood induction laboratory paradigms, even after controlling for quantity and frequency of smoking, are more likely to expect that smoking would serve as a negative reinforcer (e.g. by reducing tension) and also that it would be associated with negative consequences (e.g. health risks) than individuals experiencing a positive mood state (McKee et al., 2003). Unfortunately, there has not been an investigation examining potential differences based on psychiatric diagnosis, although individuals with PD and PTSD might be more prone to having these expectancies than nonclinical individuals.

Together, the present investigation sought to examine smoking characteristics, quit behavior, and motivational factors and outcome expectancies among a community-recruited sample of daily smokers with PTSD or PD relative to those with nonclinical panic attacks but no Axis I disorders (PA) and controls with no current (past 6 months) axis I psychopathology (C). Smokers interested in quitting on their own were studied, as this population represents the primary method by which the majority of cigarette smokers attempt to quit (Cunningham, 2000). The present design allows for a novel and direct comparison between individuals with two diagnoses related to smoking-relevant outcomes (PTSD and PD), as well as comparison of those groups to two types of 'control' groups: a subclinical population with greater-than-average emotional distress (PA; Norton, Dorward, & Cox, 1986) and control (C) participants with no current axis I psychopathology.

First, in terms of the nature of smoking and quit behavior, it was hypothesized that persons with PTSD and those with PD would report greater smoking rates and nicotine dependence than PA and C comparison groups, but would not differ from one another. This prediction was based upon past work that has suggested that individuals with these diagnoses display heavier patterns of use (Beckham et al., 1997; McCabe et al., 2004). Second, it was hypothesized that PTSD and PD groups would report more unsuccessful quit attempts than PA and C groups as well as more severe symptoms during past quit attempts; again, no differences were expected between the PTSD and PD groups. This hypothesis was driven by theoretical models that suggest individuals with PTSD or PD would be more emotionally reactive to, and less tolerant of, aversive symptoms (e.g., nicotine withdrawal) experienced upon a smoking quit attempt (Beckham et al., 1995; Zvolensky & Bernstein, 2005). Third, it was hypothesized that smokers with PTSD or PD would report greater levels of motivation to smoke for negative affect management than the comparison groups as well as motivation to smoke for addictive (e.g., loss of control over smoking behavior) and habitual (e.g., smoking becoming routine) reasons but would not differ from one another. This hypothesis is based on past work suggesting that individuals with anxiety symptoms report greater motivation to smoke for purposes of negative affect reduction (Beckham et al., 1997; Gregor et al., 2007; Zvolensky et al., 2005). Finally, it was hypothesized that smokers with PTSD or PD would report greater negative affect reduction and negative consequences expectancies than the comparison groups but would not differ from one another. This hypothesis was supported by past work suggesting that individuals experiencing negative mood states are more likely to expect smoking to alleviate such states and to expect smoking to be associated with a variety of negative consequences (McKee et al., 2003). For all comparisons, it was hypothesized that individuals in the PA group would have greater smoking history characteristics (e.g., smoking at greater rates) and affect-relevant smoking behavior (e.g., motives for negative affect reduction) than the C group, but would be less severe than the PD and PTSD groups.

Method

Participants

The sample consisted of 123 participants (62% women) with a mean age of 29.7 years ($SD = 11.9$). The racial distribution of the population generally reflected that of the state of Vermont (State of Vermont Department of Health, 2000), with 91.9% Caucasian, 4.1% Hispanic, 2.4% African American, 0.8% Black/Hispanic, and 0.8% other. Participants were daily cigarette smokers and smoked, on average, 15.7 cigarettes per day ($SD = 6.7$). The average score on the Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) was 3.13 ($SD = 1.74$), indicating low levels of nicotine dependence. Approximately 66% of participants reported drinking alcohol at least 2–4 times per month and consumed 3–4 drinks on average, per occasion. Additionally, participants scored a mean of 9.12 ($SD = 7.77$) on the Alcohol Use Disorders Identification Test (AUDIT; Babor, De La

Fuente, Saunders, & Grant, 1989), with 47.2% of participants meeting criteria for at least moderate (i.e. score of 8 or higher) alcohol problems.

Participants were recruited from the greater Burlington, Vermont community, for participation in a 'self-quit' smoking cessation study (i.e., no formal treatment for smoking cessation of any type was offered), via placement of flyers throughout marketplaces and well-traveled locations and posting of printed advertisements in local newspapers. Recruitment procedures were tailored, via specifically worded flyers and advertisements, to ensure participants with PTSD, PD, nonclinical PA, and no current Axis I psychopathology were represented in the sample. As a result of this targeted recruitment strategy, approximately 38.2% ($n = 47$) of the sample had a current primary axis I diagnosis of PTSD, 13% ($n = 16$) had a current primary diagnosis of PD; with or without agoraphobia, 20.3% ($n = 25$) had current nonclinical PA, and 28.5% ($n = 35$) did not meet criteria for any axis I psychopathology (C). On average, the PTSD and PD groups met criteria for 1.30 ($SD = 0.89$) additional Axis I diagnoses. The PTSD and PD groups did not significantly differ on mean number of comorbid diagnoses. Specifically, in addition to their primary diagnoses, 28 individuals (22.8%) met criteria for Generalized Anxiety Disorder, 22 (17.9%) for Major Depressive Disorder, 9 (7.3%) for Social Anxiety Disorder, 8 (6.5%) for PD, 5 (4.1%) for Specific Phobia, 4 (3.3%) for PTSD, 3 (2.4%) for Dysthymia, 2 (1.6%) for Bipolar Disorder, and 1 (0.8%) for Obsessive Compulsive Disorder. Among the individuals in the PTSD group, 8 participants (17%) met criteria for PD, and among the PD group, 4 participants (25%) met criteria for PTSD; please see Results section for more information regarding the issue of psychiatric comorbidity among the sample. Reliability ratings by an independent rater (MJZ) were completed on a random selection of 20% of the protocols, with no cases of disagreement being noted for primary diagnosis.

Participants in the PTSD group reported having experienced 3.8 traumatic events, on average, as reported on the Posttraumatic Stress Diagnostic Scale (PDS; Foa et al., 1997). With regard to the nature of traumatic events among the PTSD group, 30 reported experiencing non-sexual assault by a family member or someone they know; 30 reported experiencing sexual contact with someone five years or older before the age of 18; 25 reported experiencing sexual assault by a family member or someone they know; 25 reported experiencing an "other" traumatic event; 19 participants reported experiencing a serious accident, fire, or explosion; 17 reported experiencing sexual assault by a stranger; 11 reported experiencing a natural disaster; 10 reported experiencing non-sexual assault by a stranger; 10 reported experiencing a life-threatening illness; 8 reported experiencing imprisonment; 3 reported experiencing military combat or a war zone; and 2 reported experiencing torture. Severity ratings on the ADIS (i.e., total of PTSD symptom severity scores) indicated that participants in the PTSD group had an average total diagnostic severity rating of 59.12 ($SD = 15.51$; Observed range = 26 – 90) out of a possible 96.

For inclusion in the study, participants were required to meet the following criteria: (1) meet current primary diagnostic criteria for PTSD, PD, PA, or no current (past 6 months) axis I psychopathology (tailored to the diagnostic groups, as described above); (2) be between 18 and 65 years of age; (3) have been a regular daily smoker for at least one year; (4) be currently smoking an average of at least 10 cigarettes per day; (5) report motivation to quit of at least 5 on a 10-point Likert-style scale (0 = *no motivation to quit*; 10 = *extreme motivation to quit*); (6) express interest in making a serious quit attempt in the next month; and (7) not have decreased the number of cigarettes smoked by more than half in the past six months. Exclusionary criteria for the investigation included: (1) limited mental competency or the inability to provide informed, written consent; (2) current suicidal or homicidal ideation; (3) current or past history of psychotic-spectrum symptoms or disorders; (4) current major medical problems (e.g., heart disease, cancer); (5) current use of nicotine replacement therapy; (6) current use of tobacco products other than cigarettes (e.g., cigars, chewing tobacco); (7) current

substance dependence (other than nicotine); and (8) pregnancy (women only). During the phone screening process, a total of 182 participants were deemed ineligible for the study based on the aforementioned criteria; and at the baseline session, 18 participants were excluded due to ineligibility.

Measures

Anxiety Disorders Interview Schedule for DSM-IV: Client Interview Schedule—(ADIS-IV; Brown, Di Nardo, & Barlow, 1994). The ADIS-IV is a semi-structured diagnostic tool used to assess DSM-IV anxiety, mood, somatoform, and substance use disorders as well as screen for the presence of psychotic disorders. Reliability of this measure has shown good to excellent inter-rater agreement for the majority of anxiety and mood disorders amongst patients who were given two independent administrations of the ADIS-IV (Brown, Di Nardo, Lehman, & Campbell, 2001).

Posttraumatic Diagnostic Scale (PDS)—The PDS (Foa, 1995) is a 49-item self-report instrument designed to assess the presence of posttraumatic stress symptoms, based on *DSM-IV* criteria (American Psychiatric Association [APA], 1994, 2000). Respondents report if they have experienced any of 12 traumatic events, including an “other” category, and then indicate which event was most disturbing. Respondents also rate the frequency (0 = *not at all or only one time* to 3 = *five or more times a week/almost always*) of 17 PTSD symptoms experienced in the past month in relation to the most-disturbing event endorsed (total score range of 0 to 51). The PDS is a measure of trauma-related symptoms with generally excellent psychometric properties (Foa, Cashman, Jaycox, & Perry, 1997). The PDS has demonstrated high internal consistency ($\alpha = .92$) and high test-retest reliability ($\kappa = .74$). In terms of convergent validity, when PDS scores were compared to those of the PTSD module on the Structured Clinical Interview for DSM-IV, the PDS correctly identified the PTSD status of 86% of participants; with positive predictive power of 100% and negative predictive power of 82% (Foa, Riggs, Dancu, & Rothbaum, 1993). In this study, the PDS was utilized to index traumatic event exposure.

Smoking History Questionnaire—(SHQ; Brown, Lejuez, Kahler, & Brown, 2002). The SHQ is a self-report questionnaire used to assess smoking history and pattern. The SHQ includes items pertaining to smoking rate, age of onset of smoking initiation, and years of being a daily smoker. The SHQ also assesses information regarding quit attempts, including withdrawal symptoms experienced during such attempts. The SHQ has been successfully used in previous studies as a measure of smoking history, pattern, and symptom problems during quitting (Zvolensky, Leen-Feldner et al., 2004; Zvolensky, Lejuez, Kahler, & Brown, 2004). The current investigation utilized the following variables from the SHQ: average number of cigarettes smoked per day, number of years as a regular smoker, number of serious quit attempts made in one’s lifetime, number of years since first quit attempt, and severity of symptoms experienced during past quit attempts. The symptom index, specifically, consists of 16 items (e.g., “difficulty concentrating”) rated on a scale from 1 (“*not at all*”) to 5 (“*extremely*”) based on how intensely participants report experiencing those symptoms during past quit attempts ($\alpha = .91$).

Fagerström Tolerance Questionnaire—(FTQ; Fagerström, 1978). The FTQ was used as a continuous self-report measure of nicotine dependence. Specifically, the FTQ was administered and scored as the Fagerstrom Test for Nicotine Dependence (FTND). The FTND is a 6-item scale designed to assess gradations in tobacco dependence (Heatherton et al., 1991). Two items are rated on a four-point Likert-style scale (0–3); and four items are rated dichotomously (yes/no). Sample items include, “How soon after you wake up do you smoke your first cigarette?” and “Do you find it hard to refrain from smoking in places where it is

forbidden?” The FTND has shown good internal consistency, positive relations with key smoking variables (e.g., saliva cotinine; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991; Payne, Smith, McCracken, McSherry, & Antony, 1994), and high degrees of test-retest reliability (Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994).

Alcohol Use Disorders Identification Test—(AUDIT; Babor, de la Fuente, Saunders, & Grant, 1992). The AUDIT is a 10-item self-report screening measure developed by the World Health Organization to identify individuals with alcohol problems (Babor et al., 1992). There is a large body of literature attesting to the validity of the AUDIT (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). In the present study, we computed two products from the AUDIT to comprehensively measure the nature of alcohol use and problems: (1) the frequency and quantity items were used to index current alcohol consumption (an average frequency-by-quantity composite score; Stewart, Zvolensky, & Eifert, 2001); and (2) the total score was employed to measure alcohol use problems (Babor et al., 1992).

Reasons for Smoking—(RFS; Ikard, Green, & Horn, 1969). The RFS consists of 23 items, rated on a 5-point Likert-style scale (1 = *never* to 5 = *always*), used to assess smoking motives. The psychometric properties of this scale, including measures of factor structure, internal consistency, and test-retest reliability, have been well-established (Shiffman, 1993). The RFS consists of six motives subscales: Habitual (e.g., “I’ve found a cigarette in my mouth and didn’t remember putting it there”), Addictive (e.g., “Between cigarettes, I get a craving only a cigarette can satisfy”), Negative Affect Reduction (e.g., “When I feel uncomfortable or upset about something, I light up a cigarette”), Positive Reinforcement (e.g., “I find cigarettes pleasurable”), Sensorimotor (e.g., “Part of the enjoyment of smoking a cigarette comes from the steps I take to light up”), and Stimulation (e.g., “I like smoking when I am busy and working hard;” Shiffman, 1983).

Smoking Consequences Questionnaire—(SCQ; Brandon & Baker, 1991). The SCQ (Brandon & Baker, 1991) is a 50-item self-report measure that assesses smoking expectancies on a Likert-type scale, ranging from 0 (“*completely unlikely*”) to 9 (“*completely likely*”). The measure and its constituent factors have excellent psychometric properties (Buckley et al., 2005; Brandon & Baker, 1991; Downey & Kilbey, 1995). The SCQ includes the following subscales: Positive Reinforcement (e.g., “I enjoy the taste sensations while smoking”), Negative Reinforcement (e.g., “Smoking helps me calm down when I feel nervous”), Negative Consequences (e.g., “The more I smoke, the more I risk my health”), and Appetite Control (e.g., “Smoking helps me control my weight”).

Procedure

Data for the current investigation were gathered at the baseline appointment, before the smoking cessation portion of the study in which participants made a self-guided quit attempt. During this baseline appointment, participants (1) first provided verbal and written informed consent, (2) completed a medical screen, (3) underwent a diagnostic evaluation (ADIS-IV) by a trained interviewer in order to determine inclusionary status and Axis I diagnoses, and (4) completed an initial battery of self-report assessments, including those used in the present investigation. For all participants, the baseline evaluation occurred two to three weeks prior to their scheduled quit day. All participants received \$25 for completion of the baseline assessment session; participation in all 8 appointments of the longitudinal cessation study yielded a total compensation amount of \$225. Only the baseline data were used in the current study; these data have not been previously reported.

Results

Participant Characteristics

See Table 1 for means and standard deviations of key participant characteristic variables. One-way ANOVAs revealed no significant differences in age ($p = .16$) or education level ($p = .11$) across the groups. There were also no differences based on diagnostic status for alcohol consumption ($p = .33$) or alcohol use problems ($p = .60$) across the four groups.

Smoking Characteristics and Quit Behavior

See Table 2 for a summary of between-group smoking characteristics and quit behavior. To test for potential effects of overlapping PTSD and PD diagnoses, all analyses were conducted both including and excluding individuals with both diagnoses. No significant differences were found with regard to the pattern or magnitude of results; therefore, individuals with co-occurring PTSD and PD were retained in the present analyses.¹

One-way ANOVAs revealed no group differences based on diagnostic status for cigarettes smoked per day ($p = .22$), FTND scores (nicotine dependence; $p = .19$), number of years as a regular smoker ($p = .12$), or number of years since the first quit attempt ($p = .32$). There was a significant group difference for the number of serious lifetime quit attempts ($F = 3.33$, $p < .05$, $h^2 = .08$). The PTSD group compared to controls, but no other groups, reported having made a greater number of quit attempts ($p < .05$). There also was a significant group difference for self-reported severity of symptoms experienced during past quit attempts ($F = 17.89$, $p < .001$, $h^2 = .34$). *A priori* between-group t-tests revealed that the PD and PTSD groups reported significantly greater levels of problematic symptoms than the C group ($p < .001$ for both) and the PA group ($p < .05$, $p < .01$, respectively).²

Motivational Bases for Smoking

See Table 3 for a summary of the motivational bases for smoking findings. For the RFS subscales, one-way ANOVAs indicated significant differences for Habitual ($F = 4.46$, $p < .01$, $h^2 = .10$), Addictive ($F = 10.48$, $p < .001$, $h^2 = .21$), Negative Affect Reduction ($F = 18.79$, $p < .001$, $h^2 = .32$), as well as Stimulation motives ($F = 4.07$, $p < .01$, $h^2 = .09$). No other significant effects were evident. The PTSD group reported greater Habitual ($p < .01$) and Stimulation ($p < .01$) reasons for smoking compared to the C group, but not any of the other groups. The PD ($p < .05$) and PTSD ($p < .001$) groups reported greater Addictive motives for smoking compared to the C group, and the PTSD group ($p < .01$) reported significantly greater Addictive reasons for smoking than the PA group. Finally, the PD ($p < .001$) and PTSD ($p < .001$) groups reported significantly greater Negative Affect Reduction reasons for smoking compared to the C group and the PA group ($p = .001$, $p < .001$, respectively).

Outcome Expectancies for Smoking

See Table 4 for a summary of the findings relevant to outcome expectancies for smoking. For the SCQ subscales, one-way ANOVAs indicated significant group differences for the Negative Consequences ($F = 6.96$, $p < .001$, $h^2 = .15$), Negative Reinforcement ($F = 14.97$, $p < .001$, $h^2 = .27$), and Appetite Control subscales ($F = 4.81$, $p < .01$, $h^2 = .11$). For the Negative Consequences subscale, the PTSD group, but not the PD group, scored significantly higher than both the C ($p < .001$) and PA groups ($p < .05$). The PTSD and PD groups did not

¹The results of these analyses can be obtained upon request from Dr. Zvolensky.

²We conducted a post hoc follow-up analyses dividing the symptoms reported during past quit attempts as a function of whether or not they were affect-relevant (e.g., anxiety) or not (e.g., sleep problems). Results did not differ in either the pattern or magnitude of those reported when using the total score. Thus, we report only the total score. The results of these analyses can be obtained upon request from Dr. Zvolensky.

significantly differ from one another ($p > .1$). For the Negative Reinforcement subscale, the PTSD group scored significantly higher than both the C and PA groups ($p < .001$ for both), and the PD group scored significantly higher than the C group ($p < .01$). The PTSD and PD groups did not differ from one another ($p > .1$). Finally, for the Appetite Control subscale, the PTSD group scored significantly higher than the C group ($p < .01$); no other group differences were evident (p 's $> .1$).

Discussion

The present investigation evaluated differences in smoking and quit behavior as well as motivational bases and outcome expectancies for smoking among a community-recruited sample of daily smokers with PTSD or PD relative to those with PA and controls (C) with no current psychopathology. There were no group differences in cigarettes smoked per day, level of nicotine dependence, or years of being a regular (daily) smoker. The lack of such differences across these smoking behavior variables is inconsistent with past reports from treatment-seeking samples whereby persons with PTSD and PD smoked at heavier rates than those without such disorders (Beckham et al., 1997; Koenen et al., 2003; McCabe et al., 2004). It is possible that the differences between the present results and those obtained from past work are due to differences in sampling strategies used in the investigations: the current investigation focused on community-recruited persons smoking a minimum of 10 cigarettes per day, whereas past studies that have detected differences in smoking rate by diagnosis recruited treatment-seeking individuals with no minimum cut-off for daily smoking behavior. In addition, it is possible that treatment-seeking persons with PD and PTSD represent a more severe group of individuals than individuals with these same disorders who are not necessarily seeking treatment for their psychological problems and are motivated to engage in a self-guided smoking cessation attempt (Berkson, 1946).

Inspection of lifetime quit behavior and perceived severity of symptoms during quit attempts revealed a novel set of findings. Here, the PTSD group compared to controls, but no other groups, reported having made a significantly greater number of lifetime quit attempts. These data suggest that daily smokers with PTSD tend to make a greater number of quit attempts than individuals with no psychiatric history even though these same groups did not differ in terms of other smoking behavior characteristics, including smoking rate and duration of quit attempt history. It is possible that smokers with PTSD are more aware of the problematic effects of smoking on their physical or psychological health and therefore are more motivated to attempt to quit than persons with no Axis I disorders (see also discussion of smoking outcome expectancy findings below). There also was a significant group difference for self-reported severity of symptoms experienced during past quit attempts, whereby the PD and PTSD groups reported significantly greater levels of problematic symptoms than the PA and C groups; no significant differences were evident, however, between the PD and PTSD groups. These results, consistent with theoretical formulations of comorbidity between these disorders and smoking (Beckham, 1999; Zvolensky & Bernstein, 2005), suggest individuals with PD and PTSD perceive symptoms during quitting as more severe and distressing than other individuals. Although the present study methodology cannot explicate the extent to which memory or recall biases play a role in such effects, future work could examine the significance of such symptoms prospectively during quit attempts. Some work suggests that hypervigilance to internal cues, emotional reactivity, and distress intolerance to early signs of withdrawal and other stressors each are related to duration of quit attempts (Brown, Lejuez, Kahler, & Strong, 2002; Quinn, Brandon & Copeland, 1996; Zvolensky, Feldner, Eifert, & Stewart, 2001). To the extent that such affective variables - hypervigilance, emotional reactivity, and distress intolerance - characterize, at least in part, PD and PTSD, individuals with these disorders may be more apt to experience (perceived or objective) aversive symptoms, triggered by the cessation of smoking, to be problematic in efforts to abstain. Some recent evidence is consistent with this

perspective (Zvolensky, Gibson et al., in press). Interestingly, individuals with PA did not differ from non-psychiatric individuals with regard to symptom severity during a quit attempt. This finding suggests that the association between physical and emotional distress alone (i.e., the experience of panic attacks in and of themselves) may be different than having a full diagnosis of PD or PTSD with regard to problematic symptoms during quitting.

The diagnostic groups also differed with regard to reported motivation for smoking. As expected, individuals with PD and PTSD reported greater motivation to smoke to reduce negative affect than individuals with nonclinical panic attacks or no current psychopathology. However, motivation to smoke to cope with negative affect did not significantly differ between those with PTSD and PD. Such results, broadly consistent with past work (Beckham et al., 1997; Feldner et al., 2007b; Zvolensky, Schmidt et al., 2005), illustrate the possible centrality of coping-oriented smoking motives for persons with anxiety disorders compared to those without such conditions. Partially in accord with prediction, the PTSD group also reported being more motivated to smoke for habitual and stimulation reasons as compared with the C group, as well as more motivated to smoke for addictive reasons than the PA and C groups; no differences were evident, again, between PTSD and PD for these smoking motives. Finally, the PTSD group reported greater motivation to smoke for addictive reasons than the PA and C groups, and the PD group reported greater motivation to smoke for addictive reasons than the C group, but not the PA group. The PA and C groups, once again, did not differ from one another on any smoking motives. Collectively, the results suggest that smokers with PTSD and PD endorse more addictive, and to a lesser extent habitual, motives for smoking compared to daily smokers without any psychiatric history. Thus, aside from negative affect reduction motives for smoking, smokers with PTSD and PD, specifically, and anxiety disorders, more generally, may be more prone to addictive and automatized (habitual) aspects of smoking.

Partially in accord with prediction, individuals with PTSD reported greater expectancies of negative reinforcement and negative consequences from smoking relative to the PA and C groups, as well as greater expectancies of appetite control relative to the C group. Individuals with PD reported greater expectancies of negative reinforcement relative to the C group. The PD and PTSD groups did not significantly differ from one another on any of the expectancy subscales, nor did the PA and C groups. These findings provide empirical evidence that daily smokers with PD and PTSD expect that smoking can provide some measure of (perceived) relief from negative mood states, and that the PTSD group, overall, expects other such benefits of smoking (e.g. appetite control). Interestingly, individuals with PTSD, despite their enhanced motivation to smoke and expectations of the short-term benefits of smoking, believe that their smoking is more detrimental to their general well being than individuals without such psychopathology. Although extant theories have not addressed the role of beliefs about harm arising from smoking among those with PTSD, it is possible that these individuals have a sense of potential connections between smoking and negative physical and psychological symptoms; in particular, such symptoms could be perceived as more emotionally distressing to these individuals already experiencing hyperarousal and other such negative emotional symptoms.

Overall, the present results suggest that PTSD and PD are meaningfully related to certain smoking-related variables of clinical importance. These data add to the growing theoretical and empirical literature suggesting that smokers with anxiety disorders may benefit from specialized treatment approaches that target these anxiety factors for the purpose of more effectively preventing relapse (Morissette et al., 2007; Zvolensky & Bernstein, 2005). Indeed, from a clinical perspective, the combination of a potentially increased reliance on smoking as a method of coping with the experience of negative mood and diagnosis-specific symptoms accompanied by a particularly pronounced experience of symptoms during quit attempts may help explain why these individuals are a difficult-to-treat sub-population of smokers. Thus, smokers with PTSD and PD might need more intensive or anxiety-oriented smoking cessation

treatments to help reduce the perceived intensity of nicotine withdrawal symptoms and develop alternative coping strategies (rather than smoking) for effectively managing stressors during a quit attempt (Zvolensky, Bernstein, Yartz, McLeish, & Feldner, 2008).

There are a number of limitations to the investigation that require interpretative caveats concerning the present findings. First, self-report measures were employed as the primary assessment methodology and, therefore, it is possible that shared method variance may have played a role in the observed results. Second, the present cross-sectional correlational design does not permit causal-oriented hypothesis testing. Future work could build from the present study by evaluating the observed relations using prospective methodologies. Third, the present sample, while recruited from the community, was enrolled as part of a larger study focused on making a self-guided quit attempt (quitting without psychosocial or pharmacological aids). It is therefore unclear how the observed differences across the studied anxiety disorders compare to samples of daily smokers seeking intervention to quit (or those not interested in quitting at all). Fourth, the sample size of the PD group ($n = 16$) was smaller than the other diagnostic groups in the present study. Future work could benefit from recruiting larger, more equal subgroups. Fifth, future work would benefit from investigating the potential moderating role of gender in the observed associations. Sixth, the present study lacks information regarding the length of time between the traumatic event and the start of the study for the participants in the PTSD group, as well as whether any of the participants were currently receiving treatment for psychological problems. Future work could benefit from exploring potential effects of these variables on the observed relations. Finally, the present study is limited in that it is comprised of a relatively homogenous sample in terms of race and ethnicity. Future work could therefore usefully focus on examining anxiety disorders within a more racially and ethnically heterogeneous sample. In this same vein, it would be useful to more directly study cigarette and anxiety relations in a developmental context, as there are likely important developmental factors to consider in understanding tobacco use and anxiety associations.

Together, the present investigation provides novel empirical data pertaining to the association between anxiety disorders and smoking characteristics, motivational factors, and smoking outcome expectancies among a community-recruited sample of daily smokers interested in quitting without professional assistance. Results suggest that individuals with PD or PTSD differ from other smoking groups in a number of clinically significant ways. Future work is needed to better understand the relevance of anxiety disorders on smoking cessation outcome.

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Table 1
Participant Characteristics and Between Group Difference

Variable	Mean	SD	Observed Range	F value	Effect Size (h ²)
Age	29.72	11.93	18 – 65	2.10	.05
Education Level ^a	3.10	0.98	1 – 6	2.07	.05
Number Comorbid Diagnoses ^b	1.30	0.89	0 – 3	2.34	.03
Alcohol Consumption (Q F)	5.02	5.03	0 – 20	1.16	.03
AUDIT total	9.12	7.77	0 – 30	0.94	.02

^a Note: $p < .05$

* $p < .01$

** $p < .001$

^a Possible values: 1 = less than high school, 2 = high school/GED, 3 = some college, 4 = college graduate, 5 = some graduate work, 6 = graduate degree

^b For the PD and PTSD groups only. AUDIT: Alcohol Use Disorders Identification Test (Babor et al., 1992).

Table 2

Nature of Smoking and Quit Behavior

Variable	F value	Effect Size (h^2)	Mean (SD)	Observed Range	Significant Group Differences
Cigarettes per Day	1.51	.04	15.69 (6.70)	3 – 48	
FTND Total	1.62	.04	3.13 (1.74)	0 – 7	
Years as a Regular Smoker	2.01	.05	12.19 (10.30)	1 – 45	
# Years since First Quit Attempt	1.19	.03	5.73 (7.26)	0 – 45	
# Serious Quit Attempts	3.33 [†]	.08			PTSD > C [†]
C			1.86 (1.82)	0 – 9	
PA			2.71 (2.31)	0 – 10	
PD			3.25 (2.18)	1 – 9	
PTSD			3.49 (2.81)	0 – 9	
Symptom Severity During Quit ^a	17.89 ^{**}	.34			PD > PA [†] ; PD > C ^{**} PTSD > PA [†] ; PTSD > C ^{**}
C			26.55 (6.43)	16 – 40	
PA			32.68 (10.09)	19 – 58	
PD			42.14 (9.53)	31 – 67	
PTSD			43.32 (12.80)	14 – 71	

[†]Note: $p < .05$

* $p < .01$

** $p < .001$

^aPossible ranges of symptom severity: 16 – 80. FTND: Fagerstrom Test for Nicotine Dependence (Fagerström, 1978).

Table 3

Nature of Motivational Bases for Smoking (RFS Subscales)

Variable	F value	Effect Size (η^2)	Mean (SD)	Observed Range	Significant Group Differences
Habitual Motives^a					
C	4.46*	.10	1.82 (.43)	1.00 – 3.00	PTSD > C*
PA			2.11 (.56)	1.00 – 3.25	
PD			2.14 (.89)	1.00 – 4.25	
PTSD			2.33 (.67)	1.00 – 3.75	
Addictive Motives	10.48**	.21			PD > C [†]
C			2.60 (.78)	1.20 – 4.40	PTSD > PA* ; PTSD > C**
PA			2.86 (.56)	1.80 – 3.80	
PD			3.28 (.97)	1.40 – 4.80	
PTSD			3.48 (.72)	2.00 – 4.80	
Negative Affect Reduction Motives	18.79**	.32			PD > PA* ; PD > C**
C			2.73 (.73)	1.33 – 4.67	PTSD > PA* ; PTSD > C**
PA			2.80 (.71)	1.67 – 4.17	
PD			3.71 (.91)	1.50 – 4.83	
PTSD			3.76 (.67)	2.33 – 4.83	
Positive Reinforcement Motives	.14	.00			
C			3.49 (.81)	1.50 – 5.00	
PA			3.58 (1.04)	1.00 – 5.00	
PD			3.56 (1.40)	1.00 – 5.00	
PTSD			3.44 (.99)	1.00 – 5.00	
Sensorimotor Motives	.62	.02			
C			2.30 (.94)	1.00 – 4.33	
PA			2.49 (1.03)	1.00 – 4.33	
PD			2.65 (1.18)	1.00 – 4.33	
PTSD			2.33 (.91)	1.00 – 4.00	
Stimulation Motives	4.07*	.09			PTSD > C*
C			2.12 (.84)	1.00 – 4.67	
PA			2.40 (.97)	1.00 – 4.00	
PD			2.46 (.76)	1.00 – 4.00	
PTSD			2.83 (1.01)	1.00 – 5.00	

† Note: $p < .05$ * $p < .01$ ** $p < .001$ ^a Possible ranges on the scales: 1 – 5.

Table 4
Nature of Outcome Expectancies for Smoking (SCQ Subscales)

Variable	F value	Effect Size (h ²)	Mean (SD)	Observed Range	Significant Group Differences
Positive Reinforcement^a					
C	1.21	.03	4.91 (1.87)	.27 – 8.67	
PA			5.09 (1.52)	1.60 – 7.93	
PD			5.32 (1.79)	2.20 – 8.80	
PTSD			5.59 (1.55)	1.73 – 8.20	
Negative Reinforcement	14.97**	.27			PD > C* PTSD > PA** ; PTSD > C**
C			4.15 (1.90)	.83 – 8.83	
PA			4.49 (1.80)	.17 – 7.83	
PD			5.90 (1.83)	2.33 – 8.75	
PTSD			6.43 (1.41)	2.73 – 8.75	
Negative Consequences	6.96**	.15			PTSD > PA† ; PTSD > C**
C			5.90 (1.15)	3.32 – 8.44	
PA			6.14 (1.33)	3.05 – 7.89	
PD			6.50 (1.85)	1.84 – 8.42	
PTSD			7.18 (1.27)	3.74 – 8.74	
Appetite Control	4.81*	.11			PTSD > C*
C			2.97 (2.59)	.00 – 7.40	
PA			4.55 (2.64)	.00 – 9.00	
PD			4.48 (2.74)	.00 – 8.80	
PTSD			5.13 (2.48)	.00 – 9.00	

*Note: $p < .05$

* $p < .01$

** $p < .001$

^aPossible ranges on the scales: 0 – 9.