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Nicotine Dependence, PTSD Symptoms, and Depression Proneness Among Male and Female Smokers

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Abstract

Several studies have linked posttraumatic stress disorder with heavy smoking. It is not known to what extent this association is specific, as opposed to being a function of a joint association of PTSD and heavy smoking with a third variable such as depression proneness. In a cross-sectional study of 157 current regular smokers, severity of nicotine dependence (but not cigarettes smoked per day) was positively correlated with total PTSD symptoms, hyperarousal symptoms, and avoidance symptoms. These correlations were not eliminated by controlling statistically for depression vulnerability, whether it was measured on a continuous self-rating scale or on the basis of interview-diagnosed history of major depression. The association between PTSD and nicotine dependence was stronger among men than among women.

Keywords

depression proneness; posttraumatic stress disorder; cigarette smoking; nicotine dependence; sex differences

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Post-traumatic Stress Disorder (PTSD) has been linked with increased use of medical services, poor self-reported health, objective health problems, morbidity, and mortality (Calhoun, Bosworth, Grambow, Dudley, & Beckham, 2002; Friedmann & Schnurr, 1995; Ouimette et al., 2004). A possible contributory cause of negative health outcomes among those with PTSD is cigarette smoking. Combat veterans with PTSD reported a greater incidence of cigarette smoking than did veterans without PTSD (Shalev, Bleich, & Ursano, 1990). Similar results were obtained in a study of male former members of the civilian resistance against Nazi occupation of Holland in World War II (op den Velde et al., 2002). One study found similar prevalence of tobacco use among combat veterans with and without PTSD (Beckham et al., 1997), but, among the smokers, those with PTSD were more likely to be heavy smokers. Consistent with these field data on heavy smoking, in a recent smoking topography study smokers with PTSD demonstrated higher puff volumes than did smokers without PTSD (McClernon et al., 2005).

An association between PTSD and smoking may reflect the use of nicotine to attempt to alleviate PTSD symptoms (McFall, MacKay, & Donovan, 1992). Nicotine could be used to decrease physiological arousal, or conversely to stimulate someone experiencing uncomfortable feelings of numbness or detachment. Among combat veterans diagnosed with

PTSD, heavy smoking status was positively related to total PTSD symptoms, as well as hyperarousal and avoidance/numbing symptoms (Beckham et al., 1997).

The study reported in this article extends earlier work on PTSD and smoking in two ways: evaluation of depression proneness as a potential confound, and exploration of sex differences. First, it is not clear whether an association between PTSD symptoms and smoking is specific, or instead a reflection of their joint association with a third variable such as depression proneness. PTSD and depression often co-occur after extreme stressors (Blanchard, Buckley, Hickling, & Taylor, 1998; Bleich, Koslowsky, Dolev, & Lerer, 1997). Lifetime prevalence of major depressive disorder was far higher (81%) among regular smokers with PTSD than among regular smokers exposed to trauma but without PTSD (36%) (McClernon et al., 2005). Depression vulnerability, like PTSD, has been linked to a higher incidence of cigarette smoking (Glassman, 1993). For example, in a five-year longitudinal study, people with a history of major depression at baseline were three times more likely to progress to smoking daily (Breslau, Peterson, Schultz, Chilcoat, & Andreski, 1998).

Thus, PTSD symptoms are associated with smoking, perhaps especially with heavy smoking or nicotine dependence. Both of these variables are associated with a tendency to become depressed. We therefore addressed the question of whether an association of PTSD symptoms with nicotine dependence severity is specific, or whether it can be accounted for entirely by their joint association with depression proneness. We measured depression proneness in two ways: (a) self-reports of depression proneness and (b) history of major depression. Many studies use history of depression as an indicator of vulnerability, but supplementing this indicator with self-rated depression proneness may be advantageous. It allows for consideration of vulnerability as a continuous variable. It also accounts for the possibility that someone could be highly vulnerable without ever having suffered a major depressive episode (e.g., if sufficient stressors have not occurred), as well as the possibility that someone with a history of major depression has now received effective, durable treatment and is no longer highly vulnerable (Just, Abramson, & Alloy, 2001).

Second, we examined the association of PTSD symptoms with nicotine dependence, with and without statistical control of depression proneness, separately among male and among female smokers. Based on response styles theory (Nolen-Hoeksema, 1991) and associated research indicating that men are more likely to attempt to distract themselves, whereas women more likely to ruminate in response to negative mood states (Butler & Nolen-Hoeksema, 1994), it seems plausible that a link between PTSD and smoking might be stronger among men. To our knowledge, no previous studies have addressed this possible sex difference.

Method

Participants

Participants were recruited through newspaper advertisements as part of a study investigating depression vulnerability among currently nondepressed smokers (Haaga, Thorndike, Friedman-Wheeler, Pearlman, & Wernicke, 2004). For the purposes of that study, inclusion criteria were that participants had to be 18 years of age or older and currently smoking at least 10 cigarettes per day, whereas exclusion criteria were: (a) receiving antidepressant medication or psychotherapy within the past two months, (b) scoring 16 or higher on the Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979), (c) scoring 1 or higher on the Beck Scale for Suicide Ideation (BSI; Beck & Steer, 1991), and (d) meeting criteria for a major depressive episode currently or within the past two months.

One hundred fifty-seven smokers (76 male and 81 female) completed the study. The sample consisted of 61 Caucasians, 88 African Americans, and 8 participants who either self-identified

as being of another race or elected not to report their race. The average age was 41 years (range 18 to 70). On average participants smoked just under 17 cigarettes per day, had been smoking for 22 years, and showed moderate nicotine dependence. A majority had tried unsuccessfully to quit smoking; those who had tried to quit reported an average of three prior attempts. Table 1 summarizes demographic, smoking, and depression vulnerability descriptive data.

Materials

Participants' smoking histories, smoking cessation histories, and demographic information were gathered via brief, face valid questionnaires.

SCID—Relevant modules of the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders-IV (SCID; First, Gibbon, Spitzer, & Williams, 1995) were administered to diagnose lifetime PTSD and major depressive episodes. Six participants declined to answer SCID questions for the PTSD module and are therefore not included in analyses involving lifetime PTSD diagnoses. To evaluate the reliability of the SCID-based diagnoses in the current study, a psychologist (the fourth author) independently diagnosed a randomly selected subset of 20 audio-taped interviews. He agreed with the judgments of the experimenters in all cases of past major depression and lifetime PTSD.

PDS—The Post-traumatic Diagnostic Scale (PDS; Foa, Cashman, Jaycox, & Perry, 1997) provides a measure of symptom severity on the PTSD cluster symptoms of hyperarousal, avoidance, and intrusion. On this self-report scale, respondents are asked which of 12 traumatic events they have either experienced or witnessed and then asked to indicate which event has most disturbed them in the past month. Respondents refer to this event when completing all remaining subsections. The PDS includes 17 items corresponding to the PTSD symptoms in the DSM-IV (American Psychiatric Association, 1994); frequency of each is rated on 4-point scale (0 = not at all or only one time; 3 = five or more times a week or almost always). Overall PTSD severity is indexed by the sum of the 17 item scores and therefore can range from 0 to 51. In a study of 264 participants from several PTSD centers, the PDS demonstrated high internal consistency overall ($\alpha = .92$) as well as for each symptom cluster (α 's = .78 to .84). The PDS overall severity score showed high retest reliability over a 2 to 3-week interval ($\kappa = .74$) and strong convergence with another self-report PTSD measure. In the current study, 15 participants indicated they had never experienced a traumatic event and therefore did not respond to PDS symptom items. They were not included in analyses involving the PDS.

FTND—The Fagerstrom Test of Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) measures smokers' degree of nicotine dependence on a 6-item scale. The scale ranges from 0 to 10 points, with higher scores reflecting more severe nicotine dependence. The FTND has demonstrated satisfactory internal consistency, retest reliability, and convergent validity with cotinine levels and self-reports of "addiction" as a reason to smoke (Heatherton et al., 1991; Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994).

DPI—The Depression Proneness Inventory (DPI; Alloy, Hartlage, Metalsky, & Abramson, 1987) is a 10 item self-report measure of vulnerability to depressive reactions to stress. The measure includes items such as "On the whole, would you rate yourself as a person who is vulnerable (susceptible) or invulnerable (resistant) to depression?" The DPI has high internal consistency ($\alpha = .90$) and one-month retest reliability ($r = .88$) (Alloy et al., 1987). The DPI showed predictive validity in that DPI scores from the beginning of an introductory psychology course predicted increased depressive symptoms in the wake of a poor performance on a midterm examination above and beyond what could be predicted on the basis of time 1 depression scores (Alloy et al., 1987). In a study of nearly 500 adults, DPI scores were significantly positively associated with (a) having ever smoked cigarettes, (b) being a current

smoker, and (c) reporting that a key motive for smoking is management of negative affect (Brody, Haaga, & Hamer, in press).

Procedure

Participants completed the study individually in one session of approximately three hours. After giving informed consent, they completed the BDI, the BSI, and demographic and smoking questionnaires. If the participant met all inclusion criteria, then he or she completed the following measures in random order: a) the lifetime PTSD and major depressive episode modules of the SCID, b) a think-aloud cognitive assessment task not relevant to this report and c) a series of questionnaires including those relevant to this report (FTND, DPI, PDS). The questionnaires were also presented in one of four random orders. Finally, participants were debriefed, thanked, and compensated with a payment of \$25.

Results

PTSD and Depression Proneness

First, we analyzed whether the potential confound of depression proneness was indeed associated with PTSD symptoms. DPI scores significantly correlated with total PTSD symptoms ($r = .23, p < .01$), arousal symptoms ($r = .20, p < .05$), and avoidance symptoms ($r = .29, p < .01$), though not intrusion symptoms ($r = .06$).

Smokers with a history of major depression reported significantly more PTSD avoidance symptoms ($M = 3.67$) than did those with no history of major depression ($M = 2.35$), $t(134) = -1.98, p < .05$. History of major depression was not, however, significantly associated with total PTSD symptoms, nor with intrusion or arousal symptoms.

Conversely, smokers diagnosed with lifetime PTSD did not differ significantly in self-rated depression proneness ($M = 28.48, SD = 9.51$) from those with no history of PTSD ($M = 25.55, SD = 9.63, p = .12$). However, those with lifetime PTSD (69%) were more likely than those with no lifetime PTSD diagnosis (37%) to have experienced a previous major depressive episode (chi-squared (1, $N = 151$) = 12.04, $p < .001$).

Thus, PTSD was associated with depression vulnerability, albeit variably across measures. To evaluate specificity we therefore analyzed the relation of PTSD measures with nicotine dependence, controlling for depression vulnerability, separately for male and female smokers.

Sex Differences in the Relation of PTSD and Nicotine Dependence

As shown in Table 2, associations of PTSD symptoms with nicotine dependence were nonexistent for women, moderately positive for men. For total PTSD symptoms as well as avoidance and arousal symptoms, correlations with nicotine dependence were significantly stronger (by Z test) among men (see Table 2).

Likewise, controlling for self-rated depression proneness, men still showed significant partial correlations of nicotine dependence with total PTSD symptoms ($pr = .38, p < .01$), arousal ($pr = .36, p < .01$), avoidance ($pr = .36, p < .01$), and intrusion symptoms ($pr = .23, p < .05$). In contrast, none of the associations between nicotine dependence and PTSD symptoms were significant for women when controlling for scores on the DPI. Sex differences in these partial correlations were significant for total PTSD, avoidance, and arousal symptoms (see Table 3).

When controlling for past major depressive episodes, the analyses yielded similar results. Among men but not among women, total PTSD symptoms and all PTSD subscales correlated

positively with nicotine dependence, when controlling for past major depression, and the sex difference in these partial correlations was significant for total PTSD (see Table 4).

Discussion

Several studies have reported an association between PTSD symptoms and smoking, particularly heavy smoking and nicotine dependence (e.g., Beckham et al., 1997). Examining this link separately by gender, we found moderate positive correlations between nicotine dependence and PTSD symptoms (total and all subscales) among men but not among women. We see this sex difference as consistent with response styles theory (Nolen-Hoeksema, 1991), which proposed that sex differences in depression might result in part from the greater prevalence among women of ruminative coping with depressed mood. Men may be more likely to try to distract themselves from negative mood states by such means as substance use. Whether smoking is actually effective in warding off the negative effects of rumination is doubtful (Richmond, Spring, Sommerfeld, & McChargue, 2001), but it would be interesting to study sex differences in the belief that it could.

More generally, our sex difference result awaits replication, and alternate explanations need to be considered as well. For example, it may be that differences in type or recency of trauma experienced are more relevant than sex per se. Weaver and Etzel (2003) found a significant positive correlation of PTSD symptoms and nicotine dependence in an all-female sample. Their sample had been exposed to severe intimate partner violence, and nicotine dependence was greater among those who had experienced partner violence more recently. In our study, sample size and heterogeneity of trauma did not permit a powerful test of sex differences controlling for type and recency of trauma, but it is noteworthy that about five-eighths (62%) of participants indicated that they had experienced the trauma more than five years ago. Also, the PDS does not require that DSM-IV criterion A2, a response involving intense fear, helplessness, or horror, be met, so it is possible that some of our respondents had experienced less severe traumas. Thus, we cannot determine conclusively whether the greater entrainment of PTSD and nicotine dependence among men is a characteristic of exposure to different types of recent traumatic experience as opposed to a sex difference in response even to the same types of events.

Consistent with earlier work (e.g., Blanchard et al., 1998; Bleich et al., 1997), we found PTSD symptoms and lifetime PTSD diagnosis to be positively correlated with depression vulnerability. However, neither history of major depression nor self-rated depression proneness accounted statistically for the link between PTSD and nicotine dependence among our male subsample. Thus, the association between PTSD and nicotine dependence, when obtained, may well be specific rather than a function of their joint association with the third variable of depression vulnerability.

This study had several positive method features contributing to generalizability of results. It was based on a community sample, including adults of both sexes, different races, and with a wide range of traumatic experiences. However, the cross-sectional and correlational nature of this study limits the findings with respect to inferring causality.

Future research investigating the relation between PTSD and cigarette smoking should examine the role of sex and type of trauma that resulted in PTSD. Additional consideration of specificity of effects, with respect to other third variables besides depression vulnerability, would also be valuable. Results of such studies could have important implications for understanding comorbidity of PTSD and substance use disorders, as well as for the development of smoking cessation programs tailored to people with PTSD symptoms.

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Table 1

Sample Characteristics

	M	SD
Demographics		
Age	41.10	12.24
% female	52%	
% African American	56%	
<u>Smoking history</u>		
# of cigarettes smoked per day	16.77	6.95
# of years smoking daily	22.19	13.12
# of quit attempts	3.06	2.91
FTND	4.68	2.08
<u>PTSD history</u>		
% diagnosed with lifetime PTSD	24%	
<u>Current PTSD symptoms</u>		
PDS total	8.16	8.63
Arousal symptoms	2.81	3.14
Avoidance symptoms	3.01	3.91
Intrusion symptoms	2.41	2.84
<u>Depression vulnerability</u>		
DPI	26.51	9.66
% diagnosed with past MDE	45%	

Note. DPI = Depression Proneness Inventory; PDS = Post-traumatic Diagnostic Scale; MDE = major depressive episode; FTND = Fagerstrom Test of Nicotine Dependence.

Table 2
Sex Differences in the Association of PTSD Symptoms and Nicotine Dependence

	Male Correlation	Female Correlation	Signif. of Difference
Total PTSD symptoms	.36 ^{***}	-.02	p = .024
PTSD Arousal symptoms	.33 ^{**}	.03	p = .075
PTSD Avoidance symptoms	.34 ^{**}	-.01	p = .038
PTSD Intrusion symptoms	.22 [*]	-.06	p = .107

Note. PTSD symptoms were measured with the Post-traumatic Diagnostic Scale. Nicotine dependence was measured with the Fagerstrom Test of Nicotine Dependence.

*
p < .05,

**
p < .01,

p < .001

Table 3

Sex Differences in the Partial Correlation of PTSD and Nicotine Dependence Controlling for Self-Reported Depression Proneness

	Total PTSD symptoms	Arousal symptoms	Avoidance symptoms	Intrusion symptoms
Nicotine Dependence				
Men	.38 ***	.36 **	.36 **	.23 *
Women	-.05	.003	-.05	-.09
Significance of Difference	p = .016	p = .046	p = .022	p = .082

Note. PTSD symptoms were measured with the Post-traumatic Diagnostic Scale. Nicotine dependence was measured with the Fagerstrom Test of Nicotine Dependence. Self-reported depression proneness was measured with the Depression Proneness Inventory.

*
p < .05,

**
p < .01,

p < .001

Table 4

Sex Differences in the Partial Correlation of PTSD and Nicotine Dependence Controlling for History of Major Depression

	Total PTSD symptoms	Arousal symptoms	Avoidance symptoms	Intrusion symptoms
Nicotine Dependence				
Males	.33 **	.31 **	.31 **	.21 *
Females	-.02	.01	-.01	-.06
Significance of Difference	p = .047	p = .088	p = .069	p = .134

Note. PTSD symptoms were measured with the Post-traumatic Diagnostic Scale. Nicotine dependence was measured with the Fagerstrom Test of Nicotine Dependence. Past major depressive episodes were assessed using the SCID.

*
p < .05,

**
p < .01