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Posttraumatic Stress and Emotion Dysregulation: Relationships with Smoking to Reduce Negative Affect and Barriers to Smoking Cessation

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Abstract

Introduction—Many cigarette smokers have experienced a traumatic event, and elevated posttraumatic stress symptoms (PTSS) are associated with increased smoking levels. Previous research has found that elevated PTSS are associated with smoking to cope with negative affect, and it has been posited that perceptions of being unable to cope with the consequences of smoking cessation interfere with smoking cessation in this population. However, the mechanism of the relationship between PTSS and these smoking maintenance factors (i.e., smoking to reduce negative affect and barriers to cessation) has not been established. Emotion dysregulation is one potential mechanism as it is associated with PTSS as well as addictive behavior aimed at avoiding and reducing negative emotional states.

Methods—We cross-sectionally tested the hypotheses that 1) PTSS and emotion dysregulation would be incrementally associated with smoking to reduce negative affect and barriers to cessation, and 2) that emotion dysregulation would mediate the relationships between PTSS, smoking to reduce negative affect, and barriers to cessation among a community sample of trauma-exposed individuals presenting for smoking cessation treatment ($N=315$).

Results—Results demonstrated elevated PTSS were associated with increased smoking to reduce negative affect and barriers to cessation, and that emotion dysregulation mediated these relationships.

Conclusion—These findings provide evidence of a mechanism between PTSS and psychological smoking maintenance factors, and suggest that emotion dysregulation may be a useful target for smoking cessation interventions among trauma-exposed individuals.

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Keywords

posttraumatic stress; emotion regulation; smoking; trauma exposure; substance use

1. Introduction

A host of previous research has indicated that trauma exposure and posttraumatic stress symptoms (PTSS) are associated with smoking. Specifically, experiencing a trauma is common among smokers,¹ with smokers reporting traumatic event exposure at more than twice the rate of non-smokers.² In addition, elevated PTSS severity and posttraumatic stress disorder (PTSD) diagnosis have been linked to current smoking status, elevated levels of smoking, and difficulties in smoking cessation.³ Considering prior research and the health consequences associated with smoking, it is important to better understand factors contributing to elevated smoking rates among these individuals, as well as potential mechanisms accounting for these relationships.

Smoking motives are one factor proposed to contribute to smoking among trauma-exposed individuals. Smoking motives predict smoking frequency,⁴ and relapse among those attempting to quit.⁵ Negative affect (NA) reduction as a smoking motive may be an important smoking maintenance factor,⁶ and relevant to posttraumatic stress. Specifically, the presence of posttraumatic stress symptomatology is associated with increased smoking to reduce NA among trauma-exposed individuals.^{7,8} Additionally, trauma-related stimuli may serve as cues for smoking to regulate NA associated with trauma exposure. For example, presenting trauma-related cues using various methods (e.g., Stroop task, script-driven imagery) results in increased smoking, particularly among those with PTSD.⁹⁻¹¹ Although this prior research demonstrates that elevated PTSS are associated with smoking to cope with NA, little research has examined mechanisms of this relationship.

Difficulties with smoking cessation may be another factor that could help explain the co-occurrence between PTSS and smoking. Research has established that individuals with PTSD have lower smoking cessation rates compared to healthy controls, those with other diagnoses, and trauma-exposed individuals without PTSD.^{12,13} One factor that may play a role in these cessation difficulties is perceived barriers to cessation. Barriers to cessation are an individual's appraisal that aspects of smoking cessation are threatening, and one does not have the coping skills to manage these threats.¹⁴ Perceived barriers predict whether an individual is able to quit smoking during a quit attempt.¹⁴ Three barriers to smoking cessation have been identified: addiction, external, and internal barriers, such as feeling unable to cope with NA (e.g., strong feelings such as anger) without smoking. Cessation barriers may be particularly relevant in the relationship between PTSS and smoking as some have hypothesized that difficulties in quitting for trauma-exposed individuals may be due to fears of the effects of nicotine withdrawal, as well as reliance on smoking as an affect regulation strategy for NA associated with PTSS.¹⁵ Although PTSS are associated with difficulties in smoking cessation, empirical research has not yet examined whether perceived barriers in smoking cessation may play a role, and mechanisms of this potential relationship.

Emotion dysregulation is a possible mechanism that could underlie the relationships between PTSS and these smoking maintenance factors (i.e., smoking to reduce NA and barriers to cessation). Emotion dysregulation is conceptualized as difficulties with the ability to understand and discriminate between emotions, as well as problems modulating one's emotions.¹⁶ Specifically, emotion dysregulation is thought to have several components: 1) awareness and understanding of one's emotions, 2) acceptance of one's emotions, 3) ability to control impulsive behaviors and achieve goals when distressed, and 4) use emotion regulation strategies to modulate emotional responses when appropriate.¹⁶ Empirical and theoretical work has emphasized the role of emotion dysregulation in elevated PTSS and PTSD.¹⁷⁻¹⁹ Specifically, studies have found that PTSS are associated with overall emotion dysregulation, as well as many of the specific subfactors of emotion dysregulation, including limited access to effective emotion regulation strategies, difficulties engaging in goal-directed behavior, and controlling impulsive behavior when distressed.^{17,20}

Emotion dysregulation has also been linked to smoking. Cross-sectional research indicates that difficulties regulating one's emotions are associated with a longer history of smoking and greater attentional bias to smoking cues.²¹ In addition, experimental research has shown that instructing participants to use less effective emotion regulation strategies (e.g., suppression) results in increased cravings, NA, and attentional biases towards smoking as compared to individuals told to use more effective emotion regulation strategies (e.g., cognitive reappraisal).²² Considering these links between emotion dysregulation, PTSS, and smoking, it is plausible that emotion dysregulation may account for the relationships between PTSS and smoking to reduce NA, as well as barriers to smoking cessation. Specifically, it is likely that individuals with elevated PTSS and dysregulated emotions would be at increased risk to using maladaptive emotion regulation strategies, such as smoking, to cope with negative affect associated with posttraumatic stress.

Together, the current study 1) replicated and extended previous research by testing whether elevated PTSS are cross-sectionally associated with smoking maintenance factors: smoking to reduce NA,⁷ and barriers to cessation, and 2) cross-sectionally tested whether emotion dysregulation would incrementally relate to these smoking-related processes above and beyond PTSS. In light of previous research, we hypothesized PTSS and emotion dysregulation would be incrementally associated with both smoking to reduce NA and barriers to cessation, after accounting for relevant covariates.^{7,21,23} These covariates included number of cigarettes smoked daily and number of traumas experienced, which have been linked to smoking to reduce negative affect,³ the other smoking maintenance factor (i.e., barriers to cessation was a covariate when smoking to reduce negative affect served as the dependent variable, and vice versa) and noncriterion smoking motives when examining smoking to reduce NA, to remain consistent with previous research on these relationships.^{7,24,25} Finally, we cross-sectionally tested whether emotion dysregulation statistically mediates the relationship between PTSS and smoking to reduce NA, and PTSS and barriers to cessation. We hypothesized that emotion dysregulation would mediate the relationships between PTSS and these smoking maintenance factors, considering previous research highlighting the role of emotion dysregulation in both PTSS as well as addictive behaviors such as smoking.

2. Method

2.1 Participants

Participants were 315 individuals recruited from the local community to participate in a larger investigation investigating the efficacy of an anxiety management smoking cessation intervention. Eligibility requirements included being at least 18 years old, a regular smoker of at least 8 cigarettes daily for at least a year, and motivated to make a smoking quit attempt in the next 30 days. Those who reported symptoms of a psychotic-spectrum disorder, use of a smoking cessation aid (e.g., pharmacotherapy) or additional tobacco products, or suffering from a significant medical condition which could potentially interfere with participating in a smoking cessation treatment, were excluded from the study and given appropriate referrals. In more specific terms of smoking status, participants smoked an average of 9 cigarettes per day, and had started smoking regularly at an average age of 17 years. In addition, the average level of nicotine dependence for participants in the current study was moderate, as indexed by the Fagerstrom Test for Nicotine Dependence ($M = 5.41$, $SD = 2.23$).²⁶

For the present investigation, participants were selected if they reported exposure to a trauma as indexed by the Posttraumatic Stress Diagnostic Scale (PDS)²⁷ and had complete data for all measures of interest. Regarding demographic information, participants' ages were in the range of 18 to 68 ($M = 38.92$, $SD = 13.46$) and participants were 52.1% female. Participants were primarily Caucasian (83.5%), with the remaining participants identifying as follows: African-American/Black (8.6%), Hispanic (3.8%), other (2.5%; e.g., more than one race), and Asian (1.6%). Slightly more than a third of participants were either married or cohabitating (37.8%), while 37.1% were single and had never been married, 22.9% separated or divorced, and 2.2% widowed. Nearly half of the sample (47.6%) had some college experience or graduated from a two-year college, 19.1% graduated from a four year college, 18.4% received a high school diploma, 9.2% graduated from professional or graduate school, and 5.7% did not have a high school diploma. Based on the Structured Clinical Interview for DSM-IV (SCID),²⁸ nearly half of this sample (47.9%) was determined to meet diagnostic criteria for one or more Axis I condition, with 7.6% of participants meeting criteria for PTSD (either primary or other current diagnosis). In addition, primary diagnoses other than PTSD were as follows: 24.4% anxiety disorders, 7.6% mood-related disorders, 6.7% substance use disorders, 2.2% other (e.g., anorexia nervosa), and 1.5% obsessive-compulsive (OC) or OC spectrum disorders.

2.2 Procedure

Participants responded to advertisements in the local community (e.g., flyers, newspaper ads) if they were interested in an anxiety-based smoking cessation treatment study. This larger study was designed to compare the efficacy of a smoking cessation treatment targeting anxiety and panic vulnerabilities to a standard smoking cessation treatment. During an initial appointment, participants provided informed consent as well as completed a battery of self-report measures for which they were compensated. Next, participants were randomized to either the active (anxiety management smoking cessation intervention) or control (standard smoking cessation intervention) condition. After treatment, participants completed follow-up appointments over the course of two years following their quit date.

Follow-up data collection is ongoing, and further procedural details are available in a previous report.²⁹ In addition, a prior study utilizing data from the present sample examined relationships between insomnia, emotion dysregulation, and PTSS;³⁰ however, the current findings have not been reported elsewhere. The current study uses data provided at baseline only, before randomization and the onset of treatment. All participants provided written informed consent and study procedures were approved by the University's Institutional Review Board.

2.3 Measures

2.3.1 Structured Clinical Interview for DSM-IV (SCID)²⁸—Participants were assessed with the SCID-NP (non-patient version) to obtain Axis-I diagnostic statuses. The SCID was administered by doctoral-level graduate students, who had completed training in SCID administration. Training included observing live and taped SCID administrations by trained interviewers as well as participating in practice SCIDs with trained students. A licensed clinical psychologist reviewed all diagnoses obtained from the SCID to confirm diagnostic accuracy. Finally, all interviews were audio-recorded, and one of the present authors (MJZ) further reviewed the reliability of a randomly selected 12.5% of these audiotaped interviews for accuracy; diagnostic agreement for all of the selected interviews was confirmed during this review.

2.3.2 Posttraumatic Stress Diagnostic Scale (PDS)³¹—The PDS is a self-report measure consisting of a 12-item list of different types of trauma exposure, and 17 items through which participants rate the severity of current (past month) DSM-IV-TR PTSD symptoms. The PDS may be used to compute a total sum of the number of traumas reported, which was used in our analyses as a covariate. Additionally, the PDS provides a sum score of total PTSS severity, which we used to measure PTSS severity in the current investigation. Previous research has found the PDS to be psychometrically sound.³¹ In the current sample, the PDS was found to demonstrate excellent internal consistency ($\alpha=.93$).

2.3.3 Difficulties in Emotion Regulation Scale (DERS)¹⁶—In the current investigation, emotion dysregulation was measured using the DERS. The DERS is a 36-item self-report questionnaire that may be used to compute 6 subscale scores as well as a total score. Respondents rated all of the items on a 5-point Likert-type scale. The DERS total score was used in the current study as an overall assessment of emotion dysregulation. Consistent with the extant literature,¹⁶ the DERS total score was found to have excellent internal consistency in the present investigation ($\alpha=.95$).

2.3.4 Fagerstrom Test for Nicotine Dependence (FTND)²⁶—The FTND is a six-item scale used to assess degree of nicotine dependence. Only number of cigarettes per day was used in the current investigation as a covariate. The FTND has demonstrated good internal consistency and high test-retest reliability in previous research.^{26,32}

2.3.5 Reasons for Smoking Questionnaire (RFS)³³—The RFS is a 23-item self-report questionnaire assessing smoking motives. The RFS has six subscales: habitual, addictive, negative affect reduction, pleasurable relaxation, sensorimotor, and stimulation.

Respondents rate each item on a 5-point Likert type scale. The RFS is psychometrically sound.³⁴ The NA reduction subscale of the RFS was utilized as a dependent measure, with the five other subscales serving as covariates. In the current investigation, the NA reduction subscale demonstrated good internal consistency ($\alpha=.89$); subscales for all other smoking motives demonstrated at least adequate internal consistency ($\alpha=.69-.83$).

2.3.6 Barriers to Cessation Scale (BCS)¹⁴—The BCS is a 19-item questionnaire measuring perceived barriers associated with smoking cessation. The BCS yields a total score, as well as 3 subscales: addictive barriers (e.g., withdrawal symptoms), external barriers (e.g., no encouragement or help from friends), and internal barriers (e.g., feeling less in control of your moods) to smoking cessation. Respondents indicate the amount they identify with each of the barriers on a 4-point Likert type scale. The BCS has demonstrated good internal consistency and reliability in previous research. The BCS total score was used in the current investigation and demonstrated good internal consistency ($\alpha=.88$).

2.3.7 Smoking Status—All participants' smoking status was biochemically assessed using carbon monoxide (CO) analysis of breath samples using a CMD/CO Carbon Monoxide Monitor (Model 3110; Spirometrics, Inc). Considering the cutoff of 6 ppm recommended by Middleton and Morice,³⁵ 91.1% of the sample's current smoking status was confirmed through this technique, with an average level of 19.8 ($SD = 12.98$).

2.4 Data Analytic Plan

We utilized hierarchical multiple regression to test the hypothesis that PTSS and emotion dysregulation would be incrementally associated with smoking to reduce NA, after accounting for relevant covariates. In step one, number of cigarettes smoked (as measured by the FTND), number of traumas reported (as measured by the PDS), the reasons for smoking other than for NA reduction (as measured by the RFS), and total barriers to cessation were entered as covariates. In step two, PTSS (as measured by the PDS) was entered. Finally, in step three, emotion dysregulation (as measured by the DERS) was entered. NA reduction as a motive for smoking (as measured by the RFS) was the dependent variable. Next, following procedures outlined by Preacher & Hayes,³⁶ a mediation analysis was conducted to examine whether emotion dysregulation would mediate the relationship between PTSS and smoking to reduce NA, after accounting for the aforementioned covariates. We used bootstrapping, a non-parametric resampling procedure, to estimate the indirect effect of the independent variable (PTSS) on the dependent variable (smoking to reduce NA) through the mediator (emotion dysregulation). These analyses provide a bias-corrected 95% confidence interval of the indirect effects. The mediated effect is considered significant if the 95% confidence interval does not include zero.³⁶ Bootstrapping procedures have been recommended for testing mediational models because they offer more statistical power than traditional parametric tests, without inflating type I error.^{36,37} For the current study, 5000 bootstrap resamples were used to estimate the indirect effects.

Next, hierarchical regression was used to test the hypothesis that PTSS severity and emotion dysregulation would be incrementally associated with barriers to smoking cessation after accounting for covariates. In step one of the model, number of cigarettes smoked (as

measured by the FTND), number of traumas experienced (as measured by the PDS), and smoking to reduce negative affect were entered as covariates. In step two, PTSS (as measured by the PDS) was entered. Finally, in step three, emotion dysregulation (as measured by the DERS) was entered. Barriers to smoking cessation (as measured by the BCS) served as the dependent variable. Finally, a mediation analysis using the bias-corrected bootstrap method was conducted to examine whether emotion dysregulation would mediate the relationship between PTSS severity and barriers to smoking cessation, after accounting for the aforementioned covariates. Please note all coefficients are reported as unstandardized estimates.

3. Results

3.1 Preliminary Analyses

First, we examined the means, standard deviations, and zero-order correlations for all variables used in analyses (see Table 1). Means for number of cigarettes smoked per day and smoking motives are comparable to previous research in a trauma-exposed sample of daily smokers.⁷ Emotion dysregulation means of our sample were similar to levels found in previous research among a trauma-exposed sample.¹⁷ Participants experienced a mean of three traumatic events. PDS scores were slightly elevated when compared to those found in previous research among a trauma-exposed sample.³⁸ Finally, the mean barriers to cessation score was similar to a prior study of daily cigarette smokers.³⁹

3.2 Primary Analyses

3.2.1 Smoking to reduce NA—In terms of the hypothesis that PTSS and emotion dysregulation would be incrementally associated with smoking to reduce NA, step one (including covariates) accounted for 53.2% of the variance in smoking to reduce NA ($F(8, 306)=43.49, p<.001$), with only addictive ($B=.42, t=6.84, p<.001, sr^2=.07$) and stimulation ($B=.22, t=5.40, p<.001, sr^2=.04$) reasons for smoking, as well as barriers to cessation $B=.01, t=3.13, p=.002, sr^2=.01$), associated with smoking to reduce NA. Step two accounted for an additional 1.2% of the variance in NA smoking, with elevated PTSS significantly associated with increased smoking to reduce NA ($B=.01, t=2.84, p=.005, sr^2=.01$). Finally, step three accounted for an additional 1.0% of the variance in smoking to reduce NA, with emotion dysregulation significantly associated with increased smoking to reduce NA ($B=.004, t=2.62, p=.009, sr^2=.01$).

Next, we tested our hypothesis that emotion dysregulation would mediate the relationship between PTSS and smoking to reduce NA. Please see Table 2 for a summary of mediation analyses and Figure 1 for a depiction of the mediation model. Here, PTSS were significantly associated with emotion dysregulation ($B=1.06, SE=.12; t=8.77, p<.001$). In addition, the indirect effect of PTSS on smoking to reduce NA through the pathway of emotion dysregulation was significant ($B=.004, SE<.01$). The direct effect of PTSS on smoking to reduce NA was no longer significant after accounting for emotion dysregulation, suggesting full mediation ($B=.01, SE<.01; t=1.39, p=.16$). The full model was significant and accounted for 55.4% of the variance in smoking to reduce NA ($F(10, 304)=37.79, p<.001$). It is

important to note that results regarding the indirect effect remained consistent without the inclusion of covariates ($B = .011$, $SE = .003$, 95% CI [.006, .018]).

3.2.2 Barriers to cessation—In terms of the hypothesis that PTSS and emotion dysregulation would be incrementally associated with barriers to smoking cessation, step one accounted for 27.0% of the variance in barriers to cessation ($F(3, 311)=38.39$, $p<.001$), with smoking to reduce negative affect associated with barriers to cessation ($B=6.92$, $t=10.64$, $p<.001$, $sr^2=.27$). Step two accounted for an additional 1.0% of the variance in barriers to cessation, with elevated PTSS significantly associated with increased barriers to cessation ($B=.12$, $t=2.06$, $p=.041$, $sr^2=.01$). Finally, step three accounted for an additional 1.4% of the variance in barriers to cessation, with emotion dysregulation significantly associated with increased barriers to cessation ($B=.07$, $t=2.49$, $p=.013$, $sr^2=.01$).

Next, we tested our hypothesis that emotion dysregulation would mediate the relationship between PTSS and barriers to cessation (see Table 2 for a summary of mediation analyses and Figure 1 for a depiction of the model). PTSS were significantly associated with emotion dysregulation ($B=1.07$, $SE=.12$, $t=8.74$, $p<.001$). Additionally, the indirect effect of PTSS on barriers to cessation through the pathway of emotion dysregulation was significant ($B=.07$, $SE=.03$). The direct effect of PTSS on barriers to cessation after accounting for emotion dysregulation was no longer significant, suggesting full mediation ($B=.04$, $SE=.07$, $t=.61$, $p=.539$). The full model accounted for a significant 30.0% of the variance in barriers to cessation ($F(6, 308)=22.04$, $p<.001$). It is important to note results for the indirect effect remained consistent when covariates are removed from analyses ($B = .153$, $SE = .040$, 95% CI [.079, .237]).

4. Discussion

The current study expands the previous literature on the relationship between PTSS and smoking by examining whether PTSS are associated with smoking to reduce NA and barriers to cessation, and whether emotion dysregulation mediates these relationships. Consistent with hypothesis, we found elevated PTSS were associated with increased smoking to reduce NA. This finding is also consistent with previous literature, and the idea that individuals with elevated PTSS may be motivated to smoke to regulate NA such as anxiety related to the traumatic event.^{7,9} In addition, as predicted, elevated PTSS were associated with increased barriers to cessation. Although, to our knowledge, this relationship has not been tested in prior research, this finding is consistent with the low rates of smoking cessation observed among individuals with elevated PTSS and PTSD.^{12,13} Further, this finding fits with hypotheses posited by other researchers that difficulties in quitting for trauma-exposed individuals may be due to fears of the effects of nicotine withdrawal as well as reliance on smoking as an affect regulation strategy for NA associated with PTSS.¹⁵

Next, consistent with prediction, we found that emotion dysregulation was incrementally associated with smoking to reduce NA, and barriers to cessation.^{23,40} Moreover, as hypothesized, we found that emotion dysregulation mediated the relationships between PTSS and smoking to reduce NA and barriers to cessation. These findings are in line with emerging research exploring the role of emotion dysregulation in the association between

PTSS and various addictive or impulsive behaviors aimed at reducing or avoiding negative emotional states. For example, recent studies have found that emotion dysregulation mediates the relationships between PTSS and impulsive or addictive behaviors (e.g., substance use, self-injury, risky sexual behaviors) aimed at reducing or avoiding negative emotional states.^{25,41} Taken together, these findings suggest that such behaviors may function as an affect regulation strategy among individuals with elevated PTSS and emotion regulation difficulties.

The results of this study are also consistent with theoretical models of emotion dysregulation suggesting that difficulties regulating emotions may be associated with behaviors aimed at reducing or avoiding aversive psychological and physiological states.⁴⁰ For example, individuals with emotion regulation difficulties may attempt to suppress, hide, or ignore negative emotions, often resulting in increased distress.^{42,43} As such, emotion dysregulation may be a risk factor for maladaptive behaviors such as substance use as an attempt to regulate one's negative emotions.^{44,45} Within this framework, individuals with PTSS and difficulties regulating their emotions may be more motivated to smoke to reduce NA and may perceive more barriers to quit because they are attempting to regulate their negative emotions through smoking rather than using more adaptive emotion regulation strategies.

Findings from the present study also have clinical implications. It is possible that assessing and targeting emotion dysregulation among trauma-exposed smokers may help to reduce smoking levels and assist with smoking cessation. Indeed, initial research on treatments targeting emotion regulation has indicated that these treatments may be beneficial for individuals with PTSD.^{19,46} However, it is unclear whether such treatments may benefit comorbid substance use issues such as smoking, and this would be important to test in future investigations.

There are several limitations worth noting which point to future research directions. First, we relied on cross-sectional data and thus cannot make causal inferences regarding the relationships between these variables. This is particularly relevant considering the current mediational analyses found emotion dysregulation to underlie the association between PTSS and certain smoking-related constructs. Our data cannot necessarily rule out alternative models, such as bidirectional relationships between emotion dysregulation and these smoking maintenance factors, given its cross-sectional nature. Prospective studies that consider alternative mediators may more stringently test the causal nature of these relationships. Second, the current sample was composed of trauma-exposed individuals with and without PTSD. Although this is consistent with prior research on these relationships,⁷ future investigations should replicate these findings among a clinical sample of individuals with PTSD. Third, the current sample includes only individuals entering a smoking cessation program. Considering that such individuals may differ from non-treatment-seeking smokers, it is unclear if these results would generalize to other smoking populations. Future research would benefit from examining these relationships in other smoking samples. Fourth, we relied on self-report measures to assess our variables of interest. Although our self-report measures are widely used and possess good psychometric properties, future research should integrate multi-method assessments, perhaps including physiological or behavioral measures of emotion regulation to further our understanding of these

relationships.^{47,48} Fifth, our assessment of PTSD symptoms was based on DSM-IV rather than DSM-5 symptoms. Although extant research has indicated that relationships between external variables and DSM-IV or DSM-5 PTSD symptoms are quite consistent, utilization of an updated DSM-5 PTSD measure may benefit future research.⁴⁹ Sixth, the current results demonstrate small to medium effect sizes. However, considering the transdiagnostic relevance of emotion dysregulation,⁵⁰ future research in this area may be warranted.

5. Conclusions

Despite these limitations, the current study adds to the literature on PTSS and smoking by demonstrating that elevated PTSS are associated with increased smoking to reduce NA and barriers to cessation. In addition, the present study identifies emotion dysregulation as a potential mechanism to help to explain these relationships. These findings are consistent with emerging literature identifying emotion dysregulation as an important factor underlying relationships between PTSS and problematic substance use.^{25,41} Finally, pending further empirical work in this area, it is likely that targeting emotion regulation difficulties among trauma-exposed smokers may be one fruitful avenue for improving smoking cessation outcomes among this population.

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Highlights

1. PTSD symptoms are associated with smoking maintenance factors.
2. Emotion dysregulation is incrementally associated with smoking-related factors.
3. Emotion dysregulation may help explain smoking maintenance among trauma-exposed smokers.

Figure 1.

Proposed mediational model: Direct and indirect effects of posttraumatic stress symptoms on smoking to reduce negative affect and barriers to cessation.

Table 1

Means, standard deviations, and zero-order correlations of all variables.

	1	2	3	4	5	6	7	8	9	10	11
1 Cigarettes per day	-	-	-	-	-	-	-	-	-	-	-
2 Number of traumas	.04	-	-	-	-	-	-	-	-	-	-
3 RFS – Habitual	.43***	.12*	-	-	-	-	-	-	-	-	-
4 RFS – Addictive	.34***	.10	.51***	-	-	-	-	-	-	-	-
5 RFS – Pleasure/Relax	.09	.03	-.00	.34***	-	-	-	-	-	-	-
6 RFS – Stimulation	.14*	-.02	.37***	.48***	.22***	-	-	-	-	-	-
7 RFS – Sensorimotor	-.04	-.05	.33***	.41***	.29***	.44***	-	-	-	-	-
8 RFS – NA Reduction	.22***	.06	.42***	.67***	.27***	.55***	.39***	-	-	-	-
9 PDS	.00	.34***	.19**	.26***	.12*	.20***	.22***	.32***	-	-	-
10 DERS	.02	.16**	.21***	.27***	.06	.19**	.31***	.36***	.52***	-	-
11 BCS	.06	.61	.27***	.57***	.28***	.39***	.44***	.52***	.26***	.33***	-
Mean (SD)	.94 (.79)	3.05 (1.81)	2.37 (1.81)	3.30 (.79)	3.73 (.79)	2.70 (.96)	2.48 (.99)	3.47 (.83)	8.38 (10.12)	75.60 (22.91)	24.87 (10.84)
Range	3	9	3-50	3-60	4-00	4-00	4-00	3-83	49	125	52

Note: n=315;

* = $p < .05$;** = $p < .01$;*** = $p < .001$.

RFS = Reasons for Smoking; NA = Negative Affect; PDS = Posttraumatic Stress Diagnostic Scale; DERS = Difficulties in Emotion Regulation Scale; BCS = Barriers to Cessation Scale. Number of cigarettes per day was coded as 0 (0-10 cigarettes per day), 1 (11-20), 2 (21-30) and 3 (31+).

Table 2

Summary of mediation analyses (5000 bootstrap samples).

Independent variable (IV)	Mediating variable (M)	Dependent variable (DV)	Effect of IV on M (a)	Effect of M on DV (b)	Direct effect (c')	Indirect Effect		Total effect (c)
						(a × b)	95% CI	
PTSS	DERS	RFS – NA	1.090***	.005**	.006	.005	.002 - .010	.011**
PTSS	DERS	BCS	1.237***	.123***	.148*	.081	.240	.301***

Note: n=315;
* = $p < .05$;
** = $p < .01$;
*** = $p < .001$.

PTSS = posttraumatic stress symptoms; DERS = Difficulties in Emotion Regulation Scale; RFS – NA = Reasons for Smoking – Smoking to Reduce Negative Affect; BCS = Barriers to Cessation Scale; all coefficients reported as unstandardized estimates.