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## Motives for Smoking in those with PTSD, Depression, and No Psychiatric Disorder

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### Abstract

**Objective:** Approaches for effectively treating smoking in those with posttraumatic stress disorder (PTSD) and with major depressive disorder (MDD) could be improved by identifying motivational processes underlying their tobacco dependence. The goal of this study was to identify the motivational processes influencing smoking dependence among smokers with PTSD and with MDD relative to non-diagnosed controls.

**Methods:** Participants were United States (US) veterans who smoked daily ( $N = 162$ ) and met DSM-IV criteria for either PTSD ( $n = 52$ ), MDD ( $n = 52$ ), or no current psychiatric disorder (controls;  $n = 58$ ). Smoking dependence motives were assessed via the Brief Wisconsin Inventory for Smoking Dependence Motives (Brief WISDM). The 11 Brief WISDM subscales are categorized into two major factors: Primary Dependence Motives and Secondary Dependence Motives.

**Results:** Smokers with PTSD scored higher than non-diagnosed controls on the following Primary Dependence Motives subscales: Automaticity, Craving, and Tolerance (all  $p$ -values  $< .05$ ). Smokers with PTSD, relative to controls, also scored higher on the overall Secondary Dependence Motives subscale, and on five of the seven Secondary Dependence Motives subscales: Cue Exposure/Associative Processes, Affective Enhancement, Affiliative Attachment, Cognitive

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**Contributors:** Dr. Cook designed the study, completed the data collection, and led the data analysis. Ms. Rosenblum conducted literature reviews, assisted with data analysis, and wrote the first draft of the manuscript. Drs. Piper, Engle, and Kaye contributed to the writing and editing of the manuscript. All authors have contributed to and have approved the final manuscript. All authors affirm 1) that this work has not been published previously and is not currently under consideration elsewhere; 2) that this work is original and the author(s)' own, and that no copyright has been breached by the inclusion of any content drawn from another source; 3) that this publication has been approved by all co-authors and, if required, by the governing authorities at the entity under which the research was carried out; 4) that the authors have no conflicts of interests; and 5) that this study followed ethical guidelines and was either approved or deemed exempt by an institutional or governmental authority.

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Enhancement, and Weight Control (all  $p$ -values  $<.05$ ). Smokers with MDD scored significantly higher than controls on one Primary Dependence Motives subscale: Craving, and on four of seven Secondary Dependence Motives subscales: Affective Enhancement, Affiliative Attachment, Cognitive Enhancement, and Weight Control (all  $p$ -values  $<.05$ ). Finally, exploratory analyses directly contrasting the PTSD group with the MDD group showed that smokers with PTSD were higher than those with MDD in the overall Secondary Dependence Motives subscale and in one of the seven Secondary Dependence Motives subscales: Cue Exposure/Associative Processes (all  $p$ -values  $<.05$ ).

**Conclusions:** Results suggest that both Primary Dependence Motives and Secondary Dependence Motives play a meaningful role in motivation to use tobacco in smokers with PTSD; smoking dependence in those with MDD may be primarily influenced by Secondary Dependence Motives.

### Keywords

Brief WISDM; major depressive disorder; posttraumatic stress disorder; psychiatric comorbidity; smoking dependence motives; tobacco

## Introduction

Smoking, the leading cause of preventable death in the United States, disproportionately affects adults with mental health conditions (Jamal et al., 2016; U.S. Department of Health and Human Services, 2014). For instance, those with posttraumatic stress disorder (PTSD) and with major depressive disorder (MDD) smoke at higher rates and are less likely to quit than those without PTSD or MDD (Feldner, Babson, & Zvolensky, 2007; Mathew, Cook, Japuntich, & Leventhal, 2015; Pericot-Valverde, Elliott, Miller, Tidey, & Gaalema, 2018; Weinberger, McKee, & George, 2012; Ziedonis et al., 2008). Tobacco smoking among those with PTSD and with MDD is an important clinical and public health concern because it contributes to disproportionate morbidity and mortality in these populations (Druss, Zhao, Von Esenwein, Morrato, & Marcus, 2011). Approaches for effectively treating smoking in those with PTSD and with MDD could be improved by identifying transdiagnostic and disorder-specific motivational processes underlying their tobacco dependence.

We sought to gain insight regarding the motivational factors influencing smoking dependence among smokers with PTSD and with MDD using the Brief Wisconsin Inventory of Smoking Dependence Motives scale (Brief WISDM; Smith et al., 2010). We focused on tobacco dependence because it is a multifactorial construct that can provide descriptive information about distinct motivational pathways that maintain smoking behavior, and because it is associated with cessation success (Baker et al., 2012). Although there is evidence that smokers with PTSD and with MDD score higher than other smokers on common, unidimensional measures of tobacco dependence (Cook, Baker, Beckham, & McFall, 2017; Dierker & Donny, 2008; Grant, Hasin, Chou, Stinson, & Dawson, 2004), such research provides little information regarding the different motives underlying tobacco dependence. The Brief WISDM addresses this limitation by identifying distinct motivational factors influencing tobacco dependence. The Brief WISDM is a validated self-report measure that comprises 11 discrete subscales that form two overarching dimensions:

Primary Dependence Motives and Secondary Dependence Motives (Piper et al., 2008; Smith et al., 2010). The Primary Dependence Motives subscale assesses the degree to which one's smoking is heavy, automatic, out of control, and related to significant craving. The Secondary Dependence Motives subscale assesses instrumental motives such as smoking to improve mood or cognition or due to environmental influences (e.g., being around other smokers). The Secondary Dependence Motives subscale might suggest smoking that is strategic rather than automatic (as in the Primary Dependence Motives subscale).

Smoking dependence in those with PTSD and with MDD could be influenced via different motivational paths. One possibility is that those with PTSD and with MDD smoke for instrumental reasons, such as affect enhancement. This hypothesis is consistent with research demonstrating that smokers with these disorders tend to experience affective distress (Cook et al., 2017; Joormann & Stanton, 2016), which in turn might motivate smoking and undermine quitting. Another possibility is that smokers with mental health disorders possess stable person factors (e.g., cognitive styles, genetics) that increase the risk for heavy smoking, automaticity, strong urges to smoke, and tolerance – core features of tobacco dependence that are implicated in smoking persistence and cessation failure (Piper et al., 2008).

This study examined relations between diagnostic category (PTSD, MDD, non-diagnosed control) and Brief WISDM scores using secondary data analysis of an experimental study of the relation between smoking and mood (Cook et al., 2017). We hypothesized that smokers with PTSD and with MDD would score higher than controls on Secondary Dependence Motives, especially for factors related to affect regulation and cognitive enhancement.

## Methods

**Participants and Procedure.**—Participants were 162 US veterans between the ages of 18 and 65 who were not interested in quitting and who attended an initial study visit. They were recruited using fliers from a US Department of Veterans Affairs (VA) hospital in southern Wisconsin. To be included in the study, participants were required to smoke 10 cigarettes per day for the past year and produce a carbon monoxide (CO) value of 8 ppm. Participants all met criteria for either PTSD ( $n = 52$ ), MDD ( $n = 52$ ), or no current psychiatric disorder (controls;  $n = 58$ ). We initially planned to collect four groups of smokers (50 per group: PTSD only, MDD only, PTSD and MDD, controls), however it was difficult to recruit a PTSD only group. Therefore we collapsed the two PTSD groups, resulting in 58% of participants in that group reporting comorbid MDD, consistent with population based comorbidity estimates (Elhai, Grubaugh, Kashdan, & Frueh, 2008). Exclusion criteria included current Axis I disorders (other than MDD, PTSD, or tobacco dependence) or current use of nicotine replacement therapy, bupropion, or varenicline. This study was approved by the University of Wisconsin Health Sciences Institutional Review Board.

**Screening.**—Potential study participants completed a brief telephone screen followed by an in-person screening visit. At the screening visit, we explained the study purpose and procedures and obtained written informed consent. Participants then provided a breath

sample for carbon monoxide (CO) assessment (Ecolyzer, Bedford), and completed a diagnostic interview and baseline self-report measures. Eligible participants were scheduled for further visits as part of the parent study (see Cook et al., 2017). Participants who completed baseline assessments were included in the present study.

## Measures

*Structured clinical interviews* including the Structured Clinical Interview for DSM-IV, non-patient version (SCID; Spitzer, Williams, Gibbon, & First, 1992) and the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1995) were completed by a trained diagnostician to assess for PTSD, MDD, and other Axis I psychiatric disorders. Inclusion criteria to the PTSD group required a total CAPS score of  $\geq 50$  (Weathers, Keane, & Davidson, 2001).

*The Brief Wisconsin Inventory for Smoking Dependence Motives (Brief WISDM)* assessed tobacco dependence by evaluating 11 different theoretically derived motivational domains. This is a validated measure with subscales possessing good internal consistency (Piper et al., 2004; Smith et al., 2010). The 37 Brief WISDM items comprise two broad dimensions: Primary Dependence Motives and Secondary Dependence Motives (Piper et al., 2008).

## Analytic Plan

Analysis of variance (ANOVA) was used to examine the association between diagnostic group (PTSD, MDD, control) and Brief WISDM subscale scores. Based on a priori hypotheses we conducted focused comparisons using dummy codes (Tabachnick & Fidell, 2007) that contrasted each diagnostic group with the controls: (1) PTSD versus controls, (2) MDD versus controls. In addition, we conducted exploratory ANOVAs directly contrasting the PTSD and MDD groups. As in prior research (Baker et al., 2012), we partialled scores in all analyses of the Primary Dependence Motives and Secondary Dependence Motives subscales to control for overall elevated levels of subscale endorsement among the smokers with MDD and PTSD; thus the reported Primary Dependence Motives scores reflect variance remaining after partialling out the Secondary Dependence Motives score (and vice versa). We confirmed the model assumptions were satisfied for the overall Primary Dependence Motives and Secondary Dependence Motives scale models. There was some variation across WISDM subscale models as to the assumption of normally distributed error (e.g., kurtosis, skew), though we chose to report raw untransformed subscale scores so as to maintain comparability with the broader WISDM literature. We use the standard  $p < .05$  criteria for determining that results from all tests are significantly different from those expected if the null hypothesis were correct. To correct for multiple comparisons, we used a false discovery rate correction (Benjamini & Hochberg, 1995) for the subscales separately within the Primary Dependence Motives (four subscales) and the Secondary Dependence Motives (seven subscales).

## Results

A comparison of demographic and smoking variables is presented in Table 1. Group differences were found for gender, with more women represented in the PTSD group than in

the MDD and control groups. Moreover, participants in the PTSD group reported significantly higher Fagerström Test for Cigarette Dependence (FTCD) scores than the control group (see Table 1).

As shown in Table 2 and 3, smokers with PTSD scored higher than non-diagnosed controls on the following Primary Dependence Motives subscales: Automaticity, Craving, and Tolerance. Smokers with PTSD, relative to controls, also scored higher on the overall Secondary Dependence Motives subscale, and on five of the seven Secondary Dependence Motives subscales: Cue Exposure/Associative Processes, Affective Enhancement, Affiliative Attachment, Cognitive Enhancement, and Weight Control (see Table 2 and 3). Smokers with MDD scored significantly higher than controls on one specific Primary Dependence Motives subscale: Craving. Relative to controls they were also higher on four of seven Secondary Dependence Motives subscales: Affective Enhancement, Affiliative Attachment, Cognitive Enhancement, and Weight Control (see Table 2 and 3). Finally, exploratory analyses directly contrasting the PTSD group with the MDD group showed that smokers with PTSD were higher than those with MDD in the overall Secondary Dependence Motives subscale and in two of the seven Secondary Dependence Motives subscales: Cue Exposure and Social/Environmental Goals. However, significant differences in Social/Environmental Goals were no longer detected between the PTSD and MDD groups following false discovery rate correction for multiple comparisons.

## Discussion

Results suggest that smokers with PTSD and with MDD have different motives underlying their smoking dependence compared to smokers with no psychiatric comorbidities. Participants with PTSD reported that their smoking was heavier, more automatic, and resulted in greater craving than controls. Smokers with MDD reported higher craving than controls. Smokers with PTSD and with MDD were especially likely to report smoking for instrumental reasons relative to controls; i.e., Affective Enhancement, Affiliative Attachment, Cognitive Enhancement, and Weight Control. Those with PTSD were also higher than controls in Cue Exposure. Finally, smokers with PTSD reported being higher than those with MDD in the overall Secondary Dependence Motives subscale as well as in Cue Exposure/Associative Processes.

These results suggest that some smoking dependence motives are transdiagnostic, such that similar patterns were reported by smokers with PTSD and with MDD; for example, Affective Enhancement (e.g., “Smoking helps me feel better if I’ve been feeling down.”), Cognitive Enhancement (e.g., “I frequently smoke to keep my mind focused.”) and Affiliative Attachment (e.g., “Cigarettes keep me company, like a close friend.”). In addition to affective and concentration disturbances (American Psychiatric Association, 2013; Cook et al., 2017), limited opportunities for social reinforcement (King, Taft, King, Hammond, & Stone, 2006; Kupferberg, Bicks, & Hasler, 2016) may create a strong motivational context for smoking in those with PTSD and MDD. These results suggest that smokers with PTSD and with MDD smoke (and perhaps relapse) because smoking is valued for its ability to enhance mood and cognitive processing, as well as its ability to foster feelings of attachment.

Results also suggest that some smoking dependence motives are diagnosis specific. For example, for smokers with PTSD, smoking appears to be especially influenced by environmental cues and lifestyle factors. Specifically, those with PTSD scored higher than both controls and those with MDD on the subscale Cue Exposure (e.g., “My life is full of reminders to smoke.”). Moreover, they scored higher than those with MDD on Social and Environmental Goads (“I’m around smokers much of the time.”), a difference that did not withstand correction for multiple comparisons and should be interpreted with caution. Such findings likely reflect the density of smoking cues in their environment as well as the influence of such cues on smoking motivation. Perhaps PTSD-related hypervigilance heightens awareness of environmental cues, including those associated with smoking (American Psychiatric Association, 2013; Feldner et al., 2007). In addition, those with PTSD showed elevations in several Primary Dependence Motives subscales relative to controls, reflecting a smoking pattern that is automatic, heavy, and characterized by frequent urges to smoke. Thus, smoking dependence in those with PTSD appears to be influenced by two motivational paths— one reflecting both environmental cues and cognitive/affective prods (Secondary Dependence Motives) and another reflecting intrinsic, core features of dependence (Primary Dependence Motives).

This research has several limitations that should be considered. First, these were non-preregistered secondary analyses of a modest sample size and therefore warrant cautious interpretation until replicated in an independent sample. Second, these cross-sectional results are based on a single observation when the participants are meeting diagnostic criteria for PTSD or MDD. More research is needed to understand whether differences in dependence motives are sustained when smokers no longer meet diagnostic criteria for PTSD or MDD. Additional research is also needed to determine whether differences in smoking dependence motives in these populations are related to future cessation success. Third, these results are based on self-reports of dependence motives. While these are not motives to use cigarettes per se, there is a certain amount of subjective self-assessment that participants need to do to complete this measure, similar to any dependence measures. To further validate the WISDM in this sample, future research could use ecological momentary assessments to examine the extent to which self-reported motives and dependence markers align with real-time smoking patterns among smokers with PTSD and MDD (e.g., Piasecki, Piper, Baker, & Hunt-Carter, 2011). Finally, these results were based on a sample of relatively heavy smoking ( 10 cigarettes/day) veterans. Different patterns of dependence motives might emerge among civilians, women, smokers with other comorbid psychiatric disorders, or lighter smokers (e.g., Primary Dependence Motives may be relatively low among light smokers; Piper, et al., 2008), regardless of whether they have a comorbid psychiatric disorder such as PTSD.

In summary, this study provides preliminary, descriptive information about the relation between PTSD and MDD and smoking dependence motives. Overall, results suggest that smoking dependence in smokers with PTSD is influenced by both Primary and Secondary Dependence Motives, whereas dependence in those with MDD is primarily influenced by Secondary Dependence Motives. Such information could facilitate the development of more effective smoking treatments for those with PTSD and with MDD. For instance, smokers with PTSD and with MDD might benefit from interventions that address both the affective and cognitive symptoms motivating their smoking dependence. Smokers with PTSD may



particularly benefit from interventions that help them decrease exposure to smoking-related cues during quit attempts, as well as increased dose and duration of nicotine replacement therapy to address core elements of tobacco dependence.

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**Table 1.**

Participant demographic and smoking characteristics by group

	Full sample ( <i>N</i> = 162)	PTSD ( <i>n</i> = 52)	MDD ( <i>n</i> = 52)	Control ( <i>n</i> = 58)
Women % ( <i>n</i> ) <sup>ac</sup>	6.4 (10)	15.7 (8)	1 (2)	1.8 (1)
White % ( <i>n</i> )	70.4 (114)	71.2 (37)	76.9 (40)	63.8 (37)
High School Diploma/GED or less % ( <i>n</i> )	35.9 (55)	28.8 (15)	35.3 (18)	41.5 (22)
Age ( <i>M</i> , <i>SD</i> ) <sup>b</sup>	52.43 (9.7)	49.4 (11.05)	54.98 (8.8)	52.89 (8.45)
FTCD ( <i>M</i> , <i>SD</i> ) <sup>a</sup>	5.7 (2.1)	6.3 (2.01)	5.8 (2.06)	5.05 (2.22)
Cigarettes/day ( <i>M</i> , <i>SD</i> )	19.8 (8.4)	21.0 (6.94)	18.21 (8.61)	19.82 (9.50)

*Note.* Dummy coding was used to test for differences between the control group (reference group = 0) and both PTSD and MDD groups. Follow up tests compared PTSD vs. MDD groups. Significant group differences are identified with superscript letters. Superscript letters indicate significant group differences for specific contrasts noted below. Cigarettes per day data collection was added midway through the study and therefore reflect smaller sample size than other measures, PTSD (*n* = 39), MDD (*n* = 33), Control (*n* = 38). PTSD = posttraumatic stress disorder; MDD = major depressive disorder; FTND = Fagerström Test for Cigarette Dependence; GED = General Educational Development; *M* = mean; *SD* = standard deviation.

<sup>a</sup> *p* < .05 for PTSD vs. Control

<sup>b</sup> *p* < .05 for MDD vs. Control

<sup>c</sup> *p* < .05 for PTSD vs. MDD

**Table 2.**

Mean (SD) Brief WISDM scores by group

	PTSD ( <i>n</i> = 52)	MDD ( <i>n</i> = 52)	Control ( <i>n</i> = 58)
<b>Primary Dependence Motives</b>	5.21 (1.15)	4.94 (1.33)	4.34 (1.41)
Automaticity <sup>a</sup>	5.23 (1.55)	4.65 (1.76)	4.20 (1.81)
Craving <sup>ab</sup>	5.35 (1.13)	5.19 (1.40)	4.17 (1.44)
Tolerance <sup>a</sup>	5.43 (1.28)	5.20 (1.45)	4.70 (1.56)
Loss of Control	4.85 (1.56)	4.71 (1.67)	4.27 (1.71)
<b>Secondary Dependence Motives <sup>ac</sup></b>	4.49 (0.94)	3.94 (1.16)	3.46 (1.06)
Cue Exposure/Associative Processes <sup>ac</sup>	5.17 (1.25)	4.32 (1.54)	3.89 (1.60)
Affective Enhancement <sup>ab</sup>	4.94 (1.48)	4.39 (1.69)	3.71 (1.55)
Affiliative Attachment <sup>ab</sup>	4.31 (1.80)	3.87 (1.77)	2.90 (1.71)
Cognitive Enhancement <sup>ab</sup>	4.88 (1.45)	4.33 (1.72)	3.15 (1.77)
Weight Control <sup>ab</sup>	2.76 (1.56)	2.71 (1.63)	2.01 (1.27)
Social/Environmental Goals	4.65 (1.74)	3.92 (1.94)	4.34 (1.83)
Taste & Sensory Processes	4.74 (1.75)	4.19 (1.69)	4.19 (1.39)

*Note.* Dummy coding was used to test for differences between the control group (reference group = 0) and both PTSD and MDD groups. Follow up tests compared PTSD vs. MDD groups. Significant group differences are identified with superscript letters. Superscript indicate significant group differences for specific contrasts noted below. Analysis of group differences in Primary Dependence Motives scores are adjusted for Secondary Dependence Motives and analysis of group differences in Secondary Dependence Motives scores are adjusted for Primary Dependence Motives. Brief WISDM = Brief Wisconsin Inventory for Smoking Dependence Motives; *SD* = standard deviation; PTSD = posttraumatic stress disorder; MDD = major depressive disorder.

<sup>a</sup>  $p < .05$  for PTSD vs. Control

<sup>b</sup>  $p < .05$  for MDD vs. Control

<sup>c</sup>  $p < .05$  for PTSD vs. MDD

**Table 3.**

Brief WISDM Subscale Point Estimates (95% CI) of Group Difference (vs. Control) by Group

	<b>PTSD vs. Control</b>	<b>MDD vs. Control</b>	<b>PTSD vs. MDD</b>
<b>Primary Dependence Motives</b>	0.11 [-0.33, 0.54]	0.23 [-0.17, 0.64]	-0.13 [-0.55, 0.29]
Automaticity	1.02 [0.37, 1.68] *	0.44 [-0.21, 1.10]	0.58 [-0.09, 1.25]
Craving	1.175 [0.66, 1.69] *	1.02 [0.51, 1.53] *	0.16 [-0.37, 0.68]
Tolerance	0.73 [0.18, 1.28] *	0.50 [-0.05, 1.06]	0.23 [-0.34, 0.79]
Loss of Control	0.58 [-0.05, 1.21]	0.45 [-0.19, 1.08]	0.13 [-0.51, 0.78]
<b>Secondary Dependence Motives</b>	0.59 [0.25, 0.93] *	0.19 [-0.15, 0.52]	0.41 [0.07, 0.74] *
Cue Exposure/Associative Processes	1.28 [0.71, 1.85] *	0.43 [-0.14, 1.00]	0.85 [0.27, 1.43] *
Affective Enhancement	1.23 [0.61, 1.84] *	0.68 [0.07, 1.29] *	0.55 [-0.08, 1.12]
Affiliative Attachment	1.41 [0.74, 2.09] *	0.94 [0.28, 1.64] *	0.45 [-0.24, 1.14]
Cognitive Enhancement	1.73 [1.09, 2.37] *	1.19 [0.55, 1.82] *	0.54 [-0.11, 1.19]
Weight Control	0.75 [0.17, 1.32] *	0.70 [0.12, 1.28] *	0.05 [-0.55, 0.64]
Social/Environmental Goals	0.31 [-0.40, 1.03]	-0.42 [-1.13, 0.28]	0.74 [0.02, 1.46]
Taste & Sensory Processes	0.54 [-0.08, 1.17]	-0.01 [-0.63, 0.61]	0.55 [-0.08, 1.19]

*Note.* Model point estimates of mean group differences in Brief WISDM Subscales contrasting PTSD vs. Control, MDD vs. Control, and PTSD vs. MDD. Confidence intervals (95%) are indicated in brackets. We used dummy coding to test for differences between the control group (reference group = 0) and both PTSD and MDD groups. Follow up tests compared PTSD vs. MDD groups. Significant group differences are identified with superscript letters. Asterisk indicate significant group differences for specific contrasts. Analysis of group differences in Primary Dependence Motives scores are adjusted for Secondary Dependence Motives and analysis of group differences in Secondary Dependence Motives scores are adjusted for Primary Dependence Motives. Brief WISDM = Brief Wisconsin Inventory for Smoking Dependence Motives; CI = confidence interval; PTSD = posttraumatic stress disorder; MDD = major depressive disorder.

\*  
p < .05