A Pilot Study of Pain-Related Anxiety and Smoking Dependence Motives Among Persons with Chronic Pain

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Abstract

Complex interactions between pain and tobacco smoking have been of increasing interest to researchers and clinicians from a variety of disciplines. There is also recent evidence to suggest that pain-related anxiety may play an important role in the maintenance of tobacco dependence among persons with comorbid pain disorders. The goal of the current study was to evaluate the explanatory relevance of pain-related anxiety in relation to tobacco dependence, among a sample of daily smokers with current chronic pain. Participants were recruited from the general population to complete an online survey that was developed to examine interrelations between chronic pain and tobacco smoking. Approximately 43% of 129 daily smoking respondents met criteria for current chronic pain. Results indicated that pain-related anxiety accounted for a significant portion of the unique variance in total smoking dependence scores, and both primary and secondary dependence composite scores (as measured by the Wisconsin Inventory of Smoking Dependence Motives). Importantly, these effects were observed above and beyond the variance accounted for by relevant sociodemographic factors, generalized anxiety, and pain severity. Pain-related anxiety was observed to be strongly associated with secondary dependence motives, which is consistent with a conceptualization of pain-related anxiety as an instrumental or situational motivator of smoking. These results suggest that tobacco smokers with comorbid pain disorders may be at risk for maintaining or exacerbating their dependence on tobacco, possibly due to individual differences in pain-related anxiety. These findings may help inform the development of tailored interventions for smokers with comorbid chronic pain.

Keywords

Tobacco addiction and chronic pain are both highly prevalent and comorbid conditions, and complex interactions between pain and smoking have been of increasing interest to researchers and clinicians across disciplines (Ditre, Brandon, Zale, & Meagher, 2011; Ditre, Gonzalez, et al., 2011). The prevalence of smoking among persons with chronic pain may be greater than twice the rate observed in the general population (Hooten, Shi, Gazelka, & Warner, 2011; Jamison, Stetson, & Parris, 1991; Zvolensky, McMillan, Gonzalez, & Asmundson, 2009). Tobacco smoking has been identified as a unique risk factor in the onset and progression of chronic pain (Shiri, Karppinen, Leino-Arjas, Solovieva, & Viikari-Juntura, 2010; Sugiyama et al., 2010), and smokers with chronic pain (relative to

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nonsmokers with chronic pain) tend to report more severe pain, greater levels of anxiety and depression, and more frequent use of analgesic medications (Fishbain, Lewis, Gao, Cole, & Rosomoff, 2009; Hooten, Shi, et al., 2011; John, Alte, et al., 2006; John, Hanke, et al., 2006). Researchers have also long suspected that pain may serve as a powerful reinforcer in the maintenance of tobacco dependence (Fertig, Pomerleau, & Sanders, 1986; Jarvik, Caskey, Rose, Herskovic, & Sadeghpour, 1989; Pomerleau, 1986).

A recently proposed integrative reciprocal model of pain and smoking suggests that pain and smoking behavior may interact in the manner of a positive feedback loop, resulting in greater pain and the maintenance of tobacco dependence (Ditre, Brandon, et al., 2011). Consistent with this perspective, the odds of meeting diagnostic criteria for current nicotine dependence appear to be two-fold greater for smokers with comorbid chronic pain, relative to those without chronic pain, even after controlling for a range of sociodemographic and psychiatric factors (Zvolensky et al., 2009). There is also mounting evidence that pain may serve to motivate smoking behavior (Ditre & Brandon, 2008; Ditre, Heckman, Butts, & Brandon, 2010), that chronic pain patients readily endorse smoking cigarettes to cope with their pain (Hooten, Vickers, et al., 2011; Patterson et al., 2012), and that recurring pain may impede smoking cessation (Hooten, Vickers, et al., 2011; Nakajima & al'Absi, 2011; Waldie, McGee, Reeder, & Poulton, 2008).

An important next step in this line of research is to identify factors that warrant consideration for their potential to influence the development/refinement of treatments for smokers with comorbid pain disorders. One such construct with clinical and theoretical relevance is *pain-related anxiety*. Pain-related anxiety has been described as a cognitive factor that promotes anxious and fearful responses to pain or pain-related events (McCracken, Zayfert, & Gross, 1992). Pain-related anxiety is closely related to, but distinct from other constructs such as fear of pain (Zale, Lang, Fields, & Ditre, in press; Zvolensky, Goodie, McNeil, Sperry, & Sorrell, 2001). Persons with chronic pain tend to demonstrate more pain-related anxiety than do comparison groups, and greater pain-related anxiety has been related to overestimates of pain intensity, the use of maladaptive pain-coping responses, and increased somatic reactivity in anticipation of pain-eliciting physical activity (McCracken, Gross, Sorg, & Edmands, 1993).

More recently, researchers have begun to examine relations between pain-related anxiety and substance use generally and tobacco smoking specifically (Hogan, Gonzalez, Howell, Bonn-Miller, & Zvolensky, 2010). Smokers seeking treatment for chronic pain have been found to endorse greater pain-related anxiety when compared to their nonsmoking counterparts (Hooten et al., 2009). Greater pain-related anxiety has also been observed among chronic pain patients who endorsed smoking cigarettes to cope with their pain, relative to those who did not endorse smoking for pain-coping (Patterson et al., 2012). There also is initial evidence that pain-related anxiety may play a role in expectancies about smoking. For example, among daily smokers with current, nonspecific body pain, pain-related anxiety was found to be positively associated with expectancies that smoking serves to decrease negative affect (Gonzalez, Hogan, McLeish, & Zvolensky, 2010). This association remained significant after accounting for the influence of gender, pain severity, daily cigarette consumption, and variance shared with related constructs (e.g., anxiety sensitivity).

Although there is initial support for the notion that pain-related anxiety may play a role in the maintenance of tobacco dependence among persons with chronic pain, this has yet to be examined empirically. To address this gap in the literature, the goal of the present study was to test cross-sectional relations between pain-related anxiety and scores on the Wisconsin Inventory of Smoking Dependence Motives (WISDM; Piper et al., 2008; Piper et al., 2004),

among a sample of current smokers with comorbid chronic pain. The WISDM is a comprehensive, theoretically-grounded, multidimensional measure of tobacco dependence that assesses 13 domains of smoking motivation, and yields a total dependence score, and two higher-order composite scores (i.e., Primary Dependence Motives - PDM, and Secondary Dependence Motives - SDM).

The PDM composite has been most strongly associated with core features of tobacco dependence (e.g., compulsion to smoke), and research has shown WISDM PDM scores to predict daily smoking, cigarette consumption, laboratory self-administration of nicotine, genetic risk for smoking, relapse following a quit attempt, and other dependence indices (Baker et al., 2007; Baker et al., 2009; Piasecki, Piper, & Baker, 2010; Piper et al., 2008; Shiffman, Dunbar, Scholl, & Tindle, 2012). Although PDM and SDM have been shown to be both correlated and independently related to the construct of tobacco dependence (Piper et al., 2008), SDM scores tend to reflect more instrumental or situational reasons people may elect to smoke (e.g., to regulate mood or control weight). Thus, in contrast to PDM, SDM may be of equal relevance for beginning, intermittent, and dependent smokers alike (Piasecki et al., 2010; Piasecki, Piper, Baker, & Hunt-Carter, 2011; Shiffman et al., 2012). Notably, both PDM and SDM scores have also been shown to distinguish between smokers with and without comorbid psychopathology, including those with a lifetime history of anxiety disorders (Piper, Cook, Schlam, Jorenby, & Baker, 2011; Piper et al., 2010).

To our knowledge, no previous research has examined the role of pain-related anxiety in relation to tobacco dependence among smokers with comorbid pain disorders. Based upon available empirical evidence (e.g., Hooten et al., 2009), we hypothesized that pain-related anxiety among smokers with chronic pain would be positively associated with WISDM-Total scores, and both PDM and SDM composite scores. We further predicted that these relations would be evident above and beyond the variance accounted for by relevant sociodemographic factors, generalized anxiety, and current pain severity. Given that pain-related anxiety may be conceptualized as a situational motivator of smoking, we also hypothesized that pain-related anxiety would evince a strong association with the SDM composite score. Finally, we sought to examine relations between pain-related anxiety and individual PDM/SDM subscale scores in an exploratory fashion.

Method

Participants and Survey Procedures

Participants completed an online survey of health and health-related behaviors that was developed by members of the current research team for the express purpose of testing relations between pain and smoking. Survey measures were administered through socialsci.com, a web-based service that connects researchers with adult residents of the United States who agree to participate in IRB-approved research studies in exchange for small points-based rewards. Respondents who expressed an interest in completing the survey were screened for lifetime tobacco smoking and current chronic pain. The only inclusion criteria were that participants had to be at least 18 years of age, United States residents, and fluent in English. Participants were derived from 129 respondents who endorsed current daily smoking. Of these, 56 (43%) also endorsed current chronic pain and were included in the current analyses. These data were collected between December 2011 and June 2012.

Measures

Pain Anxiety Symptoms Scale - 20 (PASS-20; McCracken & Dhingra, 2002)— The PASS-20 is a 20-item measure of fearful and anxious responses to pain, including

cognitive and physical manifestations of pain-related anxiety, fearful appraisals of pain, and escape/avoidance behaviors. Higher total scores represent greater pain-related anxiety. The PASS-20 is a reliable and valid measure of pain-related anxiety among persons with chronic pain, and this measure demonstrated excellent internal consistency in the current sample (chronbach's α = .96). The PASS-total score was used to index pain-related anxiety in the present study, as it represents an inclusive global composite of the construct (McCracken et al., 1992).

Wisconsin Inventory of Smoking Dependence Motives (WISDM; Piper et al., 2004)—The WISDM is a 68-item, multidimensional measure of tobacco dependence that yields a total dependence score (i.e., WISDM-Total), which is comprised of two higher-order composite scores (i.e., Primary Dependence Motives - PDM, and Secondary Dependence Motives - SDM). Relative to other measures of tobacco dependence (e.g., FTND, DSM-IV criteria), the WISDM assesses a broader range of dependence constructs, which allows for the detection of theoretical and clinically-meaningful distinctions among smokers (Piper et al., 2008). The PDM composite is comprised of four subscales that assess core features of tobacco dependence, whereas the SDM composite is comprised of nine subscales that assess instrumental or situational motivators of smoking. We elected to focus our hypotheses on the WISDM-Total and PDM/SDM composite scores, partly because there is some evidence that real-time smoking motives may be most interpretable at the level of the higher-order factors (e.g., Piasecki et al., 2011). The WISDM has been shown to be a reliable and valid measure of tobacco dependence and related constructs, and this measure demonstrated excellent internal consistency in the current sample (WISDM-Total α = .98; PDM α = .91; SDM α = .91).

Chronic Pain Screener—Current chronic pain status was screened with a single item adapted from the Kansas Behavioral Risk Factor Surveillance System (Toblin, Mack, Perveen, & Paulozzi, 2011) and the National Health Interview Survey (National Center for Health Statistics, 2011). Specifically, participants were asked: "Do you currently suffer from any type of chronic pain, that is, pain that occurs constantly or flares up frequently? Do not report aches and pains that are fleeting or minor." Participants who endorsed this item were subsequently administered the Graded Chronic Pain Scale (to more thoroughly characterize their chronic pain status), and queried with regard to their use of pain medications (including type and frequency of use).

Graded Chronic Pain Scale (GCPS; Von Korff, 2011)—The GCPS provides a reliable and valid method of assessing global pain severity across a range of chronically painful conditions, among both treatment-seeking pain patients and persons in the general population. Participants rated the intensity of their pain *right now*, their *worst* pain in the past three months, and their pain *on average* during the past three months using separate 0–10 numerical rating scales. Consistent with GCPS scoring instructions, these items were summed to yield a continuous composite score of characteristic pain intensity/severity. Participants also reported the extent to which pain interfered with ability to perform daily activities, work, and recreational, social, and family activities, and the number of days in the past three months that pain interfered with daily activities. Consistent with scoring instructions, these items were summed to yield a continuous composite disability score. The GCPS also allows for categorical classification of chronic pain by grade, which takes into account pain intensity and disability/interference to reflect severity of the chronic pain condition. Chronic pain grades range from Grade 1 (low intensity, low interference) to Grade 4 (severe interference). This measure demonstrated excellent internal consistency in the current sample (α = .93).

Generalized Anxiety Disorder - 7 (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006)—The GAD-7 is a brief 7-item measure of generalized anxiety symptomatology based on diagnostic criteria described in DSM-IV. The GAD-7 has been shown to be a reliable and valid measure of anxiety in the general population (Lowe et al., 2008), and this measure demonstrated good internal consistency in the current sample ($\alpha = .89$). The GAD-7 was selected for its utility as a broad-based index of anxiety and worry.

Sociodemographic and Smoking Characteristics—A range of sociodemographic (e.g., age, gender, race/ethnicity, education, and income) and smoking characteristics (e.g., lifetime smoking status, number of cigarettes smoked per day, and number of years smoking) were assessed via self-report and are presented in Table 1. Participants also completed the Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991), which is a widely used measure of physical dependence on nicotine.

Data Analytic Strategy

First, we conducted a series of bivariate correlations to examine associations between pain-related anxiety, WISDM scores, generalized anxiety, pain severity, and sociodemographic characteristics. As seen in Table 1, significant positive correlations were observed between WSDM-Total scores and income ($r = .33$) and education ($r = .29$), and between PASS-Total scores and income ($r = .28$), generalized anxiety ($r = .38$), and pain severity ($r = .55$). Based on these observations, and known gender differences with regard to anxiety and pain reporting (Zvolensky et al., 2001), all subsequent analyses were designed to control for the influence of education, income, gender, generalized anxiety, and pain severity. Second, we conducted separate hierarchical regressions to test our hypotheses that pain-related anxiety would be positively associated with WISDM-Total, PDM, and SDM scores, respectively (identical analyses were also conducted for each of the 13 individual WISDM subscales). For each of the hierarchical regression models, predictors were entered in the following order: Step 1 (income, education, gender); Step 2 (generalized anxiety, pain severity); Step 3 (pain-related anxiety). Finally, we assessed the relative contribution of pain-related anxiety to the observed variance in WISDM scores by examining change in R-squared (ΔR^2) and squared semipartial correlations (sr^2) at the final step of each model.

Results

Participant Characteristics

The sample was predominately Caucasian (91%) and female (59%), with a mean age of approximately 30 years ($SD = 7.6$). Participants reported smoking 15 cigarettes per day ($SD = 13.2$) for an average of 11 years ($SD = 8.4$). Approximately 82% of the sample endorsed pain intensity/disability at levels considered to be of clinical significance (Velly et al., 2011), and 60% endorsed pain that resulted in moderate to severe functional impairment (Von Korff, 2011). The majority of the sample (68%) endorsed regular (weekly/daily) use of analgesic medications, and greater than half (57%) of all participants reported using prescription opioids. See Table 2 for a breakdown of sample sociodemographic, smoking, pain, and anxiety characteristics.

Pain-Related Anxiety and WISDM-Total Score

As seen in Table 3, results of the hierarchical regression analysis revealed that neither sociodemographic characteristics (Step 1: $p = .09$) nor generalized anxiety and pain severity (Step 2: $p = .77$) accounted for a significant portion of the variance in WISDM-Total scores. However, as hypothesized, we did observe a positive and significant association between pain-related anxiety and WISDM-Total scores among smokers with chronic pain, even after

controlling for these other relevant factors (Step 3: $\beta = .62$, $p < .001$). Furthermore, examination of the change in R-squared statistic at Step 3 revealed that pain-related anxiety accounted for approximately 20% of the unique variance in WISDM-Total scores ($p < .001$).

Pain-Related Anxiety and WISDM PDM and SDM Composite Scores

Also as hypothesized, and similar to the finding observed for WISDM-Total, the results of separate hierarchical regression analyses revealed that pain-related anxiety continued to be positively and significantly associated with both WISDM-PDM (Step 3: $\beta = .48$, $p < .01$) and WISDM-SDM (Step 3: $\beta = .64$, $p < .001$) composite scores, even after controlling for relevant sociodemographic factors, generalized anxiety, and pain severity (Table 4 presents the results at Step 3 for PDM, SDM, and the individual subscale scores). Examination of the respective squared semipartial correlations revealed that pain-related anxiety accounted for a substantial portion of unique variance in both PDM ($sr^2 = .11$) and SDM ($sr^2 = .21$) composite scores.

Pain-Related Anxiety and Individual WISDM Subscale Scores

Exploratory hierarchical regression analyses were performed to examine associations between pain-related anxiety and the each of the 13 WISDM subscales. Table 4 presents the individual regression coefficients (β) and squared semipartial correlations (sr^2) for each subscale, after controlling for relevant sociodemographic factors, generalized anxiety, and pain severity. With regard to the subscales that comprise PDM, pain-related anxiety was observed to be positively associated with *automaticity*, *loss of control*, and *tolerance* ($ps < .03$), but not *craving* ($p = .10$). Examination of the squared semipartial correlations revealed that pain-related anxiety accounted for 5–11% of unique variance across the individual PDM subscales. With regard to the subscales that comprise SDM, pain-related anxiety was observed to be positively associated with eight of the nine individual subscales (all $ps < .04$), with a trend-level finding ($p = .05$) observed for *cue-exposure/associative processes*. Examination of the squared semipartial correlations revealed that pain-related anxiety accounted for 7–25% of unique variance across individual SDM subscales.

Discussion

Although there is reason to suspect that pain-related anxiety may be related to tobacco dependence and the motivational processes that underlie smoking behavior among persons with chronic pain, this notion had yet to be tested empirically. The current study evaluated the explanatory relevance of pain-related anxiety in relation to smoking dependence motives, among a sample of daily smokers with current chronic pain. As hypothesized, pain-related anxiety was found to be significantly and positively associated with WISDM-Total scores, and both primary (PDM) and secondary dependence motives (SDM) composite scores. Importantly, these effects were observed above and beyond the variance accounted for by other factors of clinical and theoretical relevance, including those specific to both pain and generalized anxiety. Although broadly consistent with evidence of an association between chronic pain status and the odds of meeting criteria for nicotine dependence (Zvolensky et al., 2009), these data suggest that pain-related anxiety may be related to essential and specific features of tobacco dependence among smokers with chronic pain.

Also as hypothesized, pain-related anxiety evinced a strong association with the SDM composite score. Specifically, pain-related anxiety was observed to account for 21% of the unique variance in SDM scores (relative to 11% for PDM), and was positively associated with all nine secondary scales. These data provide initial support for the notion that pain-related anxiety may operate as a situational motivator of smoking among persons with comorbid pain disorders.

Notably, we observed no significant associations between pain severity and either generalized anxiety or measures of smoking dependence (see Table 1). This pattern of findings may have been influenced by the somewhat truncated range of pain severity (see Table 2), and the fact that we did not recruit a treatment-seeking clinical population (e.g., smokers with chronic pain seeking treatment). There were, however, consistent associations between pain-related anxiety and smoking dependence motives, suggesting that fear and worry about pain may share more robust relations with tobacco dependence than do pain or anxiety symptom severity.

Replication and application of the present findings could have clinical implications for smokers with comorbid pain disorders, particularly with regard to the development and refinement of interventions for this unique subpopulation of tobacco smokers. Positive associations between pain-related anxiety and smoking dependence motives may help to explain, in part, why smoking is more prevalent among persons in pain (e.g., Ditre, Brandon, et al., 2011), and why smokers with chronic pain are more likely to meet criteria for nicotine dependence (Zvolensky et al., 2009). Additionally, smoking cessation interventions that aim to reduce pain-related anxiety may, in turn, mitigate the extent to which recurring pain serves to motivate smoking (e.g., Ditre & Brandon, 2008) or impair confidence in quitting (e.g., Hooten, Shi, et al., 2011; Zale & Ditre, 2013).

Strengths of the current study include the recruitment of daily smokers with current chronic pain from the general population (such that the sample was not limited to treatment-seeking pain patients), and the utilization of valid and reliable measures of chronic pain, generalized anxiety, pain-related anxiety, and smoking dependence motives. In addition, all analyses statistically-controlled for the influence of highly relevant third variables, including sociodemographic factors, self-reported pain intensity, and generalized anxiety. Despite these strengths, several limitations bear noting.

First, the use of cross-sectional data precludes us from making any causal or mechanistic inferences. Although these findings demonstrate positive associations between pain-related anxiety and motives hypothesized to underlie tobacco dependence, conclusions regarding the relative importance of this factor above and beyond other pain- and smoking-relevant variables would be premature. Second, these data are not necessarily representative of all smokers with chronic pain in the general population. The current sample was predominantly female and Caucasian, and our web-based survey required access to the internet and familiarity with points-based reward systems. Third, self-report measures were utilized as the primary assessment methodology, thus precluding biochemical verification of smoking status, and corroboration of chronic pain status via medical chart review. Future research would benefit from examining the unique contribution of pain-related anxiety in relation to other constructs hypothesized to influence complex interrelations between pain and smoking (see Ditre, Brandon, et al., 2011 for a comprehensive review), among larger, more diverse samples of tobacco smokers, with specific deference to respective pain- and smoking-related treatment outcomes. Finally, at the present stage of research development, we focused on global measurements of pain-related anxiety. Future work could build upon the present findings and explore whether certain lower-order factors of pain-related anxiety offer enhanced explanatory power relative to the global construct.

In summary, the present investigation represents an important, albeit early, step towards better understanding potentially reciprocal interactions between pain and smoking. These results suggest that certain subpopulations of smokers may be at greater risk for maintaining or exacerbating their dependence on tobacco, possibly due to individual differences in pain-related anxiety.

Acknowledgments

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Table 1

Bivariate Correlations Between Variables of Primary Interest

Variable	1	2	3	4	5	6	7	8	9
1 Gender	–	−.52**	−.26	.07	.15	−.15	−.16	−.14	−.04
2 Income		–	.72**	.07	−.08	.33*	.33*	.30*	.28*
3 Education			–	.04	.19	.29*	.29*	.27*	.17
4 Pain Severity[1]				–	.13	.17	.16	.16	.55**
5 Generalized Anxiety[2]					–	.13	.06	.15	.38**
6 WISDM-Total Score[3]						–	.89**	.97**	.52**
7 WISDM PDM[4] Composite							–	.76**	.41**
8 WISDM SDM[5] Composite								–	.53**
9 Pain-Related Anxiety[6]									–

Note. Gender: 0 = Male, 1 = Female;

[1] Graded Chronic Pain Scale-Characteristic Pain Intensity Subscale;

[2] Generalized Anxiety Disorder 7-item;

[3] Wisconsin Inventory of Smoking Dependence Motives;

[4] Primary Dependence Motives,

[5] Secondary Dependence Motives,

[6] Pain Anxiety Symptoms Scale-20 Total Score.

*
$p < .05$;

**
$p < .01$.

Table 2

Sample Sociodemographic, Smoking, Pain, and Anxiety Characteristics

	n	(%)
Gender		
Female	33	(58.9)
Male	23	(41.1)
Income		
< 25K	21	(37.5)
25–50K	16	(28.6)
> 50K	19	(33.9)
Education		
High School or GED	6	(10.7)
Some College	30	(53.6)
4 Year College or More	20	(35.7)
Marital Status		
Single	30	(53.6)
Married	21	(37.5)
Divorced	5	(8.9)
Race		
Caucasian	51	(91.1)
Other	5	(8.9)
GCPS[1] Chronic Pain Grade		
Grade 1 – Low Intensity, Low interference	10	(17.9)
Grade 2 – High intensity	13	(23.2)
Grade 3 – Moderate Interference	16	(28.6)
Grade 4 – Severe Interference	17	(30.4)
Pain Medication Use - Frequency		
Never	8	(14.3)
Occasionally	10	(17.9)
Weekly	25	(44.6)
Daily	13	(23.2)
Pain Medication Use - Type		
Any OTC (e.g., aspirin, acetaminophen, NSAIDs)	53	(92.6)
Any Prescription	42	(75.0)
Prescription Opioid and Non-Opioid (both)	27	(48.2)
Prescription Opioid Only	5	(8.9)
Prescription Non-Opioid Only	10	(17.9)
	M	(*SD*)
Age	29.5	(7.6)
Cigarettes per Day	14.9	(13.2)
Years of Daily Smoking	11.2	(8.4)

	n	(%)
Fagerström Test for Nicotine Dependence	3.8	(2.2)
Pain Severity[2]	18.5	(5.0)
Generalized Anxiety[3]	11.0	(5.2)
Pain-Related Anxiety[4]	54.9	(29.6)
WISDM[5] Total Score	47.7	(16.1)
WISDM PDM[6] Score	3.6	(1.4)
WISDM SDM[7] Score	3.7	(1.3)

[1]Graded Chronic Pain Scale;

[2]GCPS Characteristic Pain Intensity;

[3]Generalized Anxiety Disorder-7;

[4]Pain-Anxiety Symptoms Scale - 20 Total Score;

[5]Wisconsin Inventory of Smoking Dependence Motives;

[6]Primary Dependence Motives;

[7]Secondary Dependence Motives.

Table 3

Hierarchical Regression Model with WISDM-Total Entered as Criterion Variable

	ΔR^2	β	t	sr^2	p
Step 1	.11				.09
Education		.11	.58	.01	.56
Income		.25	1.17	.02	.25
Gender		.01	.04	.00	.97
Step 2	.04				.37
Education		.06	.30	.00	.77
Income		.27	1.22	.03	.23
Gender		−.02	−.16	.00	.88
Generalized Anxiety[2]		.13	.89	.01	.38
Pain Severity[3]		.13	.97	.02	.34
Step 3	.20				<.001
Education		.22	1.17	.02	.25
Income		−.03	−.13	.00	.89
Gender		−.07	−.43	.03	.67
Generalized Anxiety		−.12	−.86	.01	.39
Pain Severity		−.16	−1.14	.02	.26
Pain-Related Anxiety[4]		.62	3.81	.19	<.001

Note. β= standardized beta weights;

[1]Wisconsin Inventory of Smoking Dependence Motives;

[2]Generalized Anxiety Disorder 7-item;

[3]Graded Chronic Pain Scale-Characteristic Pain Intensity Subscale;

[4]Pain Anxiety Symptoms Scale-20 Total Score.

Table 4

Hierarchical Regressions of Pain-Related Anxiety on WISDM PDM and SDM Subscales

	β	t	sr^2	p
Criterion Variables				
WISDM-PDM[2]	.48	2.72	.11	<.01
WISDM-Automaticity	.51	2.95	.13	<.01
WISDM-Craving	.32	1.66	.05	.10
WISDM-Loss of Control	.40	2.26	.08	.03
WISDM-Tolerance	.44	2.51	.08	.02
WISDM-SDM[3]	.64	3.94	.21	<.001
WISDM-Affiliative Attachment	.60	3.66	.18	<.01
WISDM-Behavioral Choice/Melioration	.71	4.61	.25	<.001
WISDM-Cognitive Enhancement	.48	2.60	.11	.012
WISDM-Cue Exposure/Associative Processes	.38	2.03	.07	.05
WISDM-Negative Reinforcement	.39	2.12	.08	.04
WISDM-Positive Reinforcement	.59	3.34	.17	<.01
WISDM-Social/Environmental Goads	.39	2.24	.07	.03
WISDM-Taste/Sensory Properties	.51	2.94	.13	<.01
WISDM-Weight Control	.41	2.39	.10	.02

Note: These data reflect only step three of the individual hierarchical regressions of pain-related anxiety on WISDM composite scores and subscales. Thus, all analyses presented adjusted for education, income, gender, generalized anxiety, and pain severity.

[1]Pain Anxiety Symptoms Scale-20 Total Score; Wisconsin Inventory of Smoking Dependence Motives-

[2]Primary Dependence Motives and

[3]Secondary Dependence Motives.