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A Measure of Perceived Pain and Tobacco Smoking Interrelations: Pilot Validation of the Pain and Smoking Inventory

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Abstract

Mounting evidence indicates that pain can motivate cigarette smoking behavior, smokers have reliably endorsed the use of tobacco to cope with pain, and there is reason to suspect that pain may impede smoking cessation. Smoking-related outcome expectancies are among the best predictors of cigarette consumption and relapse, and the goal of this pilot study was to develop a standardized measure of how tobacco smokers perceive their pain and smoking behavior to be interrelated (i.e., pain as a motivator of smoking, expectancies for smoking as a means of coping with pain, and pain as a barrier to quitting). Participants ($N = 75$) completed an online survey that was designed to assess interrelations between pain and tobacco smoking. The 9-item Pain and Smoking Inventory (PSI) demonstrated excellent internal consistency ($\alpha = .95$). As expected, PSI scores were higher among smokers with chronic pain (vs. no pain), and were positively associated with established indices of both pain and tobacco smoking dependence. These results corroborate the notion that smokers can effectively communicate perceptions of interrelations between their pain and smoking behavior. Future research is needed to establish reliability and validity of the PSI among larger, more diverse samples of smokers with varying levels of pain. Future work should also examine PSI scores as predictors of smoking cessation outcomes, and whether PSI data may usefully inform the development of tailored interventions for smokers in pain.

Keywords

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Introduction

Tobacco addiction and chronic pain are both highly prevalent and co-occurring disorders that have been hypothesized to operate in the manner of a positive feedback loop, resulting in greater pain and the maintenance of smoking behavior (Ditre, Brandon, Zale, & Meagher, 2011; Zale, Maisto, & Ditre, 2016). Rates of tobacco smoking among individuals in pain (28%–68%; Goesling, Brummett, & Hassett, 2012; Michna et al., 2004; Orhurhu, Pittelkow, & Hooten, 2015; Patterson et al., 2012) far exceed those observed in the general population (18%; CDC, 2014), and smokers with chronic pain (vs. no chronic pain) are nearly two times more likely to meet diagnostic criteria for nicotine dependence (Zvolensky, McMillan, Gonzalez, & Asmundson, 2009). Smokers who live with pain have also been shown to consume more cigarettes per day and report less confidence in their ability to quit than pain-free smokers (Ditre, Kosiba, Zale, Zvolensky, & Maisto, 2016; Zale, Ditre, Dorfman, Heckman, & Brandon, 2014). Despite emerging evidence that tobacco smokers with comorbid pain may constitute a recalcitrant subgroup that faces unique barriers to smoking cessation (Ditre, Langdon, Kosiba, Zale, & Zvolensky, 2015; Zale & Ditre, 2013), the extent to which individuals perceive their pain and smoking behavior to be interrelated remains understudied.

A seminal qualitative study of pain-smoking perceptions revealed that treatment-seeking pain patients readily endorse: smoking in response to pain; the use of tobacco to cope with pain; and concurrent pain as a barrier to quitting (Hooten et al., 2011). These reports are consistent with: experimental evidence that situational pain can be a potent motivator of smoking behavior (Ditre & Brandon, 2008; Ditre, Heckman, Butts, & Brandon, 2010); ecological momentary assessment data indicating that increased pain often precedes smoking episodes (Dhingra et al., 2013); demonstrated positive associations between pain intensity and the self-reported use of cigarettes to cope with clinical pain (Patterson et al., 2012); and cross-sectional evidence that smokers with pain anticipate greater difficulty when attempting to quit than smokers with no pain (Ditre et al., 2016; Zale et al., 2014). Given increasing empirical and clinical interest in these processes, along with the fact that smoking-related perceptions and outcome expectancies are among the best predictors of cigarette consumption and relapse (Gwaltney, Shiffman, Balabanis, & Paty, 2005; Hendricks & Leventhal, 2013), it is essential to develop a standardized measure of how tobacco smokers perceive their pain and smoking behavior to be interrelated.

The goal of this study was to pilot test a new measure of perceptions of pain and tobacco smoking across three conceptually-distinct domains that are supported by a comprehensive model of pain and smoking (Ditre et al., 2011): (1) pain as a motivator of smoking behavior, (2) smoking as a strategy for coping with pain, and (3) pain as a barrier to smoking cessation. Consistent with classical conditioning and withdrawal-based learning models (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Eissenberg, 2004), as well as established research on relations between stress/negative affect and smoking (Heckman et al., 2013; Kassel, Stroud, & Paronis, 2003), researchers have suggested that pain may function an interoceptive cue for smoking (Ditre et al., 2011). Thus, items designed to assess *pain as a motivator of smoking* may tap into automatic or conditioned smoking responses, whereas the use of *smoking to cope with pain* is more consistent with self-medication and stress-coping

models of addiction (Ditre et al., 2011; Khantzian, 1985; Wills & Shiffman, 1985). Items designed to assess *pain as a barrier to smoking cessation* focus on expectancies that pain will interfere with or prevent attempts to quit smoking. Given that three items per domain are required for factor identification (Goldberg & Velicer, 2006), we a priori selected a total of nine items for the measure (hereafter referred to as the Pain and Smoking Inventory; PSI). We hypothesized that PSI scores would distinguish between smokers with and without chronic pain, and be positively associated with established indices of both pain (e.g., pain intensity/disability, catastrophizing) and tobacco smoking (e.g., cigarette smoking dependence, smoking motives, expectations for difficulty quitting).

Method

Participants and survey procedures

An online survey of pain and tobacco smoking was administered via 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. Participants were required to be 18 years of age or older and able to read and write English. A total of 706 participants enrolled in the online survey, which included both smokers and nonsmokers with varying levels of historical or co-occurring pain. Only participants who reported currently smoking at least five cigarettes per day and responded to a question that assessed chronic pain status were included in the current analyses ($N = 75$). A cut-off five cigarettes per day has consistently been used to distinguish moderate-to-heavy smokers from low-level smokers (< 5cpd) who tend to evince less stability in their smoking patterns and cigarette consumption over time (Husten, 2009). In order to investigate differences in PSI scores as a function of chronic pain status, we included participants who did not endorse chronic pain as a comparison group.

Measures

Pain and Smoking Inventory (PSI)—Items were generated to address each of three conceptually-distinct domains of clinical and empirical interest, including: (1) pain as a motivator of smoking, (2) smoking tobacco to cope with pain, and (3) pain as a barrier to smoking cessation. Participants were asked to rate each statement on a 7-point scale (0 = *not true at all*, 6 = *extremely true*). Given that the PSI was designed for administration in both research and clinical settings, we determined a priori to select the minimum number of items needed to limit patient burden and maximize efficiency (Edwards, 2010). Therefore, principal components analysis (PCA) was used to assist in reducing the number of items (Suhr, 2005). PCA of 54 draft items resulted in a single-factor solution that accounted for 61% of the variance. Given that item-total correlations indicated similar performance across items, three items (the minimum needed for factor identification; Goldberg & Velicer, 2006) deemed by the current investigative team to have the greatest face validity (which can maximize respondent cooperation, motivation, and satisfaction, as well as scientist and practitioner acceptance; Streiner & Norman, 2008) were selected for each domain. In a second PCA, these final nine items (see Table 1) accounted for 71% of the variance and demonstrated excellent internal consistency ($\alpha = .95$). We also observed good to excellent internal consistency for each of the PSI domains, including pain as a motivator of smoking

(α = .84), smoking to cope with pain (α = .87), and pain as a barrier to smoking cessation (α = .95).

Chronic pain status—Chronic pain status was assessed using a single item that has previously been used classify chronic pain status among tobacco smokers (e.g., Ditre, Zale, Kosiba, & Zvolensky, 2013; Toblin, Mack, Perveen, & Paulozzi, 2011). Participants responded (yes/no) to the question: "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 and minor."

Graded Chronic Pain Scale (Von Korff, 2011)—The GCPS is an 8-item measure of pain intensity and interference that has been validated for use in the general population. Pain intensity was assessed with three items (i.e., pain right now, worst pain in the past three months, and pain on average during the past three months) that utilize a numerical rating scale from 0 (*no pain*) to 10 (*pain as bad as could be*). Four separate items were used to assess the number of days in the past three months that pain interfered with daily activities, and the degree to which pain interfered with daily activities, work, and recreational/social activities, respectively (0 = *no interference*; 10 = *unable to carry on any activities*). Items were then summed to yield composite scores representing characteristic pain intensity (α = .88) and interference (α = .98).

McGill Pain Questionnaire-Short Form (Melzack, 1987)—The MPQ-SF is comprised of 15 sensory (e.g., throbbing, sharp) and affective (e.g., sickening, tiring/exhausting) descriptors of pain, which are rated on a scale ranging from 0 (*none*) to 3 (*severe*). The MPQ-SF yields a total pain severity score (α = .92) and two composite scores that represent sensory (α = .89) and affective (α = .86) dimensions of pain.

Pain Catastrophizing Scale (Sullivan, Bishop, & Pivik, 1995)—The PCS is a 13-item measure that assesses the tendency to interpret actual or anticipated pain in an exaggerated manner using a response scale from 0 (*none of the time*) to 4 (*all of the time*). The PCS yields a total score and three subscale scores representing magnification (e.g., I become afraid the pain will get worse), rumination (e.g., I keep thinking about how much it hurts), and helplessness (e.g., there's nothing I can do to reduce the intensity of the pain). The PCS total score (α = .97) and the magnification (α = .89), rumination (α = .93), and helplessness subscales (α = .95) demonstrated good to excellent reliability in the current sample.

Discomfort Intolerance Scale (Schmidt, Richey, & Fitzpatrick, 2006)—The DIS assesses the capacity to tolerate uncomfortable physical sensations, including pain. Participants were asked to rate their agreement (0 = *not at all like me*; 6 = *very much like me*) with five items that measure the intolerance and avoidance of physical discomfort. The DIS demonstrated adequate internal consistency (α = .52).

Pain-related emotional distress—Participants responded to a single item adapted from the Multidimensional Pain Inventory (Kerns, Turk, & Rudy, 1985): "How much emotional

distress do you experience because of your pain?" Response options ranged from 0 (*none*) to 4 (*very severe*).

Fagerstrom Test of Cigarette Dependence (Fagerstrom, 2012)—The FTCD is a widely used and valid 6-item measure of dependence on cigarette smoking. The FTCD yields a maximum total score of 10, with scores of 1–2 indicative of low dependence, 3–4 indicative of mild dependence, 5–7 indicative of moderate dependence, 8–10 indicative of high dependence. Internal consistency in the current sample ($\alpha = .75$) was consistent with previous research that utilized the FTCD (e.g., Richardson & Ratner, 2005), and commensurate with a tendency to observer lower coefficient alpha values when measures contain fewer items (Cronbach, 1951).

Wisconsin Inventory of Smoking Dependence Motives (Piper et al., 2004)—The WISDM is a 68-item, multidimensional measure of cigarette smoking dependence that yields a total score and two composite scores representing core features of cigarette smoking dependence (Primary Dependence Motives; PMD) and instrumental/situational motivators of smoking (Secondary Dependence Motives: SDM). The WISDM total score ($\alpha = .98$) and the PDM ($\alpha = .95$) and SDM ($\alpha = .98$) composite scores demonstrated excellent reliability in the current sample.

Minnesota Withdrawal Scale (Hughes & Hatsukami, 1986)—The MWS was used to assess severity of smoking withdrawal during the most recent quit attempt. Participants rated the extent to which they experienced eight prototypical withdrawal symptoms (e.g. desire to smoke, difficulty concentrating) on a scale from 0 (*none*) to 6 (*severe*) during the last time they tried to quit smoking. The MWS has previously been used to assess withdrawal severity during past quit attempts (Ditre et al., 2016), and demonstrated excellent internal consistency in the current sample ($\alpha = .94$).

Smoking Abstinence Questionnaire-Withdrawal Subscale (Hendricks, Wood, Baker, Delucchi, & Hall, 2011)—The SAQ-W includes seven items that assess expectancies for withdrawal symptoms during a future quit attempt (e.g., I would really crave a cigarette). Participants were asked to rate the likelihood of each item on a scale from 0 (*not likely at all*) to 6 (*extremely likely*). The SAQ-W demonstrated excellent reliability in the current sample ($\alpha = .93$).

Anticipated difficulty quitting—Participants responded to a single item adapted from the Thoughts About Abstinence Scale (Hall, Havassy, & Wasserman, 1990): "Circle a number that best describes how difficult you think it would be for you to quit and remain smoke free." Response options ranged from 0 (*lowest amount of difficulty*) to 9 (*highest amount of difficulty*).

Sociodemographic and Smoking History—Participants self-reported their age, gender (male, female), race/ethnicity (White, Black/African American, Asian, Other), marital status (single, married, divorced), highest education completed (did not graduate high school, graduated high school, some college, technical/associates degree, four years of college, some school beyond college, professional degree), and annual household income

(<25,000, 25,000–50,000, >50,000). Participants also reported the number of cigarettes they were currently smoking per day, the number of years they had been smoking daily, and the number of times they had made a serious attempt to quit smoking.

Data analysis

We first utilized chi-square analyses and bivariate correlations to determine whether participants with vs. without chronic pain differed on sociodemographic measures. Given that participants with chronic pain were more likely to be female (p < .01), gender was retained as a covariate in all analyses that tested differences in pain and smoking expectancies as a function of chronic pain status. We utilized separate ANCOVA models to test the hypothesis that smokers with chronic pain would evince greater PSI scores. The chronic pain status*gender interaction was not significantly associated with the PSI total score or domain scores (ps = .35–.91), so gender was retained as a covariate and the interaction term was dropped from the models. We then examined relations between PSI scores and each of our pain and smoking measures. Bivariate correlations were computed to test the hypotheses that PSI scores would be positively associated with indices of pain (i.e., pain intensity/disability, pain severity, pain catastrophizing, discomfort intolerance, and pain-related emotional distress) and smoking (i.e., cigarette smoking dependence, smoking motives, withdrawal severity, expectancies for nicotine withdrawal, and anticipated difficulty quitting). All analyses used a cut-off score of p < .05 for determining statistical significance.

Results

Sample characteristics

The current sample had a mean age of 30 years (SD = 7.54) and gender was evenly distributed (51% female). Respondents were predominantly Caucasian (91%), and more than one third (38.6%) had completed a four-year degree or higher. Smokers reported consuming an average of 15 cigarettes per day (SD = 11.60), and daily smoking for approximately 11 years (SD = 7.96). Those with chronic pain (n = 57) reported an average pain duration of 4 years (SD = 1.59), with a current pain intensity (M = 4.95, SD = 2.47) that can be characterized as clinically-significant (i.e., > 4/10; Hartrick, Kovan, & Shapiro, 2003), while participants without chronic pain reported a significantly lower current pain intensity (M = 1.32, SD = .58, p < .001). Approximately 72% of the chronic pain sub-sample endorsed current use of prescription pain medications (complete sample characteristics are presented in Table 2).

PSI scores as a function of chronic pain status

As hypothesized, ANCOVA results indicated that smokers with chronic pain scored higher on the PSI (M = 3.20; SE = 0.21) than smokers without chronic pain (M = 1.62; SE = 0.39), $F(1,72)$ = 11.99, p = .001, η_p^2 = .14. Similar results were observed for each PSI domain, such that smokers with chronic pain (vs. no chronic pain) scored higher on items assessing pain as a motivator of smoking (M = 3.44, SE = 0.23 vs. M = 1.99, SE = 0.43; $F(1,72)$ = 8.61, p = .004; η_p^2 = .11), the use of smoking to cope with pain (M = 3.42, SE = 0.23 vs. M = 2.01, SE = 0.42; $F(1,72)$ = 7.56, p = .008, η_p^2 = .10), and pain as a barrier to quitting (M = 2.75, SE = 0.24 vs. M = 0.80, SE = 0.43; $F(1,72)$ = 15.12, p < .001, η_p^2 = .17).

Associations between PSI scores and pain measures

Consistent with expectations, PSI total scores were positively associated with pain intensity, interference with functioning, and the severity of both sensory and affective components of the pain experience (all ps < .01). Smokers who scored higher on the PSI also endorsed greater levels of pain catastrophizing and discomfort intolerance, and reported greater levels of pain-related emotional distress (all ps < .01). A similar pattern of results was observed for each of the PSI domain scores (correlations between the PSI and each pain-relevant measure are presented in Table 3).

Associations between PSI scores and smoking measures

Also consistent with expectations, we observed significant positive correlations between PSI scores and several indices of cigarette smoking dependence, including the FTCD (p < .05) and WISDM total/composite scores (all ps < .001). Smokers who scored higher on the PSI also reported having experienced more severe nicotine withdrawal during their most recent quit attempt (MNWS; p < .01), and that they anticipate greater difficulty quitting during future cessation attempts (p < .01). A similar pattern of results was observed for each of the PSI domain scores (see Table 3).

Discussion

The goal of this study was to pilot test a brief, standardized measure of perceived pain and smoking interrelations across three domains of interest (i.e., pain as a motivator of smoking, the use of tobacco to cope with pain, and pain as a barrier to smoking cessation). The nine-item PSI demonstrated excellent internal consistency, and the individual items were observed to be moderately to highly correlated (all rs between .484 – .885). Although an initial PCA indicated that the PSI was largely unidimensional, the three domains of interest are theoretically and conceptually distinct and present unique opportunities for clinical application. Across the three domains, we observed the greatest empirical distinction for pain as a barrier to smoking cessation, with the three items that were selected a priori to represent this domain evincing the greatest correlations with one another (all rs > .828). We also observed good internal consistency among each of the individual PSI domains. Collectively, these data are consistent with qualitative evidence that smokers can effectively communicate their perceptions of interrelations between their pain and tobacco smoking behavior (Hooten et al., 2011; Patterson et al., 2012), and suggest that the PSI may be a useful tool in the standardized assessment of how tobacco smokers perceive their pain and smoking behavior to be interrelated.

Consistent with expectations, PSI scores differed as a function of chronic pain status, such that smokers with chronic pain evinced mean PSI total scores approximately twice those of smokers with no chronic pain. Examination of mean PSI domain scores further revealed that smokers with chronic pain endorsed "pain as a barrier to quitting" at a rate nearly 3.5 times that of smokers with no chronic pain. Taken together, these findings suggest that perceptions of pain and smoking interrelations may be more salient among smokers with chronic pain. Indeed, smokers who live with persistently painful conditions would likely encounter a greater number of occasions to experience pain as a proximal antecedent of smoking (e.g.,

Dhingra et al., 2013), use tobacco to cope with painful episodes (Hooten et al., 2011; Patterson et al., 2012), or identify pain as a barrier to smoking cessation (Ditre et al., 2016; Ditre et al., 2015; Hooten et al., 2011; Zale et al., 2014).

Also consistent with expectations, PSI scores were found to be positively associated with established indices of both pain and cigarette smoking dependence. For example, PSI total and domain scores were positively correlated with ratings of pain intensity, disability, catastrophizing, discomfort intolerance, and pain-related emotional distress, with correlation coefficients that may be classified as moderate to large in magnitude (Cohen, 1988). Again, these findings suggest that perceptions of pain and smoking interrelations may be especially relevant among smokers who endorse more severe pain/functional impairment, and those who tend to either avoid uncomfortable physical sensations or interpret their pain in an exaggerated manner. PSI total and domain scores were also moderately positively correlated with measures of cigarette smoking dependence, severity of nicotine withdrawal experienced during a recent quit attempt, and anticipated difficulty quitting during future cessation attempts. Interestingly, the strongest correlations were observed between PSI scores and the WISDM Secondary Dependence Motives scale (Piper et al., 2008), which assesses instrumental or situational motivation for smoking. This finding is consistent with previous suggestions that pain and pain-related cognitive/affective factors may operate as a situational motivators of smoking behavior (Ditre et al., 2013), and supports the notion that clinical interventions for smokers in pain should address pain addressed as a proximal antecedent or high-risk situation for smoking.

Strengths of the current study include the utilization of a theoretical model of pain and smoking to inform item selection, comparisons of smokers with and without chronic pain, and administration of reliable and valid measures of both pain and tobacco smoking. Limitations include the modest sample size, which may have limited power to detect effects that were small-to-medium in magnitude, selection of items deemed to have the greatest face validity, and inability to biochemically verify smoking status. The fact that our sample was predominantly White and that the vast majority had achieved a level of education beyond a high school degree could limit generalizability of our findings. Despite these limitations, demonstrated associations were generally robust and consistent with study hypotheses.

This pilot study provides initial support for the PSI as a standardized measure of perceived interrelations between the experience of pain and smoking behavior. Although these data indicate that the PSI is a unidimensional measure in which all items perform in a similar manner, there are important theoretical and conceptual distinctions to be made between pain as a situational motivator of smoking behavior and the extent to which co-occurring pain may be viewed as a barrier to smoking cessation. Future work should examine the PSI factor structure (i.e., via factor analysis) among larger, more diverse samples of smokers with varying levels of acute and chronic pain, including samples seeking pain treatment. Future research is also needed to determine whether PSI scores have utility in the prediction of smoking cessation outcomes, including withdrawal severity and relapse rates/trajectories. Given evidence of nicotine-opioid interactions (Shi, Weingarten, Mantilla, Hooten, & Warner, 2010), future research should also investigate associations between the PSI and use of prescription opioids. Finally, future work should examine whether PSI data can inform

the development of tailored interventions for smokers in pain. For example, components of existing evidence-based smoking interventions identify and address both perceived barriers to smoking cessation and proximal antecedents, or high risk "trigger" situations, for smoking (Abrams et al., 2011; Fiore et al., 2008; Perkins, Conklin, & Levine, 2008). Scores on the PSI barrier and motivation domains could inform tailored application of these treatment components for smokers in pain. It is also possible that individuals who endorse the use of smoking to cope with pain may benefit from treatments that address more adaptive approaches to pain management prior to engaging a cessation attempt.

Acknowledgments

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Table 1

PSI item-total correlations, inter-item correlations, and scoring instructions

PSI Item	Item-Total Correlation	PSI Item								
		1	2	3	4	5	6	7	8	9
1. Smoking helps me cope with my pain	.835	–	.683	.802	.676	.724	.719	.679	.648	.668
2. The number of cigarettes I smoke per day is often influenced by my pain	.615		–	.736	.659	.742	.588	.484	.630	.680
3. When my pain flares up I want to have a cigarette	.756			–	.639	.726	.665	.736	.568	.649
4. My pain makes me less confident that I could stop smoking for good	.857				–	.612	.866	.547	.885	.692
5. Smoking a cigarette helps me think about something other than my pain	.683					–	.622	.742	.602	.686
6. My pain would interfere with any attempt I make to quit smoking	.800						–	.588	.828	.711
7. Feeling pain makes me want to smoke	.743							–	.630	.680
8. My pain prevents me from trying to quit smoking	.819								–	.599
9. Smoking helps me cope with the stress and unhappiness that comes with pain	.693									–

Note. All *p*s < .001; Instructions to participants: Below are a series of statements about ways that pain may be related to cigarette smoking. Please rate your level of agreement for each using the following scale: 0 (not true at all, 1, 2, 3 (somewhat true), 4, 5, 6 (extremely true). The total score for the PSI is the average of all items. Domain subscales are scored as the average of all items within each domain (Pain as a motivator of smoking: Items 2, 3, 7; Smoking for pain coping: Items 1, 5, 9; Pain as a barrier to quitting: Items 4, 6, 8). Responses on all items ranged from 0–6. N = 75.

Table 2

Sociodemographic characteristics by chronic pain status

Participant Characteristics	Chronic Pain ($N = 57$)	No Chronic Pain ($N = 18$)	Total Sample ($N = 75$)
	n (%)	n (%)	n (%)
Gender [*]			
Male	23 (40.4%)	14 (77.8%)	37 (49.3%)
Female	34 (59.6%)	4 (22.2%)	38 (50.7%)
Race/Ethnicity			
White	54 (94.7%)	14 (77.8%)	68 (90.7%)
Black/African American	2 (3.5%)	1 (5.6%)	3 (4.0%)
Asian	1 (1.8%)	2 (11.1%)	3 (4.0%)
Other	0 (0.0%)	1 (5.6%)	1 (1.3%)
Marital status			
Single	32 (56.1%)	12 (66.7%)	44 (58.7%)
Married	20 (35.1%)	6 (33.3%)	26 (34.7%)
Divorced	5 (8.8%)	0 (0.0%)	5 (6.7%)
Education			
Did not graduate high school	1 (1.8%)	0 (0.0%)	1 (1.3%)
Graduated high school	4 (7.0%)	1 (5.6%)	5 (6.7%)
Some college	22 (38.6%)	8 (44.4%)	30 (40%)
Technical/Associates degree	7 (12.3%)	3 (16.7%)	10 (13.3%)
Four years of college	15 (26.3%)	4 (22.2%)	19 (25.3%)
Some school beyond college	6 (10.5%)	1 (5.6%)	7 (9.3%)
Professional degree	2 (3.5%)	1 (5.6%)	3 (4.0%)
Household income			
<25,000	23 (40.3%)	6 (33.3%)	29 (38.6%)
25,000–50,000	16 (28.1%)	4 (22.2%)	20 (26.7%)
>50,000	18 (31.6%)	8 (44.4%)	26 (34.7%)
	M (SD, Range)	M (SD, Range)	M (SD, Range)
Age	29.44 (7.40, 19–59)	30.11 (8.17, 19–50)	29.60 (7.54, 19–59)
Cigarettes per day	15.11 (12.89, 5–100)	12.44 (5.80, 5–25)	14.67 (11.60, 5–100)
FTCD	3.54 (2.30, 1–9)	3.17 (2.90, 1–8)	3.45 (2.45, 1–9)
Number of quit attempts	5.79 (8.02, 0–40)	6.33 (6.67, 0–25)	5.96 (7.57, 0–40)
Years daily smoking	10.99 (8.01, 1–41)	10.06 (7.90, 1–32)	10.77 (7.96, 1–41)

Note.

[*] $p < .01$. FTCD = Fagerström Test for Cigarette Dependence. $N = 75$.

Table 3

Correlations between the PSI and pain- and smoking-related variables

	Mean (SD, Range)	PSI			
		Total	**Coping**	**Motivator**	**Barrier**
Pain-Related Measures					
Graded Chronic Pain Scale					
Pain Intensity	15.49 (6.99, 3–28)	.51***	.44***	.44***	.55***
Disability	14.47 (11.17, 2–40)	.50***	.47***	.42***	.51***
McGill Pain Questionnaire – Short Form					
Total	14.95 (10.64, 0–45)	.50***	.43***	.43***	.52***
Sensory Index	7.87 (11.67, 0–33)	.47***	.41***	.41***	.51***
Affective Index	3.23 (3.23, 0–12)	.49***	.44***	.43***	.50***
Discomfort Intolerance Scale	13.95 (5.31, 3–29)	.31**	.19	.27*	.38**
Pain Catastrophizing Scale					
Total	19.65 (15.57, 0–52)	.48***	.43***	.42***	.47***
Rumination Subscale	7.08 (5.12, 0–16)	.48***	.43***	.45***	.45***
Helplessness Subscale	8.00 (7.17, 0–24)	.46***	.41***	.40***	.48***
Magnification Subscale	4.57 (3.87, 0–12)	.42***	.39**	.36**	.42***
Pain-Related Emotional Distress	1.39 (1.17, 0–4)	.34**	.30**	.29*	.36**
Smoking-Related Measures					
Fagerström Test for Cigarette Dependence	3.45 (2.45, 1–9)	.25*	.25*	.23*	.22†
Anticipated Difficulty Quitting	6.60 (2.77, 0–9)	.31**	.33**	.29*	.25*
Smoking Abstinence	3.79 (1.10, 0–5)	.33**	.41***	.32**	.19
Questionnaire–Withdrawal Wisconsin Inventory of Smoking Dependence Motives					
Total	44.40 (17.25, 0–74)	.66***	.67***	.59***	.59***
Primary Dependence Motives	3.45 (1.14, 0–6)	.51***	.53***	.46***	.44***
Secondary Dependence Motives	3.40 (1.37, 0–5.81)	.69***	.69***	.61***	.63***

	Mean (SD, Range)	PSI			
		Total	Coping	Motivator	Barrier
Minnesota Nicotine Withdrawal Scale	27.16 (14.61, 0–48)	.38[**]	.43[***]	.32[**]	.32[**]

Note.

[*]
p < .05;

[**]
p < .01;

[***]
p < .001;

[†]
p = .053; Coping = Smoking for pain coping; Motivator = Pain as a motivator of smoking; Barrier = Pain as a barrier to smoking cessation. PSI Total Score M = 2.82 (SD = 1.71, R = 0–5.78); PSI Coping M = 3.10 (SD = 1.77, R = 0–6); PSI Motivator M = 3.10 (SD = 1.81, R = 0–6); PSI Barrier M = 2.28 (SD = 1.92, R = 0–6), N = 75.