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Differential Effect of Sex on Pain Severity and Smoking Behavior and Processes

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Abstract

Scientific evidence suggests that pain contributes to the maintenance of tobacco cigarette smoking among individuals with varying levels of pain. Yet, little is understood about factors that may moderate relations between pain severity and smoking processes. Considering that women are more likely to experience deleterious pain- and smoking-related outcomes, female smokers may be a particularly vulnerable group when considering pain in the maintenance of maladaptive smoking behavior. Thus, it is important to investigate the role of sex in pain-smoking relations. The current cross-sectional study examined sex differences in the relation between reported levels of pain and cessation-relevant smoking processes (i.e. cigarette dependence, barriers for cessation, and past cessation-related problems). Participants included 100 adult daily cigarette smokers ($M_{\text{age}} = 32.57$ years, $SD = 13.58$; 33% female). Results indicated that greater pain was significantly associated with greater cigarette dependence, greater perceived barriers to cessation, and greater cessation-related problems among female, but not male, smokers. The current findings identify sex as a potentially important moderator of complex associations between pain and tobacco smoking and suggests that women may constitute a group that is especially vulnerable to the effects of pain in the maintenance of tobacco dependence. Based on the present data, integrated pain-smoking treatments may be especially useful for female, versus male, smokers.

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Keywords

Pain; Sex; Nicotine; Smoking; Cigarettes

1. Introduction

Cigarette smoking remains the leading cause of preventable death and disability in United States and worldwide (US Department of Health and Human Services [USDHHS], 2014). Smoking is associated with a variety of health conditions characterized by physical discomfort and impairment, including various cancers (e.g., lung, liver, colorectal, breast), cardiovascular disease, Type 2 diabetes, rheumatoid arthritis, and respiratory diseases, such as chronic obstructive pulmonary disease and tuberculosis (Centers for Disease Control and Prevention [CDC], 2016; Nahin, 2015; USDHHS, 2014). Thus, of increasing interest among policy makers and practitioners is the influence of pain on tobacco cigarette smoking (Ditre, Brandon, Zale, & Meagher, 2011; Hooten et al., 2011). Compared to the general population, cigarette smoking is significantly more prevalent among individuals with chronic pain, and chronic pain contributes to greater levels of nicotine dependence and number of cigarettes smoked per day (Zvolensky, McMillan, Gonzalez, & Asmundson, 2009). Moreover, the experience of pain may interfere with quit success via lower confidence in ability to quit and greater difficulty quitting across smokers who experience both chronic and non-chronic pain (Ditre, Kosiba, Zale, Zvolensky, & Maisto, 2016; Zale & Ditre, 2014; Zale, Ditre, Dorfman, Heckman, & Brandon, 2014). Indeed, observed relations between pain and smoking are not restricted to smokers with *chronic* pain but also generalize to smokers with varying levels of pain (Abrams, Carleton, & Asmundson, 2007; LaRowe, Langdon, Zvolensky, Zale, & Ditre, 2017; Smit et al., 2019; Zale et al., 2014).

Proposed theoretical models posit that the pain-smoking association is not limited to a uni-directional pathway (Ditre et al., 2011; Zale, Maisto, & Ditre, 2016). Pain has been shown to motivate smoking (Ditre & Brandon, 2008; Parkerson & Asmundson, 2016) and pain patients endorse the use of cigarettes to cope with pain (Hooten et al., 2011; Patterson et al., 2012). Indeed, smokers may use cigarettes to manage pain in part due to the analgesic effects of nicotine (Ditre, Heckman, Zale, Kosiba, & Maisto, 2016; Jones & Dunlop, 2007). Conversely, cigarette smoking has been implicated in the onset and exacerbation of painful conditions, including chronic low back pain and rheumatoid arthritis (Shiri, Karppinen, Leino-Arjas, Solovieva, & Viikari-Juntura, 2010; Sugiyama et al., 2009; USDHHS, 2014). Thus, pain and smoking appear to relate in a dynamic feedback loop wherein each maintains and exacerbates the other. Although smoking contributes to the experience of pain, considering the importance of identifying factors that contribute to smoking from a public health perspective (CDC, 2016; USDHHS, 2014), it is equally important to examine the effect of pain in maintaining smoking behavior.

Despite the well-documented association between pain and smoking, little is known about potential moderators of these relations. Elucidating such factors has the potential to inform more personalized, tailored, and effective treatments (Kraemer, Frank, & Kupfer, 2006; Kraemer, Wilson, Fairburn, & Agras, 2002). Sex is one factor that may serve as a potential

moderator in pain-smoking relations. With regard to pain, women tend to report pain with greater frequency (Keefe et al., 2000; Keogh & Herdenfeldt, 2002), perceive pain as being more severe (Bartley & Fillingim, 2013; Paller, Campbell, Edwards, & Dobs, 2009), and are more likely to pursue treatment for a variety of painful conditions, relative to men (Paller et al., 2009). Women also are more inclined to develop painful health conditions, and are overall more sensitive to pain than are men (Fillingim, King, Ribeiro-Dasilva, Rahim-Williams, & Riley, 2009; Gerdle et al., 2008).

With regard to smoking, women are at a greater risk of experiencing psychological effects of chronic smoking (USDHHS, 2014), and hold more maladaptive beliefs about smoking, including that smoking will reduce negative affect (Aguirre et al., 2016; Garey et al., 2018; Pang, Zvolensky, Schmidt, & Leventhal, 2015). Prior work also has documented that women tend to endorse greater cigarette dependence, greater perceived barriers of quitting smoking, and more cessation-related problems (Garey, Farris, Schmidt, & Zvolensky, 2016; Robles et al., 2016; Zvolensky, Farris, Schmidt, & Smits, 2014), all of which have been related to poorer smoking cessation outcomes (Garey et al., 2017; Heatherton, Kozlowski, Frecker, & Fagerström, 1991; Zvolensky, Johnson, Leyro, Hogan, & Tursi, 2009). Considering that women endorse stronger beliefs that smoking can serve as a coping tool for negative experiences (Aguirre et al., 2016; Pang et al., 2015), it is possible that women also hold stronger perceptions regarding benefits of smoking in relation to pain. This conceptualization is largely consistent with negative reinforcement models of addiction motivation (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004).

The use of cigarettes in response to pain could lead to worse clinically-relevant smoking behaviors and processes, including more severe cigarette dependence, greater perceived barriers to cessation, and more reported problems when attempting to quit. Such processes may be particularly relevant when examining sex differences in pain-smoking relations, given that they represent a continuum of behavior and processes that can maintain tobacco use and impede cessation (Heatherton et al., 1991; Zvolensky, Johnson, et al., 2009). Considering that women appear to be more prone to adverse pain and smoking experiences (Bartley & Fillingim, 2013; Syamlal, Mazurek, & Dube, 2014), female smokers may represent a particularly vulnerable group when considering pain in the maintenance of tobacco dependence. Although numerous biopsychosocial factors have been identified to explain sex differences in pain experience/perception (Fillingim et al., 2009; Paller et al., 2009) and smoking behavior/processes (Aguirre et al., 2016; Pang et al., 2015; Smith, Bessette, Weinberger, Sheffer, & McKee, 2016), no previous work has evaluated sex as a moderator of the effect of pain on smoking.

The goal of the current project was to examine how relations between reported levels of pain and cessation-related smoking factors (i.e. cigarette dependence, perceived barriers to quitting, and past cessation-related problems) differs as a function of sex. Based on previous research, we hypothesized main effects of sex and pain experiences for each dependent variable, such that female smokers will report greater cigarette dependence, perceive more barriers to quitting smoking, and report more problems during quit attempts, relative to male smokers, and that greater pain will be positively associated with all dependent measures. Additionally, we hypothesized that there would be a significant interaction such that pain

would be related to an increase in cigarette dependence, barriers for cessation, and past cessation-related problems among women, but not men.

2. Methods

2.1 Participants

Participants included 100 adult daily smokers ($M_{\text{age}} = 32.57$ years, $SD = 13.58$; 33% female) recruited from communities in Burlington, Vermont and Houston, Texas to participate in a study examining smoking cessation processes. Inclusion criteria for the current study were: (1) being between 18 and 65 years of age; (2) being interested in making a serious, unaided, quit attempt; and (3) smoking a minimum of 5 cigarettes per day for at least one year. Participants were excluded based on the following criteria: (1) pregnancy or the possibility of being pregnant (by self-report); (2) current use of nicotine replacement therapy and/or smoking cessation counseling; (3) current or history of psychotic-spectrum symptoms or disorders; or (4) current suicidality. We did not exclude participants based on their use of electronic nicotine delivery devices. The racial/ethnic distribution of this sample was 84.0% White/Caucasian; 7.0% Black/Non-Hispanic; 2.0% Hispanic; 1.0% Asian; 1.0% American Indian/Alaska Native; 4.0% Multi-racial; and 3.0% 'Others'. On average, participants reported smoking 16.9 cigarettes per day ($SD = 10.47$), smoking their first cigarette at 17.3 years of age ($SD = 3.43$), reported being a daily smoker for an average of 15.1 years ($SD = 13.55$), and 87% reported a previous attempt to quit smoking. Additionally, 23% of participants reported having no pain, 58% reported having very mild to mild pain, and 19% of participants reported having moderate to severe pain.

2.2 Measures

Demographics.—Demographic information included sex, age, and race. Sex was the moderator in each model.

Short Form Health Survey – 20 (SF-20).—The SF-20 (Stewart, Hays, & Ware, 1988) is a 20 item self-report measure of general mental and physical health. Consistent with previous research, a single item was used to assess the presence of past-month bodily pain (i.e., “How much bodily pain have you had during the past four weeks” (Ditre, Langdon, Kosiba, Zale, & Zvolensky, 2015; LaRowe et al., 2017; Zvolensky et al., 2009). Response options ranged from 1 (*None*) to 5 (*Severe*). Additionally, a single item was also used to assess reported overall health (i.e. “In general, would you say your health is:”). Response options for this item ranged from 1 (*Excellent*) to 5 (*Poor*).

Fagerström Test for Cigarette Dependence (FTCD).—The FTCD (Heatherton et al., 1991) is a six-item assessment of cigarette dependence. Total scale scores range from 0 to 10, with higher scores reflecting high levels of physiological tobacco dependence on nicotine. Consistent with previous work (Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994), the internal consistency for the FTCD was low in the present sample (Cronbach's $\alpha = .62$).

Barriers to Cessation Scale (BCS).—The BCS (Macnee & Talsma, 1995) is a 19-item self-report assessment of perceived barriers to or stressors resulting from smoking cessation (e.g., “Feeling less in control of your moods”). Responses are provided on a 4-point Likert scale ranging from *not a barrier* (0) to *large barrier* (3). The BCS has three subscales as originally developed: Addictive Barriers, External Barriers, and Internal Barriers. The BCS has demonstrated strong psychometric properties in a sample of treatment seeking smokers (Garey et al., 2017). The BCS total score was utilized in the present study (Cronbach’s $\alpha = .87$).

Smoking History Questionnaire (SHQ).—The SHQ is a self-report questionnaire used to assess smoking history (e.g., onset of regular daily smoking), pattern (e.g., number of cigarettes consumed per day), and problematic symptoms experienced during past quit attempts (e.g., weight gain, nausea, irritability, and anxiety; Brown, Lejuez, Kahler, & Strong, 2002). As is in past work (Robles et al., 2016) a mean composite score of severity of problem symptoms experienced during past quit attempts was derived from this measure. Specifically, this measure includes 17 items such as “While trying to quit, how serious have each of the following problems been for you?”. Items were rated on a Likert-type scale ranging from 1 (*not at all*) to 5 (*extremely*). The mean severity rating of assessed items served as an indicator of past cessation-related problem. The SHQ was also employed to describe the sample smoking history.

2.3 Procedure

Adult daily smokers were recruited from the community to participate in a self-guided quit study examining barriers to successful smoking cessation (Langdon, Farris, Hogan, Grover, & Zvolensky, 2016; Langdon, Farris, Øverup, & Zvolensky, 2016). Interested participants were scheduled for an in-person baseline assessment to determine study eligibility. Following written informed consent, participants completed a clinical interview to assess presence of a DSM IV Axis I Disorder as well as a computerized self-report battery of questionnaires. Participants were compensated \$20 for participating in the baseline assessment, regardless of study eligibility. The current study is based on baseline (pre-cessation) data for a sub-set of the sample, which was selected based on available data on all studied variables. The study protocol was approved by the University of Vermont and University of Houston Institutional Review Board.

2.4 Analytic Strategy

Analyses were conducted using SPSS version 24. First, sample descriptive statistics and zero-order correlations among study variables were examined. Point-biserial correlations were used for sex and Pearson’s correlations were employed for all other relations. Second, to evaluate main and interactive effects of reported pain and sex, three separate hierarchical regression analyses were conducted among dependent variables: cigarette dependence, perceived barriers for quitting, and past cessation-related problems. Covariates were entered in the first step of each model and included age and overall health; cigarette dependence also was included as a covariate in models where it was not the outcome (i.e., perceived barriers to quitting and past cessation-related problems). Pain and sex were then simultaneously entered in the second step of each model. Finally, the interaction of reported pain and sex

was added in the third step. Planned post-hoc simple slope analyses were conducted using the PROCESS macro (Hayes, 2013) to examine associations between reported pain and the three dependent variables across sex (0 = male; 1 = female). Squared semi-partial correlations (sr^2) were used as measures of effect size.

3. Results

3.1 Descriptive Statistics

Pearson's and point-biserial correlations are presented in Table 1. Reported pain correlated significantly and positively with past cessation-related problems ($r = .30$; $p < .001$). Sex was significantly and positively associated with barriers to cessation and past cessation-related problems (r 's from .26 to .34; p 's $< .05$).

3.2 Primary Analyses

In predicting cigarette dependence, covariates entered in the first step accounted for significant variance ($F[2, 97] = 7.10$, $p = .001$, $R^2 = .13$; see Table 2). Age ($b = .05$, $SE = .02$, $t = 3.06$, $p = .003$) was a significant predictor. Step two was not significant ($R^2 = .0004$, $p = 0.98$). Step three was significant ($R^2 = .08$, $p = .003$). As expected, there was a significant interaction ($b = 1.18$, $SE = .39$, $t = 3.07$, $p = .003$), such that pain was related to greater cigarette dependence among women ($b = .78$, $SE = .31$, $t = 2.50$, $p = .01$), but not men ($b = -.40$, $SE = .24$, $t = -1.64$, $p = .10$; See Figure 1a). The effect size of the interaction accounted for 8% of variance.

For perceived barriers for cessation, covariates entered in the first step did not account for significant variance ($F[3, 96] = .63$, $p = .60$, $R^2 = .02$; see Table 2). The addition of sex and reported pain in step two was significant ($R^2 = .07$, $p = .03$). Additionally, a significant main effect emerged for sex ($b = 5.34$, $SE = 2.15$, $t = 2.48$, $p = .02$). Step three was also significant ($R^2 = .07$, $p = .01$). As hypothesized, the interactive effect of pain and sex was significant ($b = 5.50$, $SE = 1.93$, $t = 2.85$, $p = .01$), such that pain was related to greater perceived barriers for quitting among women ($b = 4.51$, $SE = 1.54$, $t = 2.92$, $p = .004$), but not men ($b = -.98$, $SE = 1.18$, $t = -.84$, $p = .41$; See Figure 1b). The effect size of the interaction accounted for 7% of variance.

Regarding past cessation-related problems, the first step was not significant ($F[3, 96] = .70$, $p = .60$, $R^2 = .02$; see Table 2). Step two was significant ($F[2, 94] = 4.48$, $p < .001$). Additionally, significant main effects emerged for pain ($b = 2.83$, $SE = 1.07$, $t = 2.64$, $p = .01$) and sex ($b = 8.10$, $SE = 2.36$, $t = 3.44$, $p = .001$). Step three was also significant ($R^2 = .06$, $p = .01$). As predicted, there was a significant interaction effect ($b = 5.97$, $SE = 2.12$, $t = 2.82$, $p = .01$), such that pain was related to past cessation-related problems among women ($b = 6.61$, $SE = 1.70$, $t = 3.90$, $p < .001$), but not men ($b = .64$, $SE = 1.30$, $t = .50$, $p = .62$; See Figure 1c). The effect size of the interaction accounted for 6% of variance.

4. Discussion

The current study aimed to examine how relations between reported levels of pain and cessation-related smoking factors (i.e. cigarette dependence, perceived barriers to quitting,

and past cessation-related problems) differ as a function of sex. Consistent with prediction, greater pain was significantly associated with greater cigarette dependence, greater perceived barriers to cessation, and greater cessation-related problems among female (but not male) smokers. The effect size of the observed interactions across the models, which ranged from 6% to 8% of variance accounted for, was relatively large for interaction terms (Abelson, 1985; Borenstein, 1998). The significant interaction for each dependent variable was evident over and above the main effects of sex and pain, as well as theoretically-relevant covariates of age, overall health, and cigarette dependence in models of perceived barriers to quitting and past cessation-related problems.

Extending prior work on pain and smoking (Shiri et al., 2010; Zale et al., 2014; Zvolensky, Johnson, et al., 2009), these results provide preliminary evidence for potentially substantive sex differences in the relation between pain and smoking behavior and processes. Based on these findings, it is possible that women may be more inclined to smoke to manage their pain experiences. This pattern of behavior may result, in part, because of stronger held beliefs about the efficacy for smoking to relieve negative affective or physical states (Aguirre et al., 2016; Pang et al., 2015). For example, it is possible that women are more sensitive to the antinociceptive effects of nicotine than men, which would increase their susceptibility to use cigarettes as pain experiences increase. This susceptibility strengthen and reinforce associations between pain experiences and smoking, and complicate quitting. Future work should investigate the differential role of sex in the effects of pain on smoking behavior and cessation-relevant processes, including lapse and relapse, perhaps via smoking-related outcome expectancies (Ditre, Zale, Heckman, & Hendricks, 2017). It is also important to examine other factors (e.g. concerns about weight gain) that may contribute to difficulty quitting among female but not male smokers and their precise function in sex-specific theoretical models for substance use.

Several additional observations warrant comment. Of note, the main effect of sex that emerged in the second step of the regression models was significantly related to perceived barriers for cessation and past-cessation related problems, but not cigarette dependence. Because the observed pain-smoking relations were nonsignificant across male participants in the sample, women are likely the driving force of these observations in this step of the analysis. Indeed, the effect size of pain on studied outcomes accounted for 0.1% to 3% of variance for men, but 10% to 26% of variance for women. Finally, despite not targeting pain patients, more than three-fourths (77%) of the current sample reported experiencing at least some pain in the past month. This finding further contributes to data suggesting that tobacco cigarette smokers may be inherently more vulnerable to experiencing pain (Shiri et al., 2010; Sugiyama et al., 2009; USDHHS, 2014). Given that smokers are at greater risk for developing and maintaining painful health conditions (Fillingim et al., 2009; Gerdle et al., 2008) and that women are at greater risk for maladaptive smoking behavior, women who experience pain may be especially vulnerable to the effects of pain in the maintenance of tobacco addiction.

Clinically, these findings provide empirical evidence that women who experience greater pain also report more severe smoking behavior and maladaptive cessation processes that may interfere with quitting. There has been an emerging global emphasis on the

development of specialized treatments across sex (Garey et al., 2018; Smith et al., 2015). These data suggest that women may especially benefit from integrated pain-smoking treatments. Although integrated programs have been successfully employed to manage pain in the context of substance use (Currie, Hodgins, Crabtree, Jacobi, & Armstrong, 2003), these integrated treatments have not yet been applied to comorbid pain and tobacco smoking. Considering that smoking serves to distract from pain, and that smoking has been identified as a strategy for managing pain-related emotional distress (Hooten et al., 2011), it is important to develop integrated smoking cessation treatments that also address pain cognitions (e.g., beliefs that pain is effectively managed via smoking).

Several limitations to this study should be noted. First, the cross-sectional study design limits conclusions that can be drawn regarding the directionality of the observed relations. Future work should evaluate sex differences on pain and smoking processes using experimental or longitudinal methods to provide stronger evidence for this pattern of findings. Second, the sample size ($N = 100$) was relatively small, and only one third (33%) of our sample was female. Although we still detected significant interactions despite the small sample size, replication of this study is needed with a larger sample that is balanced by sex to strengthen the observed findings. Third, data for this study was collected via self-report. Although past work examining pain-smoking processes has also used self-report as the primary assessment methodology (Ditre et al., 2017; LaRowe et al., 2017; Parkerson & Asmundson, 2016), future work would benefit from using multiple assessment methods, such as implicit testing or interviewing. Fourth, although use of a single item to assess pain is consistent with past work (Ditre et al., 2015; LaRowe et al., 2017; Zvolensky, Johnson, et al., 2009), future research should employ assessment of multiple dimensions of pain (e.g., interference; Von Korff, Ormel, Keefe, & Dworkin, 1992).

Overall, the present report identifies sex as a potentially important moderator of associations between pain and tobacco cigarette smoking and suggests that women may constitute a group that is especially vulnerable to the effects of pain in the maintenance of tobacco dependence. Future work is needed to explore the extent to which men and women differ to further inform work on pain and the maintenance of tobacco dependence.

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Highlights

- We examined the differential effect of sex on pain severity and smoking processes
- Sex moderated the relation between pain severity and smoking processes
- Pain and smoking processes were related among female, but not male, smokers
- Women are a vulnerable group to the effect of pain on maladaptive smoking behavior

Figure 1a.
Interaction of Pain Severity and Sex on Cigarette Dependence.

Figure 1b.
Interaction of Pain Severity and Sex on Barriers of Cessation.

Figure 1c.
Interaction of Pain Severity and Sex on Past Cessation-Related Problems.

Table 1.

Descriptive statistics and correlations among variables

	Mean/ <i>n</i>	SD/%	1.	2.	3.	4.	5.	6.	7.
1. Sex (% female)	33	33	-						
2. Age	32.57	13.58	-.003	-					
3. Overall Health	2.77	0.71	.08	.14	-				
4. Reported Pain	2.38	1.10	.09	.22 [*]	.28 ^{**}	-			
5. FTCD	5.06	2.22	.0002	.32 ^{**}	.21 [*]	.13	-		
6. BCS	26.58	10.29	.26 [*]	.08	.08	.15	.12	-	
7. Cessation-related Problems	34.58	11.94	.34 ^{***}	.12	.09	.30 ^{**}	.05	.53 ^{***}	-

Note.

N = 100;

^{***}
p < .001,^{**}
p < .01,

^{*}
p < .05. Sex: 0 = Male, 1 = Female; Overall Health = Short Form Health Survey Item 1 (Ware et al., 1992), Reported Pain = Short Form Health Survey Item 2 (Ware et al., 1992), FTCD = Fagerström Test for Cigarette Dependence (Heatherton et al., 1991), BCS = Barriers to Cessation Scale (Macnee & Talsma, 1995), Cessation-related Problems = Smoking History Questionnaire (Brown et al., 2002).

Table 2.

Regression Models

<i>Model 1: Cigarette Dependence</i>						
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>P</i>	<i>sr</i> ²	<i>R</i> ² Change
Step 1						.13 **
Age	.05	.02	3.06	.003	.08	
Overall Health	.53	.30	1.7	.08	.03	
Step 2						.0004
Pain	.04	.21	.18	.86	.0003	
Sex	-.06	.45	-.14	.89	.0002	
Step 3						.08 **
Pain * Sex	1.18	.39	3.10	.003	.08	
<i>Model 2: Barriers to Cessation</i>						
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>P</i>	<i>sr</i> ²	<i>R</i> ² Change
Step 1						.02
Age	.03	.08	.35	.73	.001	
Overall Health	.78	1.50	.52	.61	.003	
Cigarette Dependence	.46	.50	.92	.36	.01	
Step 2						.07 *
Pain	1.03	.98	1.05	.30	.01	
Sex	5.34	2.15	2.48	.02	.06	
Step 3						.07 **
Pain * Sex	5.50	1.93	2.85	.01	.07	
<i>Model 3: Past Cessation-related Problems</i>						
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>P</i>	<i>sr</i> ²	<i>R</i> ² Change
Step 1						.02
Age	.09	.09	.98	.33	.01	
Overall Health	1.26	1.75	.72	.47	.01	
Cigarette Dependence	.02	.58	.03	.98	.00001	
Step 2						.17 ***
Pain	2.83	1.07	2.64	.01	.06	
Sex	8.10	2.36	3.44	.001	.10	
Step 3						.06 **
Pain * Sex	5.97	2.12	2.82	.01	.06	

Note. N = 100;

p < .001,

**
p < .01,

* p < .05. 0 = Male, 1 = Female; Overall Health = Short Form Health Survey Item 1 (Ware et al., 1992), Reported Pain = Short Form Health Survey Item 2 (Ware et al., 1992), FTCD = Fagerström Test for Cigarette Dependence (Heatherton et al., 1991), BCS = Barriers to Cessation Scale (Macnee & Talsma, 1995), Past Cessation-related Problems = Cessation-related Problems = Smoking History Questionnaire (Brown et al., 2002).