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Increasing Cessation Motivation and Treatment Engagement among Smokers in Pain

Emily L. Zale
Syracuse University

Abstract

Tobacco smokers are at increased risk for the development and progression of chronic pain, and smokers with co-occurring pain tend to report greater difficulty and less confidence in quitting. Smokers in pain face unique cessation challenges and may benefit from tailored interventions that address smoking in the context of pain. This pilot study is the first to test the effects of an intervention tailored for smokers with co-occurring pain on motivation to quit and engage cessation treatment. Smokers with chronic pain (N = 76, 57.9% Female, 52.6% White, Mcpd = 17.64) were randomly assigned to either the tailored or control intervention. Results indicated that the tailored intervention (vs. control) increased knowledge of pain-smoking interrelations, motivation to quit smoking, desire to quit, and expected success in quitting (ps < .01). Participants who received the tailored intervention were also more likely to accept information about available smoking cessation treatments (p = .015), and to report interest (p = .006) and intention to engage treatment in the next month (p = .003). Effects of the tailored intervention on desire to quit and willingness to learn about cessation treatments were mediated by increased knowledge of pain-smoking interrelations. At one-month follow-up, treatment gains in knowledge of pain-smoking interrelations were maintained (p = .009), and participants who received the tailored intervention were more likely to report having subsequently talked to their doctor about smoking (p = .034). These data support the notion that smokers with co-occurring pain may benefit from interventions that have been tailored to address tobacco smoking in the context of pain. Collectively, these findings suggest that smokers with co-occurring pain may become more motivated to quit and engage cessation treatment as they become aware of how continued smoking may be incongruent with their desired pain outcomes.

INCREASING CESSATION MOTIVATION AND TREATMENT ENGAGEMENT AMONG SMOKERS IN PAIN

by

EMILY L. ZALE

B.A., University of Rochester, 2007
M.S., Texas A&M University, 2012

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Table of Contents

List of Tables

List of Figures

List of Appendices

Increasing Cessation Motivation and Treatment Engagement among Smokers in Pain

Tobacco use remains the leading preventable cause of mortality in the United States (US), accounting for an estimated 448,000 deaths and nearly $289 billion in health-related economic losses annually (DHHS, 2014). Despite the known health risks, including multiple forms of cancer, cardiovascular diseases, and respiratory diseases (DHHS, 2004), nearly 36 million American adults (15.1%) continue to smoke cigarettes (Jamal et al., 2016). Like smoking, pain is a critical national health problem that affects over 100 million adults at an annual cost in excess of $560 billion (IOM, 2011). Estimates derived from nationally-representative and clinical pain samples suggest that the prevalence of tobacco smoking among persons with co-occurring pain may be greater than twice the rate observed in the general population (28%-68%; Goesling, Brummett, & Hassett, 2012; Michna et al., 2004; Orhurhu, Pittelkow, & Hooten, 2015; Patterson et al., 2012).

Despite recent declines in smoking prevalence among US adults, there remain subgroups of smokers that evince substantially greater smoking prevalence and tobacco-related health disparities (Borrelli, 2010). The hardening hypothesis posits that remaining smokers may be "burdened" by characteristics that make continuous abstinence more difficult (Hughes & Brandon, 2003) or recalcitrant to quitting (Augustson & Marcus, 2004; Irvin & Brandon, 2000). A growing body of evidence indicates that interrelations between pain and smoking are reciprocal in nature, ultimately resulting in greater pain and the maintenance of smoking (e.g., Ditre, Brandon, Zale, & Meagher, 2011; Zale, Maisto, & Ditre, 2016). As such, smokers in pain likely represent an important subgroup, which faces unique smoking-related health disparities and may benefit from tailored interventions that address smoking in the context of pain (Ditre et al., 2011; Zale, Ditre, Dorfman, Heckman, & Brandon, 2014).

Several converging lines of evidence indicate that tobacco smoking contributes to the onset and progression of chronic pain and interferes with pain treatment. First, smoking has been identified as a unique risk factor in the development of rheumatoid arthritis (DHHS, 2014) and chronic low-back pain (Shiri, Karppinen, Leino-Arjas, Solovieva, & Viikari-Juntura, 2010), and smoking has been associated with the prevalence/severity of numerous other painful conditions (e.g., Aamodt, Stovner, Hagen, Brathen, & Zwart, 2006; Amin et al., 2007; Lee et al., 2010; Patel et al., 2006; Winn, 2001). Among treatment-seeking pain patients, smokers consistently report greater pain intensity and pain-related disability than nonsmokers (e.g., Hooten, Shi, Gazelka, & Warner, 2011; Weingarten et al., 2008; Weingarten et al., 2009), and there is some evidence that pain and disability may be even more pronounced among smokers who are more dependent on tobacco (Hahn, Rayens, Kirsh, & Passik, 2006; Hooten, Shi, et al., 2011). Tobacco smoking has been shown to decrease the efficacy of pharmacologic and surgical pain treatments (e.g., Glassman et al., 2007; Harty & Veale, 2010), and smokers are less likely to complete treatment for chronic pain than nonsmokers (Hooten, Townsend, Bruce, & Warner, 2009). Smokers are also more likely to continue to experience pain-related distress and disability following pain treatment (Fishbain et al., 2008; Hooten, Townsend, Bruce, Schmidt, et al., 2009).

A growing body of research further suggests that smokers with co-occurring pain face unique challenges to smoking cessation. Experimental evidence indicates that the experience of pain can increase urge to smoke and motivate smoking behavior (Ditre & Brandon, 2008; Ditre, Heckman, Butts, & Brandon, 2010), episodes of increased pain have been shown to precede bouts of cigarette smoking (Dhingra et al., 2013), and smokers with chronic pain consistently endorse smoking in response to their pain (Jamison, Stetson, & Parris, 1991; Patterson et al., 2012). Treatment-seeking pain patients have also identified distraction from physical pain and

pain-related distress as a primary smoking motive (Aimer et al., 2015; Hooten, Vickers, et al., 2011). With regard to smoking cessation, smokers with co-occurring pain report greater difficulty and less confidence in quitting (Ditre, Langdon, Kosiba, Zale, & Zvolensky, 2015; Zale et al., 2014) and may be less likely to achieve long-term smoking abstinence (Aigner et al., 2017; Waldie, McGee, Reeder, & Poulton, 2008). Experimental pain reactivity has also been shown to predict relapse to smoking (Nakajima & al'Absi, 2011), and greater pain-related anxiety has been shown to predict early lapse and relapse to smoking in the context of a self-guided quit attempt (LaRowe, Langdon, Zvolensky, Zale, & Ditre, in press). Despite the possibility that co-occurring pain may impede smoking cessation, there is some evidence that smokers may experience clinically-meaningful reductions in pain severity after quitting (Behrend et al., 2012).

Although more than 70% of all smokers endorse a *desire* to quit smoking (Fiore et al., 2008), the vast majority (~90%) are not yet ready to make a serious cessation attempt (Herzog & Blagg, 2007; Lichtenstein & Hollis, 1992; Pisinger, Jørgensen, Møller, Døssing, & Jørgensen, 2010). Behavioral and pharmacologic cessation therapies, which have been shown to more than double quit rates, remain dramatically underutilized (Babb, Malarcher, Schauer, Asman, & Jamal, 2017; CDC, 2011), and engaging smokers in evidence-based treatment has been identified as a significant public health priority (USDHHS, 2010). Smokers who are not ready to engage an abstinence-oriented treatment may be more amenable to interventions that are designed to increase motivation and receptivity towards future cessation treatment (Drake & Mueser, 2000).

According to a phase-based framework for treating tobacco dependence, the process of smoking cessation is comprised of four phases (i.e., Motivation, Precessation, Cessation, Maintenance) that present unique opportunities for intervention (Baker et al., 2011). Smokers

who are unwilling to make a serious quit attempt can be classified in the Motivation Phase of smoking cessation. At the Motivation Phase, smokers should receive treatment designed to increase the likelihood of future cessation attempts (Baker et al., 2016), and treatment effects may be most appropriately assessed via self-report and behavioral indices of motivation to quit (Baker et al., 2011). Prior research has demonstrated that psychoeducation regarding smoking-health interactions may increase motivation to quit smoking (e.g., McCaul et al., 2006; Zvolensky, Lejuez, Kahler, & Brown, 2003), and guidelines for brief motivational substance-use interventions indicate that all patients should be educated about relations between substance use and co-occurring medical conditions (SAMHSA, 2012).

Given emerging evidence of reciprocal relations between pain and smoking behavior, researchers have suggested that smokers with co-occurring pain may benefit from tailored interventions that address smoking in the context of pain (Ditre et al., 2011; Zale et al., 2014). Smokers receiving treatment for chronic pain have indicated that they think providing messages about pain and smoking (i.e., *smoking may impede recovery*) could be helpful in motivating other patients to reduce their smoking (Kaye, Prabhakar, Fitzmaurice, & Kaye, 2012). A recent pilot investigation of a smoking cessation treatment for pain patients found that an intensive 7-session intervention, which was comprised of both individual and group cognitive behavioral therapy, was efficacious in promoting smoking abstinence (Hooten et al., 2014). However, to date, no studies have tested a tailored intervention for smokers in pain who are not yet ready to engage a serious cessation attempt.

The objective of this study was to develop and pilot test a brief (i.e., single session) intervention, which has been tailored to address smoking in the context of pain, for smokers with chronic pain who are not ready to quit. Consistent with a phase-based approach (i.e., treatment at

the Motivation Phase), the goals of the tailored intervention were to: (1) educate patients about pain-smoking interrelations, (2) increase motivation to engage a serious quit attempt, and (3) increase motivation to utilize available smoking cessation treatment. We conducted a pilot randomized controlled trial of the brief tailored intervention versus the standard of care that is recommended by US Department of Health and Human Services (DHHS) Clinical Practice Guidelines for the Treatment of Tobacco Dependence (Fiore et al., 2008). We hypothesized that smokers randomized to the tailored intervention (vs. control) would: (1) demonstrate greater knowledge of pain-smoking interrelations, (2) self-report greater motivation to quit smoking, (3) demonstrate a greater willingness to accept information about smoking cessation treatment, and (4) self-report greater intention to utilize existing cessation services. We further hypothesized that increased knowledge of pain-smoking interrelations would mediate effects of the tailored intervention on motivation to quit smoking and engage cessation treatment. Finally, we hypothesized treatment gains in knowledge of pain-smoking interrelations and motivation to quit smoking would be maintained at one-month follow-up, and that smokers who received the tailored intervention would be more likely to report having subsequently engaged smoking cessation treatment.

Method

Participants

Participants were recruited from the local community via newspaper and internet advertisements for a research study about smoking and chronic pain. Respondents were screened by telephone for the following inclusion criteria: (1) between 18-65 years of age, (2) currently smoking $\geq$ 10 cigarettes per day; (3) current self-reported moderate-very severe chronic pain; (4) average pain intensity of at least 4/10 over the past three months. Given that we sought to recruit

smokers who were not yet ready to quit, and therefore could be classified in the Motivation Phase of smoking cessation, respondents were excluded if they reported a current active quit attempt or use of treatment (i.e., pharmacological or behavioral) to help quit or cut down on smoking. Participants who were determined to be eligible by phone screening were scheduled for an in-person session.

Intervention Development

Development of the tailored intervention was informed by a growing empirical literature on interrelations between pain and smoking (e.g., Ditre et al., 2011), theories of health behavior change, SAMSHA recommendations for the development of brief interventions (SAMHSA, 2012), and Clinical Practice Guidelines for the Treatment of Tobacco Dependence (Fiore et al., 2008). The Clinical Practice Guidelines recommend that smokers who are not ready to make a quit attempt should receive brief interventions to promote motivation to quit. Common components of evidence-based motivational smoking interventions include: (1) assessment of smoking history, substance use, and mood; (2) identification of high risk smoking situations and coping skills; (3) application of the FRAMES acronym (provide personalized feedback, advice to quit, and a menu of strategies for quitting; emphasize personal responsibility for behavior change; enhance self-efficacy; deliver the intervention in an empathic manner); and (4) motivational enhancement (Emmons, 2007; Niaura & Shadel, 2007; Perkins, Conklin, & Levine, 2008). Motivational enhancement represents an adaptation of motivational interviewing that incorporates personalized health-related feedback "that is intended to strengthen and consolidate commitment to change and promote a sense of self-efficacy" (SAMHSA, 2013). Smokers are more likely to engage a quit attempt when they receive even minimal intervention (< 3 minutes),

and those lasting 30-90 minutes have been shown to increase abstinence rates nearly three-fold (Fiore et al., 2008).

The tailored intervention included a novel psychoeducation component that was informed by several theories of health behavior change and empirical evidence that providing smokers with an explicit link between continued smoking and illness increases motivation to quit (McCaul et al., 2006). First, the Transtheoretical Model (TTM) represents an integrative, biopsychosocial approach to conceptualizing health behavior change that has been applied extensively to the study of tobacco cessation (Prochaska & DiClemente, 1983; Prochaska, Redding, & Evers, 2008). Core components of the TTM include stages of change, which classifies readiness to quit smoking according to smokers' stated intention and measurable steps toward quitting, and decisional balance between the perceived positive and negative effects of smoking. The TTM predicts that smokers may be motivated to progress from one stage to the next as they come to perceive discrepancy between positive and negative effects of smoking. Thus, smokers in pain may become more motivated to quit once they perceive a discrepancy between continued smoking and their desired pain outcomes.

Second, the Health Belief Model (HBM) posits that individuals are more likely to change an unhealthy behavior if they believe that (a) they are susceptible to negative health outcomes, (b) the negative health outcomes will be severe in nature, and (c) behavior change will be effective in alleviating or reducing these negative outcomes (Champion & Skinner, 2008). Pain has been conceptualized as an aversive state that demands attention and orients behavior towards escape/alleviation (Eccleston & Crombez, 1999), and smokers in pain likely hold a salient desire for reduced pain and improved functioning. Therefore, a novel psychoeducation component that addresses pain-smoking interrelations may increase motivation to quit because: (a) smokers may

perceive themselves as immediately susceptible to the negative pain-related effects of smoking, (b) pain is likely to be perceived as a severe health outcome, and (c) smokers may come to understand the pain-related benefits of quitting.

A related concept, the "teachable moment," describes a context or event in which behavior change may become more salient due to health concerns, and tobacco use is thought to provide a prototypical teachable moment due its broad range of deleterious health effects (Lawson & Flocke, 2009). It is our contention that addressing smoking in the context of pain may provide an optimal "teachable moment," as smokers in pain may become more motivated to quit if they come to understand the extent to which continued smoking may increase or maintain their pain.

Intervention Conditions

Active condition (i.e., tailored intervention). Participants randomized to the active condition received an intervention that was tailored to address smoking in the context of pain. Consistent with existing evidence-based treatments (e.g., Perkins et al., 2008), the tailored intervention included personalized feedback and assisted participants in developing discrepancy between continued smoking and their health-related goals. The feedback and discrepancy components were tailored to address smoking in the context of pain by focusing on pain-smoking interrelations (i.e., personalized feedback address both pain and smoking; discrepancy targeted pain-related goals). The third component of the active intervention was anovel pain-smoking psychoeducation component, which included information about the deleterious effects of smoking on pain and the potential pain-related benefits of smoking cessation. In accordance with recommendations for evidence-based brief smoking interventions and motivational enhancement, the intervention was delivered in a collaborative, warm, and empathic tone

(Emmons, 2007; SAMHSA, 2012). For example, the psychoeducation component was delivered using the "elicit – provide – elicit" framework, in which study therapists (1) elicited permission to discuss pain/smoking, (2) provided educational information, and (3) elicited feedback from the participant about the information that was provided. The therapist guide for the active intervention is included in Appendix B and the educational handout is included in Appendix C.

Control condition (i.e., control intervention). Participants randomized to the control condition received a 3As (ask, advise, arrange) intervention, which is an effective smoking treatment recommended by Clinical Practice Guidelines (Fiore et al., 2008). Specifically, participants were (1) asked about their smoking status and motivation to quit, (2) advised to quit smoking, and (3) offered resources to help them quit, including self-help materials (i.e., Clearing the Air; National Cancer Institute) that have been widely utilized as a behavioral smoking intervention in randomized clinical trials (Lancaster, Stead, Silagy, & Sowden, 2000). The 3As intervention is widely used as a standard of care in medical practices, and has demonstrated effectiveness for increasing smoking abstinence rates (Fiore et al., 2008). We selected the 3As intervention as a control because it allowed us to test whether the tailored intervention improves outcomes relative to current practice (Arean & Alvidrez, 2002; Mohr et al., 2009). The therapist guide for the control intervention is included in Appendix D.

Outcome Measures

Motivation to quit smoking. Cessation motivation is a multidimensional construct (Nezami, Sussman, & Pentz, 2003) that is comprised of both cognitions about quitting (e.g., *I have a desire to quit smoking*) and measurable steps towards behavior change (e.g., seeking treatment). Motivation to quit was assessed with three self-report measures that target specific and distinct facets of the motivation construct.

***Thoughts about abstinence*.** The Thoughts About Abstinence Scale (TAA; Hall, Havassy, & Wasserman, 1990) is a reliable and valid measure that uses three separate Numerical Rating Scales (NRS) to assess desire to quit smoking (0 = *no desire to quit*, 10 = *full desire to quit*), anticipated success in quitting (0 = *lowest expectation of success*, 10 = *highest expectation of success*), and anticipated difficulty quitting (0 = *lowest amount of difficulty*, 10 = *highest amount of difficulty*). The TAA has previously been used to assess motivation to quit and expectations for smoking cessation among smokers in pain (Ditre, Kosiba, Zale, Zvolensky, & Maisto, 2016).

***Contemplation ladder*.** The contemplation ladder (Biener & Abrams, 1991) is a widely used, reliable, and valid measure of motivation to quit smoking on an 11-point Visual Analogue Scale (VAS). The contemplation ladder includes anchor points at 0 (*no thought of quitting*), 2 (*I think I need to consider quitting someday*), 5 (*I think I should quit but not quite ready*), 8 (*starting to think about how to change my smoking patterns*), and 10 (*taking action to quit, e.g., cutting down, enrolling in a program*). The contemplation ladder has previously been used to assess motivation to quit among smokers in pain (Zale et al., 2014).

***Motivation rulers*.** Motivation rulers for smoking cessation (Boudreaux et al., 2012) consist of three separate NRSs that assess importance of quitting (0 = *not important at all*, 10 = *most important goal of my life*), readiness to quit smoking in the next month (0 = *not ready at all*, 10 = *100% ready*), and confidence that "you will quit smoking" in the next month (0 = *not at all confident*, 10 = *100% confident*). Motivation rulers have previously demonstrated reliability and validity for assessing smoking motivation among medical populations (Boudreaux et al., 2012).

Knowledge of pain-smoking interrelations. The Pain and Smoking Questionnaire (PSQ) is a 25-item questionnaire developed by members of our research team to assess

knowledge of interrelations between pain and tobacco smoking. A total of 17 items assess knowledge of associations between smoking and multiple health conditions (e.g., lung cancer, heart disease, diabetes). Eight separate items assess specific knowledge of pain-smoking interrelations, including whether smoking can cause chronic pain, contribute to pain-related impairment in functioning, reduce the effectiveness of prescription pain medications, provide acute analgesic effects, or help to distract from pain. Pain-specific items also assess knowledge of whether pain can motivate smoking behavior or whether quitting smoking is associated with improved pain and physical functioning. Response options for each item are *yes*, *no,* or *not sure/don't know*. The PSQ was scored as the number of total pain-smoking items that were correctly answered (range 0 – 8), with higher scores representing a greater number of correct responses.

Cessation treatment engagement. Motivation to engage cessation treatment was assessed pre- and post-intervention as (1) willingness to learn about treatment options, (2) interest in engaging treatment, and (3) intention to engage treatment in the next 30 days. Willingness to engage treatment was assessed with the question "would you like to learn about options for treatment to help you quit smoking?" Participants who answered *yes* were then given a list of treatment options (i.e., medication/primary care, Quitline, behavioral health, or none of the above), and asked whether they were interested in using any of the treatments and whether they planned to enroll in any of the treatments in the next 30 days. Multiple responses were permitted. For each question, participants who selected at least one treatment option were considered to have indicated interest in treatment and an intention to enroll in treatment, respectively. At one-month follow-up, engagement in treatment over the past 30 days was assessed (yes/no) for each treatment option.

Treatment satisfaction. The Client Satisfaction Questionnaire (Larsen, Attkisson, Hargreaves, & Nguyen, 1979) was used to assess satisfaction with the study interventions. The CSQ includes individual items that measure perceived quality of the treatment (0 = *poor*, 3 = *excellent*), satisfaction with the treatment (0 = *very dissatisfied*, 3 = *very satisfied*), and whether participants felt the treatment was helpful, would seek treatment again or recommend treatment to a friend (0 = *no, definitely not*, 3 = *yes, definitely*).

Perceived discrepancy between smoking and desired pain outcomes. An open-ended text box was included for participants to provide comments about reasons why the tailored intervention did or did not improve their motivation to quit smoking. Perceived discrepancy between smoking and desired pain outcomes was coded as yes/no. Comments were coded as indicative of discrepancy only if participants made statements specifically about "pain" or "chronic pain." All other statements, including associations between smoking and general health, were coded as not indicative of perceived discrepancy.

Demographics, Smoking, and Pain History

Demographics. The demographics form assessed age, gender, marital status, race/ethnicity, education, and household income. This demographics form has been previously used to asses sociodemographic characteristics among smokers in pain (Ditre et al., 2015; Ditre, Zale, Kosiba, & Zvolensky, 2013; Zale et al., 2014).

Smoking history. The Smoking History Form (Brown, Lejuez, Kahler, & Strong, 2002) is a widely used assessment of smoking behavior, including smoking rate, age of smoking onset/years of smoking, and prior attempts to quit smoking. The Smoking History Form has been used previously as a descriptive measure of smoking characteristics among smokers in pain (Ditre et al., 2013; Zale et al., 2014).

Exhaled carbon monoxide (CO). Exhaled CO was assessed using the CoVita Smokerlyzer Micro+^{TM} (Bedfont Scientific; Haddonfield, NJ). Exhaled CO is a well-established and non-invasive objective measure of tobacco smoking (Benowitz et al., 2002; Evans, Sutton, Oliver, & Drobes, 2015; Piper & Curtin, 2006), which is highly correlated with smoking heaviness and time since last cigarette (Hung, Lin, Wang, & Chan, 2006; Kwok, Taggar, Cooper, Lewis, & Coleman, 2014). A cut-off of 4 ppm has been identified as a reliable indicator of cigarette use in the previous 24 hours (Cropsey, Eldridge, Weaver, Villalobos, & Stitzer, 2006; Javors, Hatch, & Lamb, 2005; Raiff, Faix, Turturici, & Dallery, 2010).

Smoking dependence. The Heaviness of Smoking Index (HSI; Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989) is a two-item measure that assesses time to first cigarette after waking and number of cigarettes smoked per day. Responses options are assigned numerical values between 0 and 3, and items are summed to generate a total score (range 0-6), with higher scores representing greater levels of smoking dependence. The HSI has been shown to reliably predict cessation outcomes (Borland, Yong, O'Connor, Hyland, & Thompson, 2010; Fagerstrom, 2012), and has been previously used among smokers in pain (Ditre, Kosiba, et al., 2016).

Stages of change. The Stages of Change (SOC; DiClemente et al., 1991) is a three item measure that is widely-used to classify motivation to quit smoking according to the Transtheoretical Model of Behavior Change (Prochaska & DiClemente, 1983; Prochaska et al., 2008). The SOC algorithm includes three items, which assess whether participants are seriously considering quitting smoking in the next 6 months or the next 30 days and the number of past-year quit attempts that lasted greater than 24 hours. Participants are classified as in either precontemplation (no consideration of quitting), contemplation (consideration of quitting but no

past-year quit attempt), or preparation (consideration of quitting in the next 30 days and one or more past-year quit attempts). The SOC has previously been used to classify stages of change among smokers with chronic pain (Zale et al., 2014).

Chronic pain grade. The Graded Chronic Pain Scale (GCPS; Von Korff, 2011) is a reliable and valid measure of chronic pain severity, which was designed for use both in the general population and among treatment-seeking pain patients. The GCPS includes 3 separate NRSs (0 = *no pain*, 10 = *pain as bad as could be*) that assess pain right now, worst pain in the past 3 months, and average pain in the past 3 months, and three 3 separate NRSs (0 = *no interference*, 10 = *unable to carry on any activities*) that assess pain-related interference with daily activities, recreation/social/family activities, and ability to work over the past 3 months. An additional item assesses pain-related days of interference in the past 3 months. The GCPS yields a characteristic pain intensity score (range 0 – 30), an interference score (range 0 – 40), and a classification of chronic pain grade that accounts for both pain intensity and interference (Grade I = low intensity/low interference; Grade II = high intensity/low interference; Grade III = high disability/moderate interference; Grade IV = severe interference). The GCPS has previously been used to assess chronic pain status among smokers in pain (Ditre, Kosiba, et al., 2016; Ditre et al., 2013), and demonstrated good internal consistency in the current sample ($\alpha = .898$).

Pain history. Descriptive information regarding pain history (e.g., pain duration and frequency) and pain treatment (e.g., satisfaction with treatment from doctors and pain specialists/pain treatment programs) was assessed using items adapted from the Kansas Behavioral Risk Factor Surveillance System (Toblin, Mack, Perveen, & Paulozzi, 2011). Participants also indicated the primary source of their pain (e.g., back pain, arthritis/rheumatism, migraines) and responded (yes/no) to an item adapted from the National Comorbidity Survey-

Replication (Kessler et al., 2004), which asked "do you currently have medically unexplained chronic pain? This is defined as pain lasting six months or longer that is severe enough to either interfere a lot with your normal activities or to cause a lot of emotional distress and that a doctor cannot find a physical cause to explain."

Potential Covariates

Pain and smoking expectancies. The Pain and Smoking Inventory (PSI; Ditre, Zale, Heckman, & Hendricks, 2016) is a 9-item measure of perceived interrelations between pain and tobacco smoking. Items assess the extent to which participants perceive their own pain and smoking to be related across three domains (pain as a motivator of smoking, smoking to cope with pain, and pain as a barrier to smoking cessation) using a 7-point Likert scale (0 = *not at all true*, 3 = *somewhat true*, 6 = *extremely true*). The total score for the PSI is the average of all 9-items, with higher scores representing greater perceived relations between pain and smoking behavior. The PSI has previously been shown to distinguish between smokers with and without chronic pain (Ditre, Zale, et al., 2016), and demonstrated excellent internal consistency in the current sample ($\alpha = .910$).

Pain-related anxiety. Pain-related anxiety was assessed using the Pain Anxiety Symptoms Scale (PASS-20; McCracken & Dhingra, 2002), which measures the frequency of 20 prototypical anxious or fearful responses to pain (e.g., I worry when I am in pain; I try to avoid activities that cause pain) using a 7-point Likert Scale (0 = *never*, 6 = *always*). Greater total scores (range 0 – 120) represent greater levels of pain-related anxiety. The PASS-20 has been previously used to investigate relations between pain and tobacco smoking among smokers in pain (Ditre et al., 2015; Ditre et al., 2013; LaRowe et al., under review), and demonstrated excellent internal consistency in the current sample ($\alpha = .922$).

Prescription opioid misuse. The Prescription Opioid Misuse Index (POMI; Knisely, Wunsch, Cropsey, & Campbell, 2008) assesses six prototypical signs of opioid misuse (e.g., taking more medication than prescribed, feeling high or buzzed after using mediation). Responses (0 = no, yes = 1) are summed to generate a total score, with high scores representing greater levels of misuse. Consistent with scoring recommendations, a cut-off score of 2 was also used to categorize misuse behavior (yes/no). The POMI demonstrated adequate internal consistency in the current sample ($\alpha = .803$).

Depression and anxiety symptoms. The Patient Health-Questionnaire-4 (PHQ-4; Kroenke, Spitzer, Williams, & Lowe, 2009) is a reliable and valid screening tool for anxiety and depression that was designed for use in medical populations. The PHQ-4 consists of two items that assess frequency of depression symptoms (i.e., feeling down, depressed or hopeless; little interest or pleasure in doing things) and two items that assess frequency of anxiety symptoms (i.e., feeling anxious, nervous, or on edge; not able to stop or control worrying) during the past two weeks. Response scales range from 0 (*not at all*) to 3 (*nearly every day*). Items are summed to generate separate scores for depression and anxiety symptoms, with higher scores indicating higher symptom severity. Consistent with scoring recommendations, a cut-off score of 3 was used to distinguish potential presence of major depression or generalized anxiety, respectively. The depression and anxiety symptom scales each demonstrated adequate internal consistency in the current sample ($\alpha = 782$ and $\alpha = .826$, respectively).

Alcohol use. The Alcohol Use Disorders Identification Test-C (AUDIT-C; Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998) is a three item self-report measure of alcohol use during the past year. Items assess frequency of alcohol consumption, typical amounts of alcohol consumed per drinking episode, and frequency of binge (i.e., ≥ 6 drinks in one drinking episode)

drinking. The AUDIT-C yields a continuous total score (range 0 – 12), with greater scores representing greater levels of alcohol use. Cut-off scores of 4 for men and 3 for women can be used to distinguish hazardous drinking. The AUDIT-C demonstrated adequate internal consistency in the current sample ($\alpha = .865$).

Procedure

All procedures were approved by the Institutional Review Board of Syracuse University. In person appointments were conducted in the Pain and Addictions Research Lab, which is housed within an outpatient medical building. Upon arrival to the in-person session, participants provided written informed consent and exhaled CO. Participants then were left alone to complete a battery of computerized self-report questionnaires that assessed baseline levels on all outcome variables, sociodemographic, smoking and pain characteristics, and potential covariates. Following baseline measures, participants were randomized to either the tailored or control intervention, and the intervention was delivered face-to-face by a trained study therapist. Participants were then left alone to complete the battery of computerized post-intervention outcome measures. At the end of the in-person session, participants were provided with a reminder card for the one-month telephone follow-up and $25 compensation for their time and travel. Participants were contacted via telephone at one-month follow-up, and outcome measures were administered verbally by trained research assistants. Research assistants were not informed of the participant's condition assignment prior to conducting the telephone follow-up. Figure 1 presents a study timeline, and Figure 2 presents the complete flow of participants through the study.

Therapist Training and Treatment Fidelity

The study interventions were delivered by the lead author (ELZ) and another clinical psychology doctoral student (MJD). The majority (82.9%) of interventions were conducted by the lead author (ELZ). Chi square analysis revealed no differences (p = .07) in the proportion of active and control interventions completed by each therapist. Study therapists were trained on all protocols by the lead author (ELZ) and the clinical supervisor, who is a licensed Clinical Psychologist (JWD). Prior to beginning the study, both study therapists completed multiple role plays of the tailored and control interventions. For each participant, study therapists completed an intervention checklist during the visit to ensure adherence to the tailored and control interventions (see Appendix E and Appendix F, respectively). All intervention sessions were audio-recorded, and the study therapists also met regularly to review intervention tapes and monitor fidelity.

Data Analytic Plan

All analyses were completed using SPSS Version 22 (IBM; 2013). First, group differences in baseline variables (e.g., demographics, smoking characteristics, pain characteristics) were examined using t-tests and chi-square analyses in order to verify that randomization was successful. No differences were observed on any baseline variables (all *ps* > .082).

Post-intervention outcomes were analyzed with an intent-to-treat approach. Analysis of covariance (ANCOVA) and logistic regression were used to test main effects of the intervention condition on knowledge of pain-smoking interrelations, motivation to engage a serious quit attempt, and intention to engage smoking cessation treatment. Separate ANCOVAs (controlling for respective baseline scores) were conducted with intervention condition entered as the fixed factor and each continuous outcome (e.g., contemplation ladder) entered as the respective

dependent variables. Separate logistic regression models (controlling for respective baseline scores) were utilized to test the effects of intervention condition and all dichotomous outcome variables (e.g., intention to engage smoking cessation treatment). We then tested increased knowledge of pain-smoking interrelations as a mediator of observed effects of treatment condition on post-intervention motivation to quit and engage smoking cessation treatment. Separate mediation models were tested for each outcome using the PROCESS Macro for SPSS (Hayes, 2013), which employs a bootstrapping approach, can accommodate both dichotomous and continuous variables, and yields estimates of direct and indirect effects of all predictor and mediator variables (Preacher & Hayes, 2008). We also conducted ANCOVA and logistic regression analyses (controlling for respective baseline scores) among participants who received the tailored intervention to test associations between perceived discrepancy (entered as the fixed factor) and each outcome variable.

One-month follow-up outcomes were analyzed for all participants who provided data (N = 59)[1] using a modified intent-to-treat approach (Gupta, 2011). For continuous variables, repeated measures analysis of variance (ANOVA) was used with intervention condition entered as the fixed factor, and all three assessment time points (baseline, post-intervention, 1-month follow-up) entered as dependent variables. Separate logistic regression models were used to test the effects of the intervention on dichotomous behavioral smoking variables (i.e., self-reported quit attempt, self-reported use of available treatment resources).

Results

Participant Characteristics

Participants included 76 daily tobacco smokers (57.9% female; 42.1% Black or African American; M_{age} = 42.71, *SD* = 13.42), who reported smoking approximately 18 cigarettes per day

(*SD* = 10.71) for an average of 26 years (*SD* = 12.76). The average HSI score was 3.37 (*SD* = 1.21), indicating a moderate level of tobacco dependence (e.g., Chaiton, Cohen, McDonald, & Bondy, 2007). The majority (59.2%) of participants endorsed having made a serious attempt to quit smoking in the past, and 42% of those with a past quit attempt reported that they had never received treatment for smoking cessation. With regard to SOC, more than one third of participants were classified as precontemplation (35.5%) and one half of participants (51.3%) were classified as contemplation.

The majority of participants reported experiencing chronic pain for at least one year (78.9%), and that they were experiencing pain at more than one location in the body (64.5%). The most commonly endorsed sources of chronic pain were chronic low back pain (55.3%), chronic back pain (46.1%), arthritis/rheumatism (32.9%), and chronic neck pain (31.6%). Mean ratings of pain *on average* over the past 3 months (*M* = 6.76, *SD* = 2.08) indicate that the sample was experiencing moderate pain that was clinically significant (Krebs, Carey, & Weinberger, 2007). More than one third of participants reported daily use of pain medications (37.3%), and 29% reported current use of prescription opioids or narcotic pain medications. Sociodemographic, smoking, and pain characteristics are presented in Table 1.

Post-Intervention Outcomes

Knowledge of pain-smoking interrelations. As hypothesized, results of ANCOVA indicated that the tailored intervention increased knowledge of pain-smoking interrelations (see Figure 3). Of the eight questions on pain-smoking interrelations, participants randomized to the tailored intervention correctly answered three more questions than did participants in the control condition, $F(1,73) = 82.37$, $p < .001$, $\eta^2_p = .53$. Participant responses at each time point are

presented in Table 2. Unadjusted means and standard deviations for knowledge scores are presented in Table 3, and adjusted means and standard errors are presented in Table 4.

Motivation to quit smoking. As hypothesized, ANCOVA revealed that the tailored intervention increased multiple indices of cessation motivation (see Table 4). Specifically, participants randomized to the tailored intervention scored higher on the contemplation ladder, $F(1,73) = 11.54$, $p = .001$, $\eta^2_p = .14$, and reported greater desire to quit smoking, $F(1,73) = 7.40$, $p = .008$, $\eta^2_p = .09$. The tailored intervention also increased expected success in quitting, $F(1,73) = 12.95$, $p = .001$, $\eta^2_p = .15$. A trend-level association was observed for greater confidence in quitting among participants who received the tailored intervention $F(1,73) = 3.68$, $p = .059$, $\eta^2_p = .05$. No group differences were observed with regard to self-reported importance ($p = .237$), readiness ($p = .138$), or anticipated difficulty quitting ($p = .703$). Intercorrelations between baseline measures of motivation to quit smoking are presented in Table 5.

Motivation to engage cessation treatment. As hypothesized, results of logistic regression revealed that the tailored intervention increased willingness to learn about cessation treatments (Wald $\chi^2 = 5.91$, $p = .015$). Participants randomized to the tailored intervention were also more likely to indicate that they would be interested in using cessation treatment in the future (Wald $\chi^2 = 7.70$, $p = .006$), and that they intended to engage treatment in the next 30 days (Wald $\chi^2 = 9.06$, $p = .003$). Follow-up analyses revealed that the tailored intervention increased interest and intention to engage the Quitline and talk to their doctor/mediation (see Table 6).

Knowledge of pain-smoking interrelations as a mediator of post-intervention outcomes. As depicted in Figure 4, we observed an indirect effect of the tailored intervention on greater desire to quit ($b = .84$, $SE = .45$, 95% CI [0.03, 1.81]) and willingness to learn about cessation treatments ($b = 2.66$, $SE = 1.46$, 95% CI [0.13, 4.90]) via increased knowledge of pain-

smoking interrelations. Increased knowledge of pain-smoking relations did not mediate treatment effects on contemplation ladder scores (b = .31, SE = .60, 95% CI [-0.92, 1.44], expected success in quitting (b = .15, SE = .52, 95% CI [-0.97, 1.12]), or intention to engage cessation treatment (b = .86, SE = .72, 95% CI [-0.52, 2.36]).

Perceived discrepancy between continued smoking and desired pain outcomes. The majority (n = 32) of participants in the active intervention provided comments about why the intervention did or did not increase motivation to quit smoking (see Table 7). All participants who provided feedback that indicated discrepancy (n = 13) between continued smoking and desired pain outcomes also reported that the intervention helped to increase their motivation to quit smoking. However, no differences were observed on any outcome variables between participants who did and did not report discrepancy (all ps > .149).

One-Month Follow-Up Outcomes

Participant characteristics. A total of 59 (78%) participants provided data at one-month follow-up. There was no association between intervention condition assignment and loss to follow-up (χ^2 = 1.89, p = .169), indicating that attrition did not differ between groups. The primary reasons for loss to follow-up were disconnected/out of service telephone number (58.8%) and did not return multiple voicemail messages (29.4%). Examination of baseline variables revealed that participants who provided follow-up data were older (M = 44.64, SD = 12.98) than participants who did not provide follow up data (M = 36.29, SD = 13.27), t(74) = 2.32, p = .023. Participants who provided follow-up data also reported smoking fewer cigarettes per day at baseline (M = 15.98, SD = 9.17), relative to those who did not provide follow-up data (M = 23.41, SD = 12.70), t(74) = 2.61, p = .011.

Smoking behavior and engagement of smoking cessation treatment. Results of logistic regression revealed that participants who received the tailored intervention were more likely to report having subsequently talked to their doctor about smoking (*OR* = 4.12, 95% CI [1.12, 15.21], Wald χ^2 = 4.51, *p* =.034), relative to participants who received the control intervention. Although four participants who received the tailored intervention reported having quit smoking (vs. zero in the control condition), results of logistic regression indicated that smoking status did not significantly differ between the two groups (*p* = .691). On average, participants in both conditions reported smoking a similar number of cigarettes per day at follow-up (*p* = .387), and no differences were observed with regard to the number of participants who reported cutting down on their smoking (*p* = ..739) or making a 24 hour quit attempt (*p* = .188).

Maintenance of treatment gains. Repeated measures ANOVA revealed that participants who received the tailored intervention continued to report greater knowledge of pain-smoking interrelations at one-month follow-up (*M* = 6.00, *SE* = .42), relative to participants who received the control intervention (*M* = 4.43, *SE* = .40), *F*(1, 49) = 7.46, *p* = .009, η^2_p = .13. No group differences were observed in contemplation ladder scores (*p* = .18), reported desire to quit (*p* = .83) or expected success in quitting (*p* = .16).

Intervention Satisfaction

Participants who received the tailored intervention reported a greater mean level of satisfaction, relative to participants who received the control intervention, *t*(74) = 3.15, *p* = .002. Participants in the tailored intervention also reported that they would be more likely to seek the intervention again in the future, *t*(74) = 2.09, *p* = .040, and to recommend the intervention to a friend, *t*(74) = 3.44, *p* = .001. The majority of participants who received the tailored intervention

rated the handout as extremely helpful (60.5%) and easy to understand (76.3%). Complete satisfaction ratings for the tailored and control interventions are presented in Table 8.

Discussion

Pain and tobacco smoking are highly comorbid critical national health problems, and smokers may constitute a recalcitrant subgroup who face unique cessation challenges and could benefit from tailored interventions (e.g., Borrelli, 2010; Ditre et al., 2011; Zale et al., 2014; Zale et al., 2016). This is the first randomized controlled trial of a motivational intervention that has been tailored to address smoking in the context of pain. Informed by existing evidence-based interventions and empirical and theoretical conceptualizations of health behavior change, the tailored intervention included a novel psychoeducation component that was designed to increase knowledge of pain-smoking interrelations and assist smokers in developing discrepancy between continued smoking and desired pain outcomes. When compared to a 3As intervention that is recommended by Clinical Practice Guidelines and used in many medical settings as the standard of care (Fiore et al., 2008), the tailored intervention increased knowledge of pain-smoking interrelations, motivation to quit smoking, willingness to learn about smoking cessation treatment, and intention to engage cessation treatment. At one-month follow up, treatment gains in knowledge of pain-smoking interrelations were maintained, and participants who received the tailored intervention were more likely to report having subsequently talked to their doctor about smoking.

The tailored intervention included a novel psychoeducation component that provided participants with clear and explicit links between smoking behavior and pain-relevant processes/outcomes. At baseline, participants answered an average of 3/8 questions about pain-smoking interrelations correctly, and the majority were unaware that smoking can cause chronic

pain (59.2%), contribute to greater pain intensity (56.5%), or reduce the effectiveness of prescription pain medications (75%). Participants who received the active intervention demonstrated significant increases in knowledge of pain-smoking interrelations, correctly answering 6/8 questions at post-intervention and one-month follow-up. Thus, results suggest that smokers are responsive to psychoeducation about complex associations between pain and tobacco, and that smokers with chronic pain are able to learn and retain new information about how smoking and pain are interrelated.

The tailored intervention (vs. 3As control) increased multiple self-report and behavioral indices of motivation to quit smoking at post-intervention. Specifically, the tailored intervention increased desire to quit smoking, contemplation ladder scores, and expected success in quitting. Participants who received the tailored intervention were also more likely to demonstrate willingness to learn about cessation treatments, interest in cessation treatment, and intention to engage treatment in the next month. Increased knowledge of pain-smoking interrelations mediated observed effects of the tailored intervention on increased desire to quit smoking and willingness to learn about treatment options. Taken together, these findings are consistent with evidence that providing smokers with clear and explicit links between smoking and health can increase motivation to quit smoking (McCaul et al., 2006), and that smokers who are not yet ready to quit may be amenable to interventions designed to increase motivation to quit and engage abstinence-oriented treatment (Drake & Mueser, 2000).

At one-month follow-up, participants who received the tailored intervention were more likely to report having subsequently engaged cessation treatment. Indeed, 37% of participants who received the tailed intervention reported talking to their doctor about smoking (vs. 12.5% of participants who received the 3A's control). This finding could reflect greater initiative on the

part of participants who received the tailored intervention to engage with their healthcare provider. Given that Clinical Practice Guidelines recommend all smokers receive a brief smoking intervention at every physician visit (Fiore et al., 2008), it is also possible that this finding reflects greater receptivity towards interventions initiated by a healthcare provider. In either case, these results provide initial evidence that the tailored pain-smoking intervention increased willingness to engage future cessation treatment.

Results of the current study contribute to a growing multidisciplinary literature examining pain-smoking interrelations, and suggest that smokers may become more motivated to quit as they become aware of how continued tobacco smoking may interfere with their desired pain outcomes. Results also indicate that a single, brief (i.e., 30 minute) session may be sufficient to increase motivation to quit smoking and engage smoking cessation treatment among smokers in pain. The tailored intervention was designed to be easily implemented in integrated health care models (Funderburk et al., 2010; James & Folen, 2005), and it is possible that the intervention could be employed in medical settings as a means of motivating smokers to quit and connecting them to additional treatment (e.g., smoking cessation medications) in real time. Indeed, previous work has demonstrated that smokers with chronic pain are amenable to pharmacologic smoking interventions (Zale & Ditre, 2013), and *talking to your doctor or using medication* was the most popular cessation treatment option selected by participants in the current study. Among participants who received the tailored intervention, 76% were interested in talking to their doctor/medication, 65% indicated that they intended to engage that treatment in the next 30 days, and 37% reported having talked to their doctor about smoking at one-month follow-up. Thus, these findings suggest that smokers with chronic pain may be receptive to tailored smoking interventions that are designed to promote ongoing engagement with the healthcare system.

Findings that the tailored pain-smoking intervention increased interest and willingness to engage cessation resources are particularly relevant, given that the tailored intervention did not increase self-reported *readiness* to quit. Evidence-based abstinence interventions assist patients in preparing for a quit attempt by setting a quit date, removing smoking related triggers, and developing strategies for coping with cravings and withdrawal symptoms (Cahill, Lancaster, & Green, 2010; Perkins et al., 2008). Although participants who were willing to learn about smoking cessation resources received a description of abstinence-oriented approaches (see Appendix G), neither study intervention included a component specifically designed to support smoking abstinence. Although results of the current study indicate that the tailored pain-smoking intervention has the potential to increase multiple facets of motivation to quit smoking, and additional abstinence-specific treatment components may be needed to increase readiness to engage a serious quit attempt.

It is also notable that participants in the current study reported fairly low levels of formal education, such that 40% of participants did not hold a high school diploma or GED. Although the national prevalence of smoking has declined in the US, there remain significant disparities as a function of educational achievement. In the general population, the prevalence of smoking among persons who completed 9^{th}-11^{th} grade (31.6%) or received a GED (34.1%) is more than double the national rate (15.1%), and when stratified by educational attainment, persons without a high school diploma are the only group to have demonstrated an increase in smoking prevalence over the past decade (Jamal et al., 2016). Thus, participants in the current study are likely representative of a substantial portion of the smoking population. Persons with lower levels of educational attainment are also more likely to demonstrate low levels of health literacy (i.e., the ability process, understand, and use health information) and may have difficulty

communicating with healthcare providers (DHHS, 2008). Indeed, when treating patients with low health literacy, providers tend to endorse low perceived effectiveness and may be reluctant to offer health education to their patients (Seligman et al., 2005). Results of the current study are encouraging because they suggest that low levels of educational attainment are not a barrier to learning or retaining information about complex pain-smoking relations.

Clinical implications of this study include the possibility that health care providers may use pain as a "teachable moment" to discuss smoking cessation with their patients. Consistent with a phase-based framework for smoking cessation (Baker et al., 2011), healthcare providers who deliver the tailored intervention should consider greater motivation towards smoking cessation to be a successful treatment outcome. When possible, providers could capitalize on increased motivation to quit and engage cessation treatment in real-time by immediately linking patients to additional services. For example, healthcare providers can recommend cessation medications, provide brief evidence-based behavioral interventions to support readiness to quit (e.g., strategies for coping with cravings; Fiore et al., 2008) and proactively connect patients to ongoing behavioral support via their state Quitline (i.e., via electronic Refer-to-Quit).

Results of the current study also have the potential to inform future research. First, a fully powered clinical trial is needed to test the effectiveness of the tailored intervention in outpatient medical settings. Such a trial could utilize medical record review to verify chronic pain status and utilization of cessation treatments, as well as collect more detailed follow-up data over multiple assessment points (e.g., number of doctor visits). An effectiveness trial that seeks to evaluate delivery of the tailored intervention in a medical setting could also include a separate component designed to educate providers about pain-smoking interrelations and train providers to talk with their patients about pain and smoking. Second, future clinical trials should utilize a

control condition that includes a motivational intervention without the tailored pain-smoking psychoeducation component (e.g., an intervention that provides general health education). Use of an untailored control intervention that also targets similar motivational processes (e.g., increased knowledge, perceived discrepancy) would allow for tests of the relative effects of pain-specific content above-and-beyond effects of the general motivational components. Third, future research should test whether booster sessions (e.g., in person or via telephone) help to maintain treatment gains in motivation and desire to quit smoking. There is some evidence to suggest that shorter visits at greater frequency contribute to improved cessation outcomes (Fiore et al., 2008), and future research should test the optimal duration and frequency for delivery of the tailored intervention. Fourth, future research should test the potential utility of further modifying the tailored intervention, which was tailored to address smoking in the context of pain among smokers not yet ready to quit, to match participant's specific stage of change (e.g., pre-contemplation via contemplation) at baseline. Finally, future research should examine the utility of delivering a similar intervention via methods that are more cost effective and do not require effort from specialized providers, including internet and smart-phone based interventions (Cunningham, 2007; Riper et al., 2009).

Strengths of the current study include assessment of multiple self-report and behavioral indices of motivation to quit smoking, use of empirical and theoretical conceptualizations of health behavior change to inform treatment development, and recruitment of a generalizable sample of daily tobacco smokers. The current study also recruited participants who were not seeking treatment for smoking cessation, which may increase generalizability to smokers who could encounter the tailored intervention in the course of seeking other healthcare services (e.g., at a regularly scheduled primary care appointment). Despite these strengths, several limitations

should be acknowledged. First, participants were recruited from the community, and we were unable to verify their chronic pain status via medical record review. Second, although research assistants conducted telephone follow-ups, study therapists conducted the in-person research visits, which may have produced demand effects or desirability bias in participant responses. However, we sought to limit these potential effects by leaving participants alone to complete computerized assessments at pre- and post-intervention and assuring participants that all responses were confidential. Third, we conducted a single follow-up assessment at one-month, which may not have provided sufficient time for participants to engage medical services, and it is not known whether participants in both conditions had equal opportunities to engage the healthcare system during the follow-up period. Fourth, we tested the tailored intervention against a 3As intervention that is recommended by Clinical Practice Guidelines and widely used in medical practices (Fiore et al., 2008), which allows for conclusions about how the tailored intervention performed relative to an intervention that participants are likely to receive in the healthcare setting. However, it is not known whether the tailored intervention would serve to increase motivation to quit and engage treatment above-and-beyond an untailored motivational intervention that provides general health information (i.e., is not tailored to address pain-smoking interrelations). Finally, although the 30-minute intervention is consistent with typical visit length for integrated healthcare settings (Funderburk et al., 2010), it may be too long to deliver within a standard medical appointment (Tai-Seale, McGuire, & Zhang, 2007). It is possible that the tailored intervention may require additional adaptation (e.g., changes to visit length or frequency) to achieve optimal feasibility and effectiveness in medical settings.

Taken together, results of the current study indicate that smokers with chronic pain may become more motivated to quit smoking and engage cessation treatment as they become more

aware of how continued smoking may contribute to deleterious pain outcomes. These findings contribute to an emerging literature on complex pain-smoking interrelations, and provide initial support for the hypothesis that smokers with chronic pain may benefit from interventions that have been tailored to address smoking in the context of pain. As such, the current results have the potential to inform the treatment of smokers with chronic pain, including the ongoing development of tailored interventions for this important subpopulation of smokers.

Footnotes

[1] Multiple imputation was considered as an alternative to restricting analyses to participants who provided follow-up data. However, when multiple imputation was used, linear mixed modeling revealed a similar pattern of results. Little's MCAR test also indicated that data were missing completely at random (p = .464). Given recommendations that pairwise or listwise deletion can be used instead of imputation when data are MCAR (Garson, 2015), and evidence from Monte Carlo Simulations that ANOVA performs similarly when samples are restricted to complete data (Cheema, 2014), we elected to report results of analyses among participants who provided follow-up data.

Table 1

Sociodemographic, Smoking, and Pain Characteristics at Baseline

	Intervention Condition		
	Tailored (n = 38)	Control (n = 38)	Total Sample (*N* = 76)
	n (%)	*n* (%)	*n* (%)
Gender			
Male	17 (44.7%)	15 (39.5%)	32 (42.1%)
Female	21 (55.3%)	23 (60.5%)	44 (57.9%)
Race/Ethnicity			
White	19 (50.0%)	21 (53.3%)	40 (52.6%)
Black/African American	15 (46.9%)	17 (53.1%)	32 (42.1%)
Other	4 (10.5%)	0 (0.0%)	4 (5.3%)
Marital status			
Single	18 (47.4%)	25 (65.8%)	43 (56.6%)
Married	4 (10.5%)	2 (5.2%)	6 (7.9%)
Widowed	2 (5.3%)	2 (5.3%)	4 (5.3%)
Divorced/Separated	14 (36.8%)	9 (23.7%)	23 (30.2%)
Education			
Did not graduate high school	16 (40.8%)	15 (39.5%)	31 (40.8%)
Graduated high school	9 (23.7%)	10 (26.3%)	19 (25.0%)
Some college	8 (21.1%)	8 (21.1%)	16 (21.1%)
Technical/Associates degree	5 (13.2%)	4 (10.5%)	9 (11.8%)
Four years of college	0 (0.0%)	1 (2.6%)	1 (1.3%)
Household income			
<10,000	19 (50.0%)	21 (55.3%)	40 (52.6%)
10,000-19,999	11 (28.9%)	9 (23.7%)	20 (26.3%)
20,000-29,999	2 (5.3%)	4 (10.5%)	6 (7.9%)
30,000-39,999	2 (5.3%)	0 (0.0%)	2 (2.6%)
>40,000	4 (10.5%)	4 (10.5%)	8 (10.5%)
Stages of Change			
Precontemplation	15 (39.5%)	12 (31.6%)	27 (35.5%)
Contemplation	18 (47.4%)	21 (55.3%)	39 (51.3%)
Preparation	5 (13.2%)	5 (13.2%)	10 (13.2%)
Previous Attempt to Quit			
Yes	21 (59.2%)	24 (63.2%)	45 (59.2%)
No	17 (44.7%)	14 (36.8%)	31 (40.8%)
Chronic Pain Grade			
I	5 (13.2%)	7 (18.4%)	12 (15.8%)
II	6 (15.8%)	6 (15.8%)	12 (15.8%)
III	8 (21.1%)	9 (23.7%)	17 (22.4%)
IV	19 (50.0%)	16 (42.1%)	35 (46.1%)
Duration of Chronic Pain			
Less than 1 Year	10 (26.3%)	6 (15.8%)	16 (21.1%)
1-3 Years	11 (28.9%)	6 (15.8%)	17 (22.4%)
3-5 Years	2 (5.3%)	7 (18.4%)	9 (11.8%)
5-10 Years	6 (15.8%)	6 (15.8%)	12 (15.8%)

More than 10 Years	9 (28.9%)	13 (34.2%)	22 (28.9%)

***Table 1*. continued**

Frequency of Pain Medication Use			
Never/Rarely	14 (36.8%)	10 (27.0%)	24 (31.6%)
1-3 Times/Month	0 (0.0%)	2 (5.3%)	2 (2.7%)
1-2 Times/Week	6 (16.2%)	6 (15.8%)	12 (16.0%)
Several Times/Week	5 (13.55)	4 (10.5%)	9 (12.0%)
Daily	12 (32.4%)	16 (42.1%)	28 (37.3%)
Prescription Opioid Misuse			
Yes	11 (28.96%)	11 (28.96%)	22 (28.9%)
No	27 (71.1%)	27 (71.1%)	54 (71.1%)
Willing to Learn about Cessation Treatment Options			
Yes	21 (55.3%)	23 (60.5%)	44 (57.9%)
No	17 (44.7%)	15 (39.5%)	32 (42.1%)
Interest in Using Cessation Treatment			
Yes	21 (55.3%)	19 (50%)	40 (52.6%)
No	17 (44.7%)	19 (50%)	36 (47.4%)
Intention to Engage Cessation Treatment			
Yes	9 (23.7%)	13 (34.2%)	22 (28.9%)
No	29 (76.3%)	25 (65.8%)	54 (71.1%)
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Age	42.76 (13.41)	42.79 (13.61)	42.78 (13.42)
Cigarettes per day	20.03 (13.24)	15.26 (6.76)	17.64 (10.71)
Heaviness of Smoking Index	3.58 (1.08)	3.16 (1.31)	3.37 (1.21)
Exhaled CO	14.39 (9.67)	17.03 (9.91)	15.69 (9.81)
Years daily smoking	26.16 (13.44)	25.41 (12.20)	25.79 (12.76)
Past-Year Quit Attempts	1.71 (4.01)	1.74 (2.05)	1.73 (3.16)
Characteristic Pain Intensity	20.66 (4.63)	20.01 (5.74)	20.34 (5.19)
Characteristic Disability	22.16 (10.61)	21.00 (10.90)	21.58 (10.70)
Pain Days in Past 6 Months	128.05 (64.68)	123.60 (67.14)	125.83 (65.52)
Pain-Related Anxiety	58.68 (23.72)	63.29 (25.60)	60.99 (24.62)
Pain-Smoking Expectancies	2.63 (1.51)	2.94 (1.60)	2.79 (1.55)
Alcohol Use	2.42 (3.05)	2.29 (3.25)	2.68 (3.14)
Depression Symptoms	2.63 (2.11)	2.55 (2.13)	2.59 (2.12)
Anxiety Symptoms	2.47 (1.91)	2.95 (2.13)	2.59 (2.01)

Note. No significant differences were observed between treatment conditions.

Table 2

Participant Responses to Items used to Assess Knowledge of Pain-Smoking Interrelations at Baseline, Post-Intervention, and One-Month Follow-Up

	Yes n (%)	No n (%)	Not Sure/ Don't Know n (%)
Baseline			
Can smoking cause chronic pain?			
Tailored	15 (39.5%)	1 (2.6%)	22 (57.9%)
Control	16 (42.1%)	3 (7.9%)	19 (50.0%)
Can smoking make pain worse over time?			
Tailored	17 (44.7%)	1 (2.6%)	20 (52.6%)
Control	16 (42.1%)	2 (5.3%)	20 (52.6%)
Can smoking make it more difficult to function physically despite pain?			
Tailored	24 (63.2%)	1 (2.6%)	13 (34.2%)
Control	21 (55.3%)	2 (5.3%)	15 (39.5%)
Can smoking reduce the effectiveness of prescription pain medications?			
Tailored	10 (26.3%)	2 (5.3%)	26 (68.4%)
Control	9 (23.7%)	3 (7.9%)	26 (68.4%)
Can the experience of pain make people want to smoke or cause them to smoke more?			
Tailored	27 (71.1%)	4 (10.5%)	7 (18.4%)
Control	27 (71.1%)	3 (7.9%)	8 (21.1%)
Can smoking directly reduce pain in a way that is similar to analgesic pain medications?			
Tailored	3 (7.9%)	19 (50.0%)	16 (42.1%)
Control	5 (13.2%)	18 (47.4%)	15 (39.5%)
Can smoking help to distract from pain?			
Tailored	22 (57.9%)	10 (26.3%)	6 (15.8%)
Control	19 (50.0%)	9 (23.7%)	10 (26.3%)
Can quitting smoking help to improve pain and physical function?			
Tailored	21 (55.3%)	2 (5.3%)	15 (39.5%)
Control	23 (60.5%)	1 (2.6%)	14 (36.8%)
Post-Intervention			
Can smoking cause chronic pain?			
Tailored	37 (97.4%)	0 (0.0%)	1 (2.6%)
Control	17 (44.7%)	2 (5.3%)	19 (50.0%)
Can smoking make pain worse over time?			
Tailored	38 (100.0%)	0 (0.0%)	0 (0.0%)
Control	18 (47.4%	1 (2.6%)	19 (50.0%)
Can smoking make it more difficult to function physically despite pain?			
Tailored	37 (97.4%)	0 (0.0%)	1 (2.6%)
Control	19 (50.0%)	6 (15.8%)	13 (34.2%)
Can smoking reduce the effectiveness of prescription pain medications?			
Tailored	36 (94.7%)	1 (2.6%)	1 (2.6%)
Control	12 (31.6%)	5 (13.2%)	21 (55.3%)

Table 2. **continued**			
Can the experience of pain make people want to smoke or cause them to smoke more?			
Tailored	35 (92.1%)	2 (5.3%)	1 (2.6%)
Control	26 (68.4%)	3 (7.9%)	9 (23.7%)
Can smoking directly reduce pain in a way that is similar to analgesic pain medications?			
Tailored	20 (52.6%)	15 (39.9%)	3 (7.9%)
Control	7 (18.4%)	15 (39.5%)	15 (42.1%)
Can smoking help to distract from pain?			
Tailored	27 (71.1%)	9 (23.7%)	2 (5.3%)
Control	24 (63.2%)	7 (18.4%)	7 (18.4%)
Can quitting smoking help to improve pain and physical function?			
Tailored	31 (81.6%)	5 (13.2%)	2 (5.3%)
Control	19 (50.0%)	5 (13.2%)	14 (36.8%)
One-Month Follow-Up			
Can smoking cause chronic pain?			
Tailored	22 (88.0%)	1 (4.0%)	2 (8.0%)
Control	15 (53.6%)	2 (7.1%)	11 (39.3%)
Can smoking make pain worse over time?			
Tailored	24 (96.0%)	0 (0.0%)	1 (4.0%)
Control	14 (50.0%)	1 (3.6%)	13 (46.4%)
Can smoking make it more difficult to function physically despite pain?			
Tailored	23 (90.0%)	0 (0.0%)	2 (8.0%)
Control	18 (64.3%)	5 (17.9%)	5 (17.9%)
Can smoking reduce the effectiveness of prescription pain medications?			
Tailored	17 (68.0%)	1 (4.0%)	7 (28.0%)
Control	11 (39.3%)	5 (17.9%)	12 (42.9%)
Can the experience of pain make people want to smoke or cause them to smoke more?			
Tailored	19 (76.0%)	2 (8.0%)	4 (16.0%)
Control	25 (89.3%)	1 (3.6%)	2 (7.1%)
Can smoking directly reduce pain in a way that is similar to analgesic pain medications?			
Tailored	8 (32.0%)	11 (44.0%)	6 (24.0%)
Control	5 (17.9%)	9 (32.1%)	14 (50.0%
Can smoking help to distract from pain?			
Tailored	18 (72.0%)	3 (12.0%)	4 (16.0%)
Control	19 (67.9%)	5 (17.9%)	4 (14.3%)
Can quitting smoking help to improve pain and physical function?			
Tailored	19 (76.0%)	5 (20.0%)	1 (4.0%)
Control	17 (60.7%)	2 (7.1%)	9 (32.9%)

Note. Baseline and Post-Intervention N = 76; One-Month Follow-Up N = 59, 6 participants had missing data at One-Month Follow-Up for some knowledge items.

Table 3

Unadjusted Means and Standard Deviations of Continuous Outcome Variables at All Time Points

	Baseline *M (SD)*	Post-Intervention *M (SD)*	One-Month Follow-Up *M (SD)*
Knowledge of Pain-Smoking Relations			
Tailored	3.66 (1.82)	6.87 (1.21)	6.00 (1.96)
Control	3.58 (2.07)	3.74 (2.26)	4.43 (2.20)
Contemplation Ladder			
Tailored	5.08 (3.18)	6.87 (3.39)	6.96 (2.63)
Control	5.92 (2.87)	6.03 (2.95)	5.97 (2.87)
Desire to Quit			
Tailored	5.29 (2.97)	6.87 (3.19)	6.69 (2.68)
Control	5.74 (2.67)	6.08 (3.08)	6.52 (3.22)
Expected Success in Quitting			
Tailored	4.16 (2.51)	6.42 (2.99)	6.31 (2.88)
Control	4.32 (2.64)	4.89 (2.77)	5.16 (3.12)
Anticipated Difficulty Quitting			
Tailored	7.45 (2.90)	6.42 (2.87)	7.00 (2.86)
Control	7.00 (2.48)	6.53 (2.67)	7.55 (2.34)
Readiness to Quit			
Tailored	4.11 (3.54)	5.84 (3.97)	5.50 (4.12)
Control	4.97 (3.29)	5.50 (3.34)	5.40 (3.95)
Importance of Quitting			
Tailored	6.55 (3.19)	7.24 (3.05)	8.73 (1.76)
Control	6.84 (2.80)	6.97 (2.93)	7.50 (2.60)
Confidence in Quitting			
Tailored	3.11 (2.81)	4.55 (3.85)	5.19 (4.06)
Control	3.53 (3.12)	3.66 (2.98)	4.43 (2.20)

Note. Baseline and Post-Intervention $N = 76$. One-Month Follow-Up $N = 59$.

Table 4

Adjusted Means and Standard Errors of Continuous Outcome Variables at Post-Intervention

	Intervention Condition	
	Tailored	Control
	M (SE)	*M (SE)*
Knowledge of Pain-Smoking Relations***	6.85 (0.24)	3.76 (0.24)
Contemplation Ladder**	7.19 (0.32)	5.67 (0.32)
Desire to Quit*	7.07 (0.31)	5.88 (0.31)
Expected Success in Quitting**	6.46 (0.33)	4.83 (0.33)
Anticipated Difficulty Quitting	6.36 (0.44)	6.59 (0.44)
Readiness to Quit	6.15 (0.45)	5.19 (0.45)
Importance of Quitting	7.35 (0.29)	6.86 (0.29)
Confidence in Quitting[†]	4.70 (0.44)	3.51 (0.44)

Note. $N = 76$. Means and standard errors adjusted for baseline levels of each respective variable.
*$p < .01$. **$p = .001$. ***$p < .001$. [†]$p = .059$.

Table 5

Intercorrelations between Measures of Motivation to Quit Smoking at Baseline

	1.	2.	3.	4.	5.	6.	7.
1. Contemplation Ladder	--	.69***	.42***	.23*	.76***	.78***	.55***
2. Desire to Quit		--	.60***	.23*	.76***	.78***	.55***
3. Expected Success in Quitting			--	.01	.42***	.46***	.44***
4. Anticipated Difficulty Quitting				--	.08	.13	-.06
5. Readiness to Quit					--	.66***	.67***
6. Importance of Quitting						--	.48***
7. Confidence in Quitting							--

Note. N= 76.
*$p < .01$. ***$p < .001$.

Table 6

Post-Intervention Willingness to Learn About, Interest in, and Intention to Engage Available Smoking Cessation Treatments

	Intervention Condition		
	Tailored *n (%)*	Control *n (%)*	*OR [95% CI]*
Willing to learn about treatment resources	36 (94.7%)	28 (77.8%)	7.74 [1.49, 40.30]*
Interested in using cessation treatment	36 (94.7%)	25 (65.8%)	9.55 [1.94, 47.02]**
Talk to doctor/medication	32 (84.2%)	21 (55.3%)	4.27 [1.37, 13.28]*
Quitline	29 (76.3%)	7 (18.4%)	18.81 [5.35, 66.07]*
Behavioral Health	9 (23.7%)	1 (2.6%)	11.78 [1.40, 99.88]*
Intention to engage treatment resources	30 (78.9%)	18 (47.4%)	5.15 [1.77, 14.96]**
Talk to doctor/medication	25 (65.8%)	14 (36.8%)	4.04 [1.47, 11.09]**
Quitline	22 (57.9%)	6 (15.8%)	9.80 [2.91, 33.02]***
Behavioral Health	3 (7.9%)	1 (2.6%)	2.91 [0.29, 29.43]

Note. $N = 76$. Odds Ratio (OR) adjusted for baseline levels of each respective variable.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 7

Participant Comments about the Tailored Intervention

Perceived Discrepancy	Participant Comment
Yes	being able to not have this chronic pain anymore
	decrease in pain
	I dont want to be in pain for the rest of my life
	making my pain feel better
	my pain
	pain
	Smoking and how it can worsen my pain
	that my smoking does have a impact on my pain
	that smoke can also cause pain
	the information on how smoking was making my pain worst
	the link between my chronic pain and smoking
No	about the brain and having to depend on others
	all aspects
	Because I'm not ready
	carbon monoxide level
	everything was helpfu
	health
	help factors available
	mabey
	more info on smoking
	no desire to quit
	no it did not.I dont want to quit
	suffice info
	not ready
	talking about all the negative impacts of smoking
	telling me my carbon levels are high
	the scale
	trying to understand why i smoke
	yes
	very much

Note. Six participants did not provide a comment. All comments are exactly as typed by participants; spelling and grammatical errors have not been corrected.

Table 8

Participant Satisfaction with the Tailored and Control Interventions

	Intervention Condition	
	Tailored *M (SD)*	Control *M (SD)*
Quality of Service**	2.63 (0.49)	2.21 (0.66)
Satisfaction with Service**	2.71 (0.46)	2.24 (0.79)
Would Seek Services Again**	2.55 (0.60)	2.21 (0.81)
Got Service You Wanted**	2.55 (0.56)	2.11 (0.65)
Service Met Your Needs***	2.45 (0.72)	1.76 (0.75)
Recommend Service to a Friend*	2.71 (0.46)	2.24 (0.71)
Satisfaction with Amount of Help Received*	2.55 (0.76)	2.16 (0.92)
Services Helped You Deal More Effectively with Problems**	2.45 (0.60)	1.95 (0.70)

Note. All response scales 0-3, with higher scores representing greater satisfaction.
*$p < .05$. **$p < .01$. ***$p < .001$.

<table>
<tr><th>Recruitment</th><th colspan="4">In-person Session</th><th>One-Month Follow-Up</th></tr>
<tr><td rowspan="2">Telephone Screening</td><td rowspan="2">Computerized Baseline Measures and Randomization [15 minutes]</td><td>Active</td><td>Tailored Intervention [30 minutes]</td><td rowspan="2">Computerized Outcome Measures [15 minutes]</td><td rowspan="2">Telephone Outcome Measures [15 minutes]</td></tr>
<tr><td>Control</td><td>Control Intervention [10 minutes]</td></tr>
</table>

Figure 1. Study timeline.

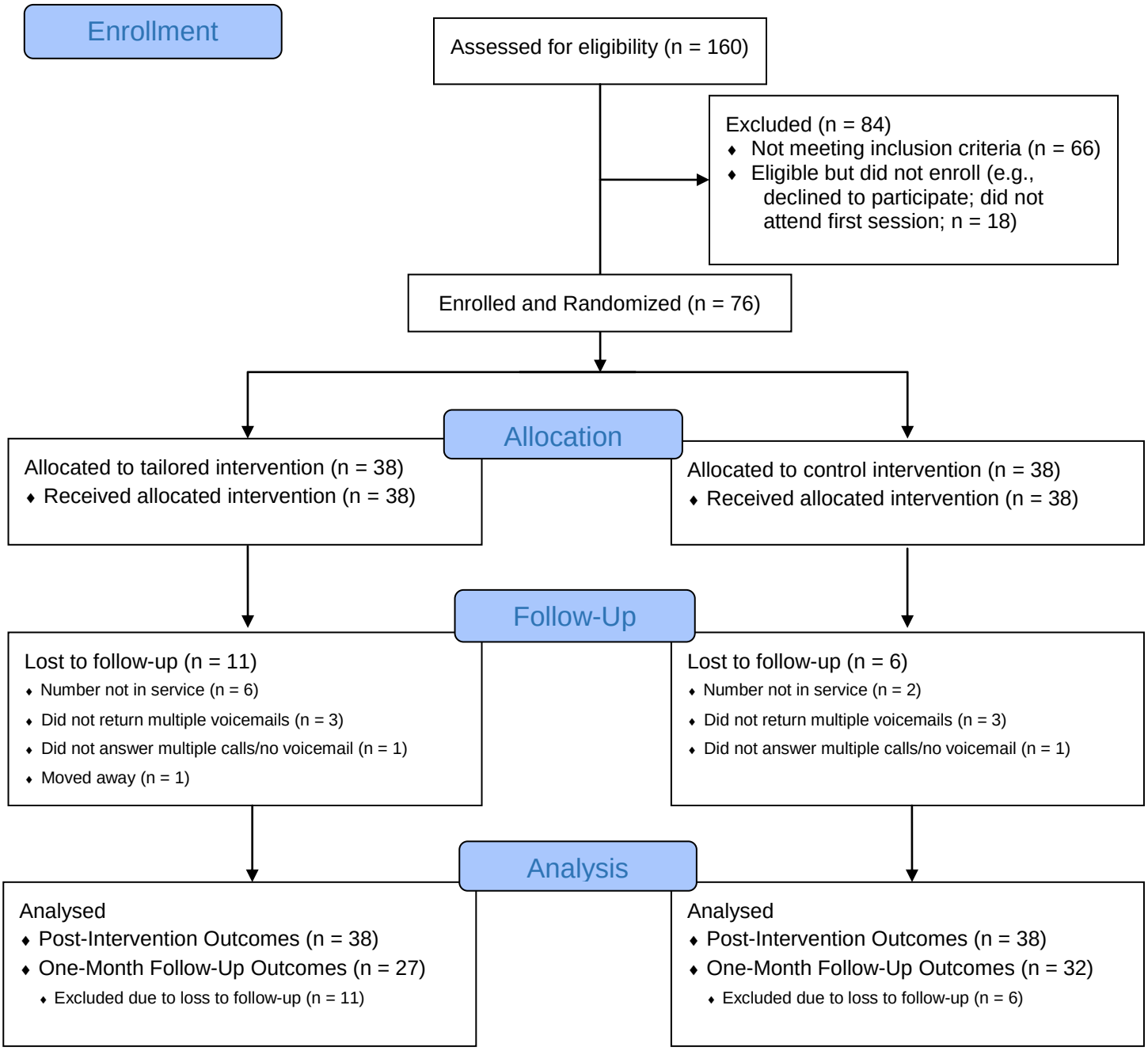


Figure 2. Participant flow chart following CONSORT guidelines.

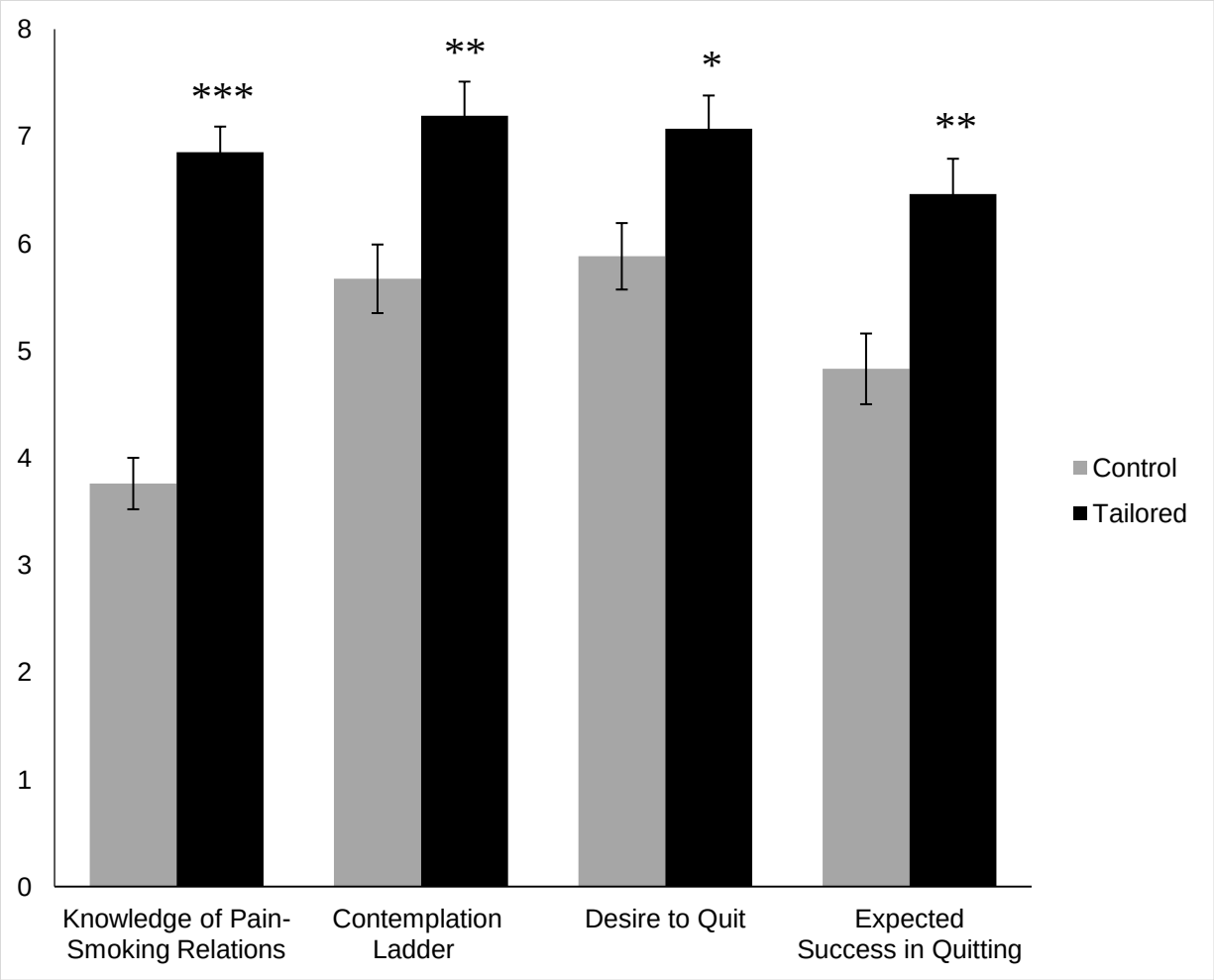


Figure 3. Post-intervention mean (adjusted) knowledge of pain-smoking interrelations and motivation to quit as a function of intervention condition. Error bars represent standard error. * $p < .01$. ** $p = .001$. *** $p < .001$.

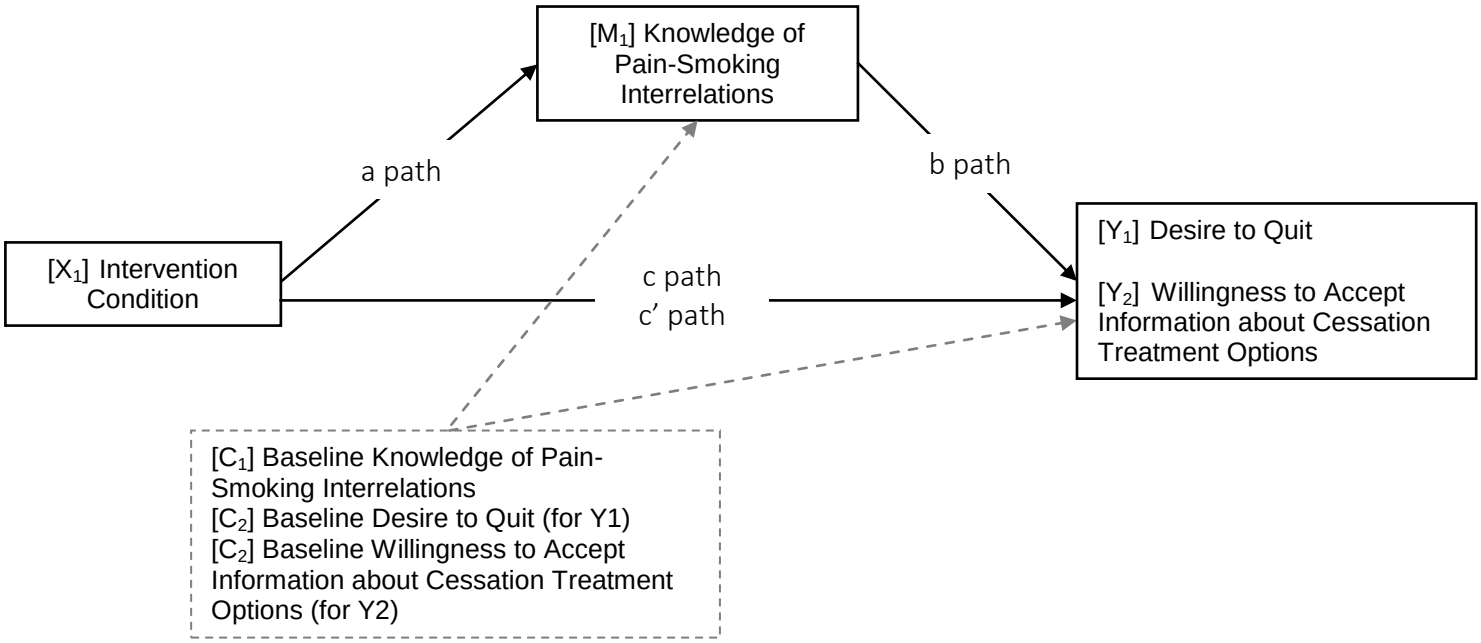


Figure 4. Conceptual model of indirect associations between the tailored intervention and greater post-intervention desire to quit and willingness to accept information about cessation treatment via increased knowledge of pain-smoking interrelations. X = independent variable. M = mediating variable. Y = Dependent Variable. C = Covariate.

Appendix A

Measures

Screening Items

1. Do you now smoke cigarettes (*read choices)*:
   _____ Not at all
   _____ Some Days
   _____ Every Day

2. Over the last week, how many cigarettes did you smoke per day on average? _____

3. Are you currently in treatment to help you quit smoking. By treatment I mean seeing a counselor or therapist, using the quitline, or using a smoking cessation medication like patches or gum. *Check all that apply:*
   _____ No
   _____ Yes, using medication, Clarify type of medication _____
   _____ Yes, seeing counselor or therapist
   _____ Yes, Quitline

4. How much bodily pain have you had during the past 4 weeks? (*read choices)*
   _____ None
   _____ Mild
   _____ Moderate
   _____ Severe
   _____ Very Severe

5. Do you currently suffer from any type of chronic pain, that is, pain that occurs constantly or flares up frequently? Do not report aches or pains that are fleeting or minor
   _____ No
   _____ Yes

6. Using a 0 – 10 scale, where 0 is "no pain" and 10 is "pain as bad as could be"… During the last 3 months, ON AVERAGE, how would you rate your pain?

   No Pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10

Thoughts About Abstinence Scale

First, I'd like to know how you feel about stopping smoking cigarettes at this time. On a scale from 1 to 10, with 1 representing no desire to quit and 10 representing full desire to quit, give yourself a rating. Chose the number between 1 and 10 that best describes your own desire to stop smoking cigarettes at this time. Remember, the higher the number, the greater your desire.

- ❍ No Desire to Quit 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Full Desire to Quit 10

Now I'd like to know how successful you expect to be quitting smoking cigarettes at this time. Be realistic about this, based on your past experiences and your present strength of motivation. On a scale from 1 to 10, with 1 representing the lowest expectation of success and 10 representing the highest expectation of success, give yourself a rating of your own expectation of success in quitting smoking cigarettes. Remember, the higher the number the greater the expectation of success.

- ❍ Lowest Expectation of Success 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Highest Expectation of Success 10

Now I'd like to know how difficult you think it will be for you to keep from smoking cigarettes after having quit. On a scale from 1 to 10, with 1 representing the lowest amount of difficulty and 10 representing the greatest amount of difficulty, give yourself a rating of how difficult you think it will be for you to quit and remain abstinent. Remember, the higher the number, the more difficult you think it will be for you to quit.

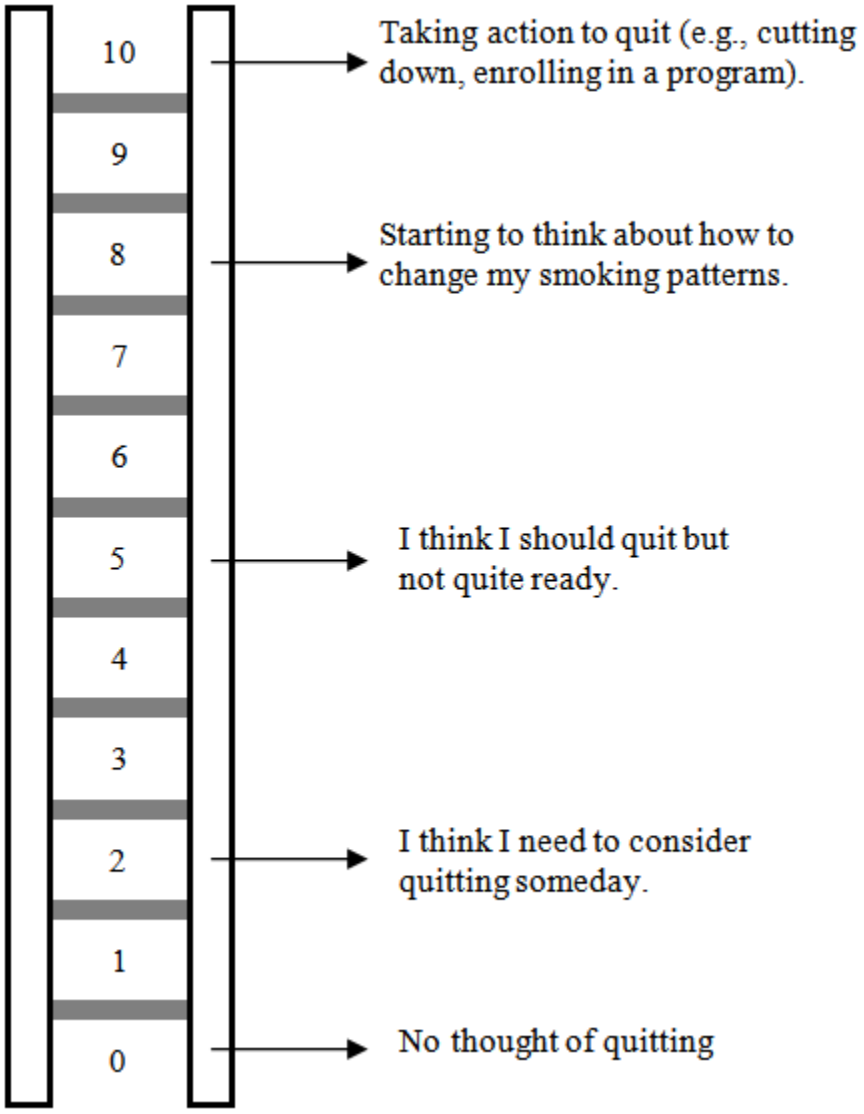
- ❍ Lowest Amount of Difficulty 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Highest Amount of Difficulty 10

Lastly, I want to know the GOAL you have chosen for yourself about smoking cigarettes at this time. Please read the goals listed on this page and circle the one goal that best represents your own goal at this time, and fill in blanks as indicated.

- ❍ I really don't have a clear goal in mind.
- ❍ I want to use cigarettes in a controlled manner – to be in control of how often I smoke and how much I smoke. I would like to limit that to no more than _____ (amount) per _____ (time). _____
- ❍ I want to be totally abstinent from all cigarette use for a period of time, after which I will make a new decision about whether or not I will smoke cigarettes again. For me, the time period I want to be abstinent for is: _____
- ❍ I don't want smoking cigarettes to be a habit for me anymore, but I would like to be able to occasionally smoke cigarettes when I really have an urge.
- ❍ I want to quit smoking cigarettes once and for all, even though I realize I may slip up and smoke cigarettes once and a while.
- ❍ I want to quit smoking cigarettes once and for all, be totally abstinent, and never smoke cigarettes ever again for the rest of my life.
- ❍ None of the above applies exactly to me. My own goal is: _____

Contemplation Ladder

Each rung on this ladder represents where various smokers are in their thinking about quitting. Click on the number that indicates where you are now. Please select only one number.



Motivation Rulers

How important is stopping smoking to you?

- ❍ Not Important at All 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Most important goal of my life 10

How ready are you to quit smoking within the next month?

- ❍ Not at All Ready 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 100% Ready 10

How confident are you that you will quit smoking within the next month?

- ❍ Not at All Confident 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 100% Confident 10

Pain and Smoking Questionnaire

Below are a series of questions about relations between tobacco smoking and various health conditions. We are interested in what you have already learned or know to be true (yes/no) versus what you may not yet know or be sure about (not sure/don't know). In other words, these questions are not asking about your opinions on these topics, but rather what you do or do not know to be true according to scientific research findings.

Please indicate whether smoking has been associated with each of the following health problems/conditions:

	Yes	No	Not Sure/Don't Know
Lung Cancer	❍	❍	❍
Chronic Obstructive Pulmonary Disease (COPD)	❍	❍	❍
Heart Disease	❍	❍	❍
Oral Disease	❍	❍	❍
Pregnancy Complications	❍	❍	❍
Infertility	❍	❍	❍
HIV	❍	❍	❍
Chronic Pain	❍	❍	❍
Diabetes	❍	❍	❍

Please indicate whether smoking is a known risk factor for each of the following health problems/conditions:

	Yes	No	Not Sure/Don't Know
Lung Cancer	❍	❍	❍
Heart Disease	❍	❍	❍
Chronic Pain	❍	❍	❍
Diabetes	❍	❍	❍

Has any health care provider ever talked to you about relationships between:

	Yes	No	Not Sure/Don't Know
Smoking and lung cancer	❍	❍	❍
Smoking and heart disease	❍	❍	❍
Smoking and chronic pain	❍	❍	❍
Smoking and diabetes	❍	❍	❍

Can smoking cause chronic pain?
- ❍ Yes
- ❍ No
- ❍ Not Sure/Don't Know

Can smoking make pain worse over time?
- ❍ Yes
- ❍ No
- ❍ Not Sure/Don't Know

Can smoking make it more difficulty to function physically despite pain?
- ❍ Yes
- ❍ No
- ❍ Not Sure/Don't Know

Can smoking reduce the effectiveness of prescription pain medications?
- ❍ Yes
- ❍ No
- ❍ Not Sure/Don't Know

Can the experience of pain make people want to smoke or cause them to smoke more?
- ❍ Yes
- ❍ No
- ❍ Not Sure/Don't Know

Can smoking directly reduce pain in a way that is similar to analgesic pain medications?
- ❍ Yes
- ❍ No
- ❍ Not Sure/Don't Know

Can smoking help to distract from pain?

- ❍ Yes
- ❍ No
- ❍ Not Sure/Don't Know

Can quitting smoking help to improve pain and physical functioning?

- ❍ Yes
- ❍ No
- ❍ Not Sure/Don't Know

Cessation Treatment Engagement

Would you like to learn about options for treatment to help you quit smoking?

- ❍ No
- ❍ Yes

Are you interested in learning more about (Check all that apply)

- ❑ Medication/Primary Care
- ❑ Quitline
- ❑ Behavioral Health
- ❑ None of the Above

Do you PLAN TO ENROLL in any treatment in the next 30 days? (Check all that apply)

- ❑ Medication/Primary Care
- ❑ Quitline
- ❑ Behavioral Health
- ❑ None of the Above

Demographics Form

The following questions are about yourself and your life situation. All answers will be kept confidential.

Gender
- ❍ Male
- ❍ Female

What is your age?

Date of Birth (mm/dd/yyyy)

What is your marital status? (Choose one)
- ❍ Single
- ❍ Married
- ❍ Separated
- ❍ Divorced
- ❍ Widowed

With which racial category do you most identify yourself? (Choose one)
- ❍ American Indian/Alaska Native
- ❍ Asian
- ❍ Native Hawaiian or Other Pacific Islander
- ❍ Black or African American
- ❍ White
- ❍ Other _____

Are you Hispanic/Latino?
- ❍ Yes
- ❍ No

What is the highest grade level you have completed? (Choose one)
- ❍ Did not graduate high school
- ❍ High school graduate
- ❍ Some college
- ❍ Technical school/Associates degree
- ❍ 4-year college degree
- ❍ Some school beyond 4-year college degree
- ❍ Professional degree (e.g. MD, JD, PhD)

What is your total household income? (Choose one)

- ❍ Under $10,000
- ❍ $10,000-$19,999
- ❍ $20,000-$29,999
- ❍ $30,000-$39,999
- ❍ $40,000-$49,999
- ❍ $50,000-$59,999
- ❍ $60,000-$69,999
- ❍ $70,000-$79,999
- ❍ $80,000-$89,999
- ❍ Over $90,000

Heaviness of Smoking Index

How soon after you wake up do you smoke your first cigarette?

- ❍ Within 5 minutes
- ❍ 6-30 minutes
- ❍ 31-60 minutes
- ❍ After 60 minutes

How many cigarettes per day do you smoke?

- ❍ 10 or less
- ❍ 11 - 20
- ❍ 21 - 30
- ❍ 31 or more

Smoking History Form

How old were you when you started smoking?

For how many years, altogether, have you been a regular/daily smoker?

Over the last week, how many cigarettes did you smoke per day on average?

Have you ever made a serious attempt to quit smoking?
- ❍ Yes
- ❍ No

How many different times in the past year have you made a serious attempt to quit smoking and stayed off cigarettes for 24 hours or more?

How many different times in your life have you made a serious attempt to quit smoking and stayed off cigarettes for 24 hours or more?

What is the longest period of time that you have ever been able to quit smoking? Please select one answer.
- ❍ Hours _____
- ❍ Days _____
- ❍ Months _____
- ❍ Years _____

How hard was it for you to quit smoking on your most recent quit attempt?
- ❍ Easy
- ❍ Slightly Difficult
- ❍ Difficult
- ❍ Very Difficult

If you quit smoking now, how confident are you that you could go without smoking for

	No Confidence	A little Confidence	Moderately Confident	Very Confident	Extremely Confident
One Week	❍	❍	❍	❍	❍
One Month	❍	❍	❍	❍	❍
One Year	❍	❍	❍	❍	❍

Do you currently use any other forms of nicotine or tobacco? (Select all that apply)

- ❑ I do not use any other forms of nicotine or tobacco
- ❑ Cigar or cigarillo
- ❑ Smokeless tobacco (e.g., chew, dip, snus, snuff)
- ❑ Pipe tobacco
- ❑ Hookah
- ❑ Electronic Cigarette (e-cig) or Nicotine Vaporizer
- ❑ Nicotine gum, patch, or lozenge
- ❑ Other (please specify) _____

Stages of Change Algorithm

In the last year, how many times have you quit smoking for at least 24 hours?

Are you seriously thinking of quitting smoking?

- ❍ No, not thinking of quitting
- ❍ Yes, within the next 6 months
- ❍ Yes, within the next 30 days

Pain and Smoking Inventory

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:

	Not true at all 0	1	2	Somewhat true 3	4	5	Extremely true 6
1. Smoking helps me cope with my pain.	❍	❍	❍	❍	❍	❍	❍
2. The number of cigarettes I smoke per day is often influenced by my pain.	❍	❍	❍	❍	❍	❍	❍
3. When my pain flares up I want to have a cigarette.	❍	❍	❍	❍	❍	❍	❍
4. My pain makes me less confident that I could stop smoking for good.	❍	❍	❍	❍	❍	❍	❍
5. Smoking a cigarette helps me think about something other than my pain.	❍	❍	❍	❍	❍	❍	❍
6. My pain would interfere with any attempt I make to quit smoking.	❍	❍	❍	❍	❍	❍	❍
7. Feeling pain makes me want to smoke.	❍	❍	❍	❍	❍	❍	❍
8. My pain prevents me from trying to quit smoking.	❍	❍	❍	❍	❍	❍	❍
9. Smoking helps me cope with the stress and unhappiness that comes with pain.	❍	❍	❍	❍	❍	❍	❍

Graded Chronic Pain Scale

On how many days in the last 180 days (6 months) have you had pain?

How would you rate your pain RIGHT NOW?

- ❍ No Pain 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Pain as bad as could be 10

In the last 3 months, how would you rate your WORST pain?

- ❍ No Pain 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Pain as bad as could be 10

In the last 3 months, ON AVERAGE, how would you rate your pain?

- ❍ No Pain 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Pain as bad as could be 10

In the last 3 months, how many days did pain keep you from doing DAILY ACTIVITIES (work, school, homework)?

- ❍ None
- ❍ 1
- ❍ 2
- ❍ 3-4
- ❍ 5-6
- ❍ 7-10
- ❍ 11-15
- ❍ 16-24
- ❍ 25-60
- ❍ 61-75
- ❍ 76-90

In the last 3 months, how much has pain interfered with your DAILY ACTIVITIES?

- ❍ No Interference 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Unable to carry on any activities 10

In the last 3 months, how much has pain interfered with your RECREATIONAL, SOCIAL, & FAMILY ACTIVITIES?

- ❍ No Interference 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Unable to carry on any activities 10

In the last 3 months, how much has pain interfered with your ABILITY TO WORK, including housework?

- ❍ No Interference 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ Unable to carry on any activities 10

Pain History

How long have you been experiencing chronic pain?

- ❍ Less than 3 months
- ❍ 4 to 6 months
- ❍ 7 to 12 months
- ❍ Over 1 year to 3 years
- ❍ Over 3 years to 5 years
- ❍ Over 5 years to 10 years
- ❍ Over 10 years

How old were you when you first experienced this type of pain?

How often do you experience this pain?

- ❍ It's constant, always there
- ❍ At least once a day
- ❍ At least once a week
- ❍ Not every week, but at least once a month
- ❍ Less often

What is the cause of your pain

- ❑ Chronic Back Pain
- ❑ Chronic Low Back Pain
- ❑ Chronic Neck Pain
- ❑ Frequent or Severe Headaches
- ❑ Cluster Headaches
- ❑ Migraines
- ❑ Arthritis/Rheumatism
- ❑ Fibromyalgia
- ❑ Musculoskeletal Pain
- ❑ Neuropathic Pain
- ❑ Other _____

Do you currently have medically unexplained chronic pain? This is defined as pain lasting six months or longer that is severe enough to either interfere a lot with your normal activities or to cause a lot of emotional distress and that a doctor cannot find a physical cause to explain.

- ❍ Yes
- ❍ No

How many doctors have you seen about your pain?

How satisfied are you with how your doctor is helping you manage your pain?
- ❍ Very Satisfied
- ❍ Satisfied
- ❍ Dissatisfied
- ❍ Very dissatisfied
- ❍ I have not seen my doctor about pain.

Have you received treatment from a pain specialist or pain treatment program?
- ❍ Yes, previously
- ❍ Yes, currently
- ❍ No

How satisfied are you with how your pain specialist/pain treatment program is helping you manage your pain?
- ❍ Very Satisfied
- ❍ Satisfied
- ❍ Dissatisfied
- ❍ Very Dissatisfied
- ❍ I have never received treatment from a pain specialist/pain treatment program.

How often do you take any medication to treat your pain?
- ❍ Daily
- ❍ Several times a week
- ❍ One or two times a week
- ❍ One to three times a month
- ❍ Rarely
- ❍ Never

What types of medication are you taking for your pain (Check all that apply)?
- ☐ Over the counter non steroidal anti-inflammatory drugs (NSAIDS, e.g., ibuprofen or naproxen)
- ☐ Over the counter pain relievers such as aspirin or acetaminophen
- ☐ Over the counter topical treatments (patch, cream)
- ☐ Prescription nonsteroidal anti-inflammatory drugs (NSAIDS, e.g., ibuprofen or naproxen)
- ☐ Prescription pain relievers such as aspirin or acetaminophen
- ☐ Prescription topical treatments (patch, cream)
- ☐ Prescription opioid/narcotic medication (e.g., OxyContin, Percocet, Vicodin)
- ☐ I do not ever take medication for my pain

Pain Anxiety Symptoms Scale

Please rate how often you do each of these things when you are in pain using the following scale:

	Never 0	1	2	Some-times 3	4	5	Always 6
1. I think that if my pain gets too severe, it will never decrease.	❍	❍	❍	❍	❍	❍	❍
2. When I feel pain I am afraid that something terrible will happen.	❍	❍	❍	❍	❍	❍	❍
3. I go immediately to bed when I feel severe pain.	❍	❍	❍	❍	❍	❍	❍
4. I begin trembling when engaged in an activity that increases pain.	❍	❍	❍	❍	❍	❍	❍
5. I can't think straight when in pain.	❍	❍	❍	❍	❍	❍	❍
6. I will stop any activity as soon as I sense pain coming on.	❍	❍	❍	❍	❍	❍	❍
7. Pain seems to cause my heart to pound or race.	❍	❍	❍	❍	❍	❍	❍
8. As soon as pain comes on I take medication to reduce it.	❍	❍	❍	❍	❍	❍	❍
9. When I feel pain I think I might be seriously ill.	❍	❍	❍	❍	❍	❍	❍
10. During painful episodes it is difficult for me to think of anything besides the pain.	❍	❍	❍	❍	❍	❍	❍
11. I avoid important activities when I hurt.	❍	❍	❍	❍	❍	❍	❍
12. When I sense pain I feel dizzy or faint.	❍	❍	❍	❍	❍	❍	❍
13. Pain sensations are terrifying.	❍	❍	❍	❍	❍	❍	❍
14. When I hurt I think about pain constantly.	❍	❍	❍	❍	❍	❍	❍
15. Pain makes me nauseous.	❍	❍	❍	❍	❍	❍	❍
16. When pain comes on strong I think that I might become paralyzed or more disabled.	❍	❍	❍	❍	❍	❍	❍
17. I find it hard to concentrate when I hurt.	❍	❍	❍	❍	❍	❍	❍
18. I find it difficult to calm my body down after periods of pain.	❍	❍	❍	❍	❍	❍	❍
19. I worry when I am in pain.	❍	❍	❍	❍	❍	❍	❍
20. I try to avoid activities that cause pain.	❍	❍	❍	❍	❍	❍	❍

Prescription Opioid Misuse Index

Please answer the following questions regarding your use of prescription analgesic/opioid medications only.

Do you ever use MORE of your medication, that is, take a higher dosage, than is prescribed for you?

- ❍ Yes
- ❍ No

Do you ever use your medication MORE OFTEN, that is, shorten the time between dosages, than is prescribed for you?

- ❍ Yes
- ❍ No

Do you ever need early refills for your pain medication?

- ❍ Yes
- ❍ No

Do you ever feel high or get a buzz after using your pain medication?

- ❍ Yes
- ❍ No

Do you ever take your pain medication because you are upset, using the medication to relieve or cope with problems other than pain?

- ❍ Yes
- ❍ No

Have you ever gone to multiple physicians including emergency doctors, seeking more of your pain medication?

- ❍ Yes
- ❍ No

Patient Health Questionnaire-4

Over the past 2 weeks have you been bothered by any of the following problems?

	0	1	2	3
Feeling nervous, anxious, or on edge.	❍	❍	❍	❍
Not being able to stop or control worrying.	❍	❍	❍	❍
Little interest or pleasure in doing things.	❍	❍	❍	❍
Feeling down, depressed, or hopeless.	❍	❍	❍	❍

Alcohol Use Disorders Identification Test-C

Think about your drinking over the past year. Please select the response that represents the best answer for you. One standard drink is equal to: 12 Oz Beer or Wine Cooler 5 Oz Glass of Wine 1.5 Oz Distilled Spirits

How often do you have a drink containing alcohol?

- ❍ Never
- ❍ Monthly
- ❍ 2-4 times a month
- ❍ 2-3 times a week
- ❍ 4 or more times a week

How many drinks containing alcohol do you have on a typical day when you are drinking?

- ❍ 0, I do not drink alcohol
- ❍ 1 or 2
- ❍ 3 or 4
- ❍ 5 or 6
- ❍ 7 to 9
- ❍ 10 or more

How often do you have six or more drinks on one occasion?

- ❍ Never
- ❍ Less than Monthly
- ❍ Montly
- ❍ Weekly
- ❍ Daily or Almost Daily

Previous Smoking Cessation Treatment

Have you ever received services to help you quit smoking?

- ❑ No
- ❑ Yes, I received counseling or therapy
- ❑ Yes, I received medication
- ❑ Yes, I called the Quitline
- ❑ Yes, I talked to my doctor
- ❑ Yes, I attended the VA QuitSmart Program

Client Satisfaction Questionnaire

Please tell us about the services you have received to help you quit smoking. We are interested in your honest opinions, whether they are positive or negative. Please answer all of the questions. We also welcome your comments and suggestions.

How would you rate the quality of service you received?
- ❍ Poor
- ❍ Fair
- ❍ Good
- ❍ Excellent

Did you get the kind of service you wanted?
- ❍ No, definitely not
- ❍ No, not really
- ❍ Yes, generally
- ❍ Yes, definitely

To what extent did the services meet your needs?
- ❍ None of my needs have been met
- ❍ Only a few of my needs have been met
- ❍ Most of my needs have been met
- ❍ Almost all of my needs have been met

If a friend were in need of similar help, would you recommend the services to him/her?
- ❍ No, definitely not
- ❍ No, I don't think so
- ❍ Yes, I think so
- ❍ Yes, definitely

How satisfied are you with the amount of help you received?
- ❍ Very Dissatisfied
- ❍ Mildly Dissatisfied
- ❍ Mildly Satisfied
- ❍ Very Satisfied

Have the services you received helped you to deal more effectively with your problems?
- ❍ No, they seemed to make them worse
- ❍ No, they didn't really help
- ❍ Yes, they helped somewhat
- ❍ Yes, they helped a great deal

In an overall general sense, how satisfied are you with the services you received?
- ❍ Very Dissatisfied
- ❍ Mildly Dissatisfied
- ❍ Mildly Satisfied
- ❍ Very Satisfied

If you were to seek help again, would you use these services again?
- ❍ No, definitely not
- ❍ No, I don't think so
- ❍ Yes, I think so
- ❍ Yes, definitely

Write additional comments below

On a scale from 1 to 5, rate how helpful you felt the handout was?
- ❍ Not at all helpful 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ Extremely helpful 5

What parts of the handout did you like best?

What parts of the handout did you not like?

On a scale from 1 to 5, rate how understandable you felt the handout was?
- ❍ Not at all understandable 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ Extremely understandable 5

Were there any things you would recommend changing to improve the understandability of the handout?

Did you feel the meeting with me helped improve your motivation to quit smoking?
- ❍ Yes; if so, what aspects of the meeting led you to want to quit? _____
- ❍ No; if so, why not? _____

On a scale from 1 to 5, rate how satisfied you would be with the format of the discussion if you were meeting with me at your doctors office after reporting that you are a current smoker?

- ❍ Not at all satisfied 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ Extremely satisfied 5

Would you prefer to have the discussion over the phone instead of in person?

- ❍ Yes
- ❍ No

Would you prefer to have the discussion over the internet instead of in person?

- ❍ Yes
- ❍ No

On a scale from 1 to 5, rate how satisfied you would be with the length of time of the discussion?

- ❍ Not at all satisfied 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ Extremely satisfied 5

Smoking Behavior at One-Month Follow-Up

Do you now smoke cigarettes?
- ❍ Not at all
- ❍ Some Days
- ❍ Every Day

Over the last week, how many cigarettes did you smoke per day on average?

In the past month, have you cut down on your smoking?
- ❍ Yes
- ❍ No

In the past month, did you quit smoking for at least 24 hours?
- ❍ Yes (if yes, how many times?) _____
- ❍ No

In the past month, did you talk to your doctor about your smoking?
- ❍ Yes
- ❍ No

In the past month, did you start using a medication to help you quit smoking? (check all that apply)
- ❑ No
- ❑ Over the Counter NRT (patch, gum, lozenge)
- ❑ Prescription NRT (inhaler, spray)
- ❑ Non-NRT Prescription (Chantix/Zyban)

In the past month, did you see a behavioral health provider about your smoking?
- ❍ Yes
- ❍ No

In the past month, did you call the quitline?
- ❍ Yes
- ❍ No

Appendix B

Therapist Guide for the Tailored Intervention

Intervention Component: Personalized Feedback

Rationale

- Feedback about personal risk and impairment is an essential component of brief substance use interventions (SAMHSA, 2012).
- Personalized feedback is a component of existing evidence-based motivational smoking interventions (e.g., Emmons, 2007).

Content

- Smoking History (e.g., tobacco dependence, baseline motivation to quit)
- Pain Complaint (e.g., pain intensity, pain-related disability)
- Pain-Smoking Expectancies (e.g., smoking as a means for pain coping)

Intervention Component: Pain-Smoking Psychoeducation

Rationale

- According to the Health Belief Model, individuals are more likely to change an unhealthy behavior if they believe that (a) they are susceptible to negative health outcomes, (b) the negative health outcomes will be severe in nature, and (c) behavior change will be effective in alleviating or reducing these negative outcomes (Champion & Skinner, 2008).
- Providing smokers with a clear and explicit link between smoking and illness has been shown to increase motivation to quit (McCaul et al., 2006).

Content

- Reciprocal relations between pain and smoking
- Evidence that smoking may:
    - Cause chronic pain
    - Increase pain intensity and disability over time
    - Interfere with pain treatment
- Smoking in order to cope with pain may lead to worse pain outcomes
- Smokers may experience clinically meaningful improvement in pain severity after quitting

Intervention Component: Develop Discrepancy between Smoking and Desired Pain Outcomes

Rationale

- The Transtheoretical Model (e.g., Prochaska & DiClemente, 1983) predicts that smokers may be motivated to progress towards behavior change as they come to perceive discrepancy between positive and negative effects of smoking.
- Developing discrepancy between continued smoking and desired outcomes is a core component of existing evidence-based motivational smoking interventions (e.g., Emmons, 2007).
- The "5 R's" (relevance, risk, reward, roadblock, repetition) are recommended by Clinical Practice Guidelines as a brief motivational smoking intervention (Fiore et al., 2008)

Content

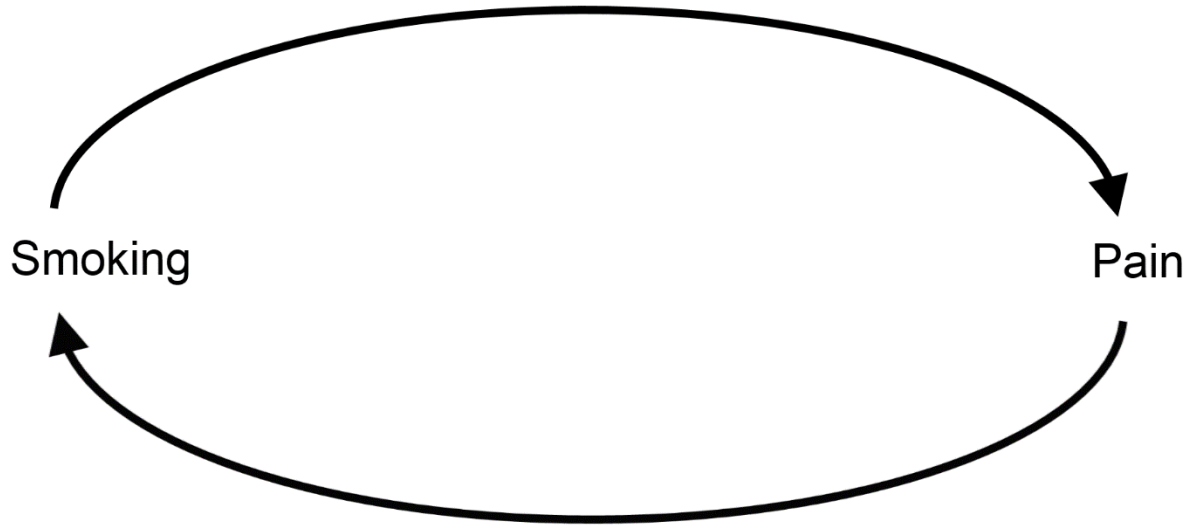
- Elicit desired pain outcomes
- Risks/benefits of smoking with an emphasis on pain outcomes
- "5 R's"
    - Relevance of quitting to pain and desired pain outcomes
    - Risks of continued smoking to pain and pain outcomes
    - Rewards of quitting for pain and pain outcomes
    - Roadblocks to quitting; engagement of smoking cessation treatment to address roadblocks
    - Repetition (smoking requires repeated attempts to quit, engagement of smoking cessation treatment can assist future quit attempts and improve chances of success)

Appendix C

Psychoeducation Handout for the Tailored Intervention

You might be interested to know …

- Smoking causes chronic pain!
- Smoking makes pain worse over time!
- Smoking can interfere with pain treatment!



Even if pain makes some people want to smoke…

- Smoking to cope with pain has been linked to worse pain over time!

But… there's <u>GOOD NEWS</u>!

People who quit smoking have lower pain and can get back to doing the things they enjoy!

Appendix D

Therapist Guide for the Control Intervention

All components of the control intervention are consistent with the US Department of Health and Human Services Clinical Practice Guidelines (Fiore et al., 2008) recommendations for the 3As (i.e., Ask, Advise, Arrange) brief smoking intervention.

Intervention Component: Ask

Rationale

- Clinical Practice Guidelines recommends that all smokers be asked about current smoking (Fiore et al., 2008)

Content

- Assess current smoking behavior
- Assess readiness to quit smoking

Intervention Component: Advise

Rationale

- Clinical Practice Guidelines recommend that all smokers be advised to quit smoking (Fiore et al., 2008)

Content

- Provide advice to quit smoking

Intervention Component: Arrange

Rationale

- Clinical Practice Guidelines recommend that all smokers be who are interested in have follow-up arranged (Fiore et al., 2008)

Content

- Provide Clearing the Air (National Cancer Institute)
- Offer information about other treatment resources

Appendix E

Tailored Intervention Fidelity Checklist

1. Did the interventionist provide personalized feedback? (Check all that apply)

___ Smoking History

___ Pain Complaint

___ Pain-Smoking Expectancies

2. Did the interventionist provide psychoeducation about pain-smoking interrelations? (Check all that apply)

___ Reciprocal Relations between Pain and Smoking

___ Effects of Smoking on Pain

___ Effects of Smoking to Cope with Pain

___ Effects of Quitting Smoking on Pain

3. Did the interventionist develop discrepancy between smoking and desired pain outcomes? (Check all that apply)

___ Elicit Desired Pain Outcomes

___ Risks/benefits of Smoking

___ 5Rs (relevance, risks, rewards, roadblocks, repetition)

Appendix F

Control Intervention Fidelity Checklist

1. Did the interventionist ask about smoking? (Check all that apply)

___ Current Smoking Behavior

___ Readiness to quit

2. Did the interventionist provide advice to quit smoking?

___ Yes

___ No

3. Did the interventionist offer assistance/resources for quitting?

___ Yes

___ No

Appendix G

Smoking Cessation Resources Handout

Interested in quitting smoking?

Services are available to help you quit.

New York State Smokers' Quitline

- 1-866-NY-QUITS (1-866-697-8487)
    - Mon-Thurs: 9 a.m. - 9 p.m.
    - Fri, Sat and Sun: 9 a.m. - 5 p.m.
- Check them out online at www.nysmokefree.com

Smoking Cessation Medication

- Your doctor can help determine which medication is best for you.
- Medication options include:
    - Over-the-counter nicotine replacement therapy (patches, gum, lozenges)
    - Prescription nicotine replacement therapy (inhaler, nasal spray)
    - Non-nicotine prescription medication (bupropion/Zyban and varenicline/Chantix).
- Talk to your doctor to learn more about medications for smoking cessation.

References

Aamodt, A. H., Stovner, L. J., Hagen, K., Brathen, G., & Zwart, J. (2006). Headache prevalence related to smoking and alcohol use. The Head-HUNT Study. *European Journal of Neurology, 13*, 1233-1238. doi: 10.1111/j.1468-1331.2006.01492.x

Aigner, C. J., Gritz, E. R., Tamí-Maury, I., Baum, G. P., Arduino, R. C., & Vidrine, D. J. (2017). The Role of Pain in Quitting among HIV Positive Smokers Enrolled in a Smoking Cessation Trial. *Substance Abuse*, 00-00. doi: 10.1080/08897077.2017.1291466

Aimer, P., Stamp, L., Stebbings, S., Valentino, N., Cameron, V., & Treharne, G. J. (2015). Identifying Barriers to Smoking Cessation in Rheumatoid Arthritis. *Arthritis Care and Research, 67*, 607-615. doi: 10.1002/acr.22503

Amin, S., Niu, J., Guermazi, A., Grigoryan, M., Hunter, D. J., Clancy, M., . . . Felson, D. T. (2007). Cigarette smoking and the risk for cartilage loss and knee pain in men with knee osteoarthritis. *Annals of the Rheumatic Diseases, 66*, 18-22. doi: 10.1136/ard.2006.056697

Arean, P. A., & Alvidrez, J. (2002). Ethical considerations in psychotherapy effectiveness research: Choosing the comparison group. *Ethics and Behavior, 12*, 63-73. doi: 10.1207/S15327019EB1201_4

Augustson, E., & Marcus, S. (2004). Use of the current population survey to characterize subpopulations of continued smokers: a national perspective on the "hardcore" smoker phenomenon. *Nicotine & Tobacco Research, 6*, 621-629. doi: 10.1080/14622200410001727876

Babb, S. D., Malarcher, A. M., Schauer, G. L., Asman, K., & Jamal, A. (2017). Quitting smoking among adults -- United States, 2000-2015. *MMWR: Morbidity and Mortality Weekly Report, 65*, 1457-1464. doi: 10.15585/mmwr.mm6552a1

Baker, T. B., Collins, L. M., Mermelstein, R., Piper, M. E., Schlam, T. R., Cook, J. W., . . . Fiore, M. C. (2016). Enhancing the effectiveness of smoking treatment research: conceptual bases and progress. *Addiction, 111*, 107-116. doi: 10.1111/add.13154

Baker, T. B., Mermelstein, R., Collins, L. M., Piper, M. E., Jorenby, D. E., Smith, S. S., . . . Fiore, M. C. (2011). New Methods for Tobacco Dependence Treatment Research. *Annals of Behavioral Medicine, 41*, 192-207. doi: 10.1007/s12160-010-9252-y

Behrend, C., Prasarn, M., Coyne, E., Horodyski, M., Wright, J., & Rechtine, G. R. (2012). Smoking Cessation Related to Improved Patient-Reported Pain Scores Following Spinal Care. *Journal of Bone and Joint Surgery (American Volume), 94*, 2161-2166. doi: 10.2106/JBJS.K.01598

Benowitz, N. L., Jacob, P., K., A., Jarvis, M. J., Hall, S., LeHouezec, J., . . . Hurt, R. D. (2002). Biochemical verification of tobacco use and cessation. *Nicotine & Tobacco Research, 4*, 149-159. doi: 10.1080/14622200210123581

Biener, L., & Abrams, D. B. (1991). The Contemplation Ladder: validation of a measure of readiness to consider smoking cessation. *Health Psychology, 10*, 360-365. doi: 10.1037//0278-6133.10.5.360

Borland, R., Yong, H. H., O'Connor, R. J., Hyland, A., & Thompson, M. E. (2010). The reliability and predictive validity of the Heaviness of Smoking Index and its two components: findings from the International Tobacco Control Four Country study. *Nicotine & Tobacco Research, 12 Suppl*, S45-50. doi: 10.1093/ntr/ntq038

Borrelli, B. (2010). Smoking cessation: next steps for special populations research and innovative treatments. *Journal of Consulting and Clinical Psychology, 78*, 1-12. doi: 10.1037/a0018327

Boudreaux, E. D., Sullivan, A., Abar, B., Bernstein, S. L., Ginde, A. A., & Camargo, C. A., Jr. (2012). Motivation rulers for smoking cessation: a prospective observational examination of construct and predictive validity. *Addiction Science & Clinical Practice, 7*, 8. doi: 10.1186/1940-0640-7-8

Brown, R. A., Lejuez, C. W., Kahler, C. W., & Strong, D. R. (2002). Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology, 111*, 180-185. doi: 10.1037//0021-843X.111.1.180

Bush, K., Kivlahan, D. R., McDonell, M. B., Fihn, S. D., & Bradley, K. A. (1998). The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. *Archives of Internal Medicine, 158*, 1789-1795.

Cahill, K., Lancaster, T., & Green, N. (2010). Stage-based interventions for smoking cessation. *Cochrane Database Syst Rev*, CD004492. doi: 10.1002/14651858.CD004492.pub4

CDC. (2011). Quitting Smoking Among Adults --- United States, 2001--2010. *Morbidity and Mortality Weekly Report, 60*, 1513-1519.

Chaiton, M. O., Cohen, J. E., McDonald, P. W., & Bondy, S. J. (2007). The Heaviness of Smoking Index as a predictor of smoking cessation in Canada. *Addictive Behaviors, 32*, 1031-1042.

Champion, V. L., & Skinner, C. S. (2008). The Health Belief Model. In K. Glanz, B. K. Rimer & K. Viswanath (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (4th ed., pp. 45-65). San Fransisco: CA: Jossey-Bass, a Wiley Imprint.

Cheema, J. R. (2014). Some general guidelines for choosing missing data handling methods in educational research. *Journal of Modern Applied Statistical Methods, 13*, 55-57.

Cropsey, K. L., Eldridge, G. D., Weaver, M. F., Villalobos, G. C., & Stitzer, M. L. (2006). Expired carbon monoxide levels in self-reported smokers and nonsmokers in prison. *Nicotine & Tobacco Research, 8*, 653-659. doi: 10.1080/14622200600789684

Cunningham, J. A. (2007). Internet-based interventions for alcohol, tobacco and other substances of abuse. In P. M. Miller & D. Kavanagh (Eds.), *Translation of addictions science into practice* (pp. 399-416). New York, NY: Elsevier Science.

DHHS. (2004). The Health Consequences of Smoking: A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

DHHS. (2008). *Quick guide to health literacy: Fact sheets, strategies, resources*. Washington, DC: Retrieved from https://health.gov/communication/literacy/quickguide/.

DHHS. (2014). The Health Consequences of Smoking - 50 Years of Progress: A Report of the Surgeon General. Atlanta: GA: U.S. Department of Health and Human Services, Center for Disease COntrol and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Dhingra, L. K., Homel, P., Grossman, B., Chen, J., Scharaga, E., Calamita, S., . . . Portenoy, R. (2013). Ecological Momentary Assessment of Smoking Behavior in Persistent Pain Patients. *Clinical Journal of Pain, 30*, 205-213. doi: 10.1097/AJP.0b013e31829821c7

DiClemente, C. C., Prochaska, J. O., Fairhurst, S. K., Velicer, W. F., Velasquez, M. M., & Rossi, J. S. (1991). The process of smoking cessation: an analysis of precontemplation, contemplation, and preparation stages of change. *Journal of Consulting and Clinical Psychology, 59*, 295-304. doi: 10.1037//0022-006X.59.2.295

Ditre, J. W., & Brandon, T. H. (2008). Pain as a motivator of smoking: Effects of pain induction on smoking urge and behavior. *Journal of Abnormal Psychology, 117*, 467-472. doi: 10.1037/0021-843X.117.2.467

Ditre, J. W., Brandon, T. H., Zale, E. L., & Meagher, M. M. (2011). Pain, nicotine, and smoking: Research findings and mechanistic considerations. *Psychological Bulletin, 137*, 1065-1093. doi: 10.1037/a0025544

Ditre, J. W., Heckman, B. W., Butts, E. A., & Brandon, T. H. (2010). Effects of expectancies and coping on pain-induced motivation to smoke. *Journal of Abnormal Psychology, 119*, 524-533. doi: 10.1037/a0019568

Ditre, J. W., Kosiba, J. D., Zale, E. L., Zvolensky, M. J., & Maisto, S. A. (2016). Chronic pain status, nicotine withdrawal, and expectancies for smoking cessation among lighter smokers. *Annals of Behavioral Medicine, 50*, 427-435. doi: 10.1007/s12160-016-9769-9

Ditre, J. W., Langdon, K. J., Kosiba, J. D., Zale, E. L., & Zvolensky, M. J. (2015). Relations between pain-related anxiety, tobacco dependence, and barriers to quitting among a community-based sample of daily smokers. *Addictive Behaviors, 42*, 130-135. doi: 10.1016/j.addbeh.2014.11.032

Ditre, J. W., Zale, E. L., Heckman, B. W., & Hendricks, P. S. (2016). A measure of perceived pain and tobacco smoking interrelations: pilot validation of the pain and smoking inventory. *Cognitive Behaviour Therapy*, 1-13. doi: 10.1080/16506073.2016.1256347

Ditre, J. W., Zale, E. L., Kosiba, J. D., & Zvolensky, M. J. (2013). A pilot study of pain-related anxiety and smoking-dependence motives among persons with chronic pain. *Experimental and Clinical Psychopharmacology, 21*, 443-449. doi: 10.1037/a0034174

Drake, R. E., & Mueser, K. T. (2000). Psychosocial approaches to dual diagnosis. *Schizophrenia Bulletin, 26*, 105-118. doi: 10.1093/oxfordjournals.schbul.a033429

Eccleston, C., & Crombez, G. (1999). Pain demands attention: a cognitive-affective model of the interruptive function of pain. *Psychological Bulletin, 125*, 356-366.

Emmons, K. M. (2007). Increasing Motivation to Stop Smoking. In D. B. Abrams, R. Niaura, R. A. Brown, K. M. Emmons, M. G. Goldstein & P. M. Monti (Eds.), *The Tobacco Dependence Treatment Handbook: A Guide to Best Practices* (pp. 73-100). New York: The Guildford Press.

Evans, D. E., Sutton, S. K., Oliver, J. A., & Drobes, D. J. (2015). Cortical activity differs during nicotine deprivation versus satiation in heavy smokers. *Psychopharmacology, 232*, 1879-1885. doi: 10.1007/s00213-014-3821-x

Fagerstrom, K. (2012). Determinants of tobacco use and renaming the FTND to the Fagerstrom Test for Cigarette Dependence. *Nicotine & Tobacco Research, 14*, 75-78. doi: 10.1093/ntr/ntr137

Fiore, M. C., Jaen, C. R., Baker, T. B., Bailey, W. C., Benowitz, N. L., Curry, S. J., & Dorfman, S. F. (2008). *Treating Tobacco Use and Dependence: 2008 Update*. Clinical Practice

Guideline. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service. May 2008.

Fishbain, D. A., Lewis, J. E., Cutler, R., Cole, B., Steele Rosomoff, R., & Rosomoff, H. L. (2008). Does smoking status affect multidisciplinary pain facility treatment outcome? *Pain Medicine, 9,* 1081-1090. doi: 10.1111/j.1526-4637.2007.00306.x

Funderburk, J. S., Sugarman, D. E., Maisto, S. A., Ouimette, P., Schohn, M., Lantinga, L., . . . Strutynski, K. (2010). The description and evaluation of the implementation of an integrated healthcare model. *Families, Systems, & Health, 28,* 146-160. doi: 10.1037/a0020223

Garson, G. D. (2015). *Missing values analysis & data imputation*. Asheboro, NC: Statistical Publishing Associates

Glassman, S. D., Dimar, J. R. I., Burkus, K., Hardacker, J. W., Pryor, P. W., Boden, S. D., & Carreon, L. Y. (2007). The Efficacy of rhBMP-2 for Posterolateral Lumbar Fusion in Smokers. *Spine, 32,* 1693-1698. doi: 10.1097/BRS.0b013e318074c366

Goesling, J., Brummett, C. M., & Hassett, A. L. (2012). Cigarette smoking and pain: depressive symptoms mediate smoking-related pain symptoms. *Pain, 153,* 1749-1754. doi: 10.1016/j.pain.2012.05.014

Gupta, S. K. (2011). Intention-to-treat concept: A review. *Perspectives in Clinical Research, 2,* 109-112. doi: 10.4103/2229-3485.83221

Hahn, E. J., Rayens, M. K., Kirsh, K. L., & Passik, S. D. (2006). Brief report: Pain and readiness to quit smoking cigarettes. *Nicotine & Tobacco Research, 8,* 473-480. doi: 10.1080/14622200600670355

Hall, S. M., Havassy, B. E., & Wasserman, D. A. (1990). Commitment to abstinence and acute stress in relapse to alcohol, opiates, and nicotine. *Journal of Consulting and Clinical Psychology, 58,* 175-181.

Harty, L. C., & Veale, D. J. (2010). Irish smokers with rheumatoid arthritis suffer more than their nonsmoking counterparts. *Journal of Rheumatology, 37,* 1062; author reply 1063. doi: 10.3899/jrheum.091403

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., Rickert, W., & Robinson, J. (1989). Measuring the heaviness of smoking: using self-reported time to the first cigarette of the day and number of cigarettes smoked per day. *British Journal of Addiction, 84,* 791-799.

Herzog, T. A., & Blagg, C. O. (2007). Are most precontemplators contemplating smoking cessation? Assessing the validity of the stages of change. *Health Psychology, 26,* 222-231. doi: 10.1037/0278-6133.26.2.222

Hooten, W. M., Shi, Y., Gazelka, H. M., & Warner, D. O. (2011). The effects of depression and smoking on pain severity and opioid use in patients with chronic pain. *Pain, 152,* 223-229. doi: 10.1016/j.pain.2010.10.045

Hooten, W. M., Townsend, C. O., Bruce, B. K., Schmidt, J. E., Kerkvliet, J. L., Patten, C. A., & Warner, D. O. (2009). Effects of smoking status on immediate treatment outcomes of multidisciplinary pain rehabilitation. *Pain Medicine, 10,* 347-355. doi: 10.1111/j.1526-4637.2008.00494.x

Hooten, W. M., Townsend, C. O., Bruce, B. K., & Warner, D. O. (2009). The effects of smoking status on opioid tapering among patients with chronic pain. *Anesthesia and Analgesia, 108,* 308-315. doi: 10.1213/ane.0b013e31818c7b99

Hooten, W. M., Townsend, C. O., Hays, J. T., Ebnet, K. L., Gauvin, T. R., Gehin, J. M., . . . Warner, D. O. (2014). A cognitive behavioral smoking abstinence intervention for adults with chronic pain: A randomized controlled pilot trial. *Addictive Behaviors, 39,* 593-599. doi: 10.1016/j.addbeh.2013.11.010

Hooten, W. M., Vickers, K. S., Shi, Y., Ebnet, K. L., Townsend, C. O., Patten, C. A., & Warner, D. O. (2011). Smoking cessation and chronic pain: patient and pain medicine physician attitudes. *Pain Practice, 11,* 552-563. doi: 10.1111/j.1533-2500.2011.00462.x

Hughes, J. R., & Brandon, T. H. (2003). A softer view of hardening. *Nicotine & Tobacco Research, 5,* 961-962. doi: 10.1080/14622200310001615330

Hung, J., Lin, C. H., Wang, J. D., & Chan, C. C. (2006). Exhaled carbon monoxide level as an indicator of cigarette consumption in a workplace cessation program in Taiwan. *Journal of the Formosan Medical Association, 105,* 210-213. doi: 10.1016/S0929-6646(09)60307-7

IOM. (2011). *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research.* Washington, DC: The National Academies Press

Irvin, J. E., & Brandon, T. H. (2000). The increasing recalcitrance of smokers in clinical trials. *Nicotine & Tobacco Research, 2,* 79-84. doi: 10.1080/14622200050011330

Jamal, A., King, B. A., Neff, L. J., Whitmill, J., Babb, S. D., & Graffunder, C. M. (2016). Current cigarette smoking among adults -- United States, 2005 - 2015. *MMWR CDC Surveillance Summaries, 65,* 1205-1211. doi: 10.15585/mmwr.mm6544a2

James, L. C., & Folen, R. A. (Eds.). (2005). *The primary care consultant: The next frontier for psychologists in hospitals and clinics*. Washington, DC, US: American Psychological Association.

Jamison, R. N., Stetson, B. A., & Parris, W. C. (1991). The relationship between cigarette smoking and chronic low back pain. *Addictive Behaviors, 16,* 103-110. doi: 10.1016/0306-4603(91)90002-Y

Javors, M. A., Hatch, J. P., & Lamb, R. J. (2005). Cut-off levels for breath carbon monoxide as a marker for cigarette smoking. *Addiction, 100,* 159-167. doi: 10.1111/j.1360-0443.2004.00957.x

Kaye, A. D., Prabhakar, A. P., Fitzmaurice, M. E., & Kaye, R. J. (2012). Smoking cessation in pain patients. *The Ochsner Journal, 12,* 17-20.

Kessler, R. C., Berglund, P., Chiu, W. T., Demler, O., Heeringa, S., Hiripi, E., . . . Zheng, H. (2004). The US National Comorbidity Survey Replication (NCS-R): design and field procedures. *International Journal of Methods in Psychiatric Research, 13,* 69-92. doi: 10.1002/mpr.167

Knisely, J. S., Wunsch, M. J., Cropsey, K. L., & Campbell, E. D. (2008). Prescription Opioid Misuse Index: a brief questionnaire to assess misuse. *Journal of Substance Abuse Treatment, 35,* 380-386. doi: 10.1016/j.jsat.2008.02.001

Krebs, E. E., Carey, T. S., & Weinberger, M. (2007). Accuracy of the pain numeric rating scale as a screening test in primary care. *Journal of General Internal Medicine, 22,* 1453-1458. doi: 10.1007/s11606-007-0321-2

Kroenke, K., Spitzer, R. L., Williams, J. B., & Lowe, B. (2009). An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics, 50,* 613-621. doi: 10.1176/appi.psy.50.6.613

Kwok, T. C., Taggar, J., Cooper, S., Lewis, S., & Coleman, T. (2014). Nicotine dependence and biochemical exposure measures in the second trimester of pregnancy. *Nicotine & Tobacco Research, 16*, 145-154. doi: 10.1093/ntr/ntt127

Lancaster, T., Stead, L., Silagy, C., & Sowden, A. (2000). Regular review: Effectiveness of interventions to help people stop smoking: findings from the Cochrane Library. *BMJ, 321*, 355. doi: 10.1136/bmj.321.7257.355

LaRowe, L. R., Langdon, K. J., Zvolensky, M. J., Zale, E. L., & Ditre, J. W. (in press). Pain-Related Anxiety as a Predictor of Early Lapse and Relapse to Cigarette Smoking. *Experimental and Clinical Psychopharmacology*.

Larsen, D. L., Attkisson, C. C., Hargreaves, W. A., & Nguyen, T. D. (1979). Assessment of client/patient satisfaction: development of a general scale. *Evaluation and Program Planning, 2*, 197-207.

Lawson, P. J., & Flocke, S. A. (2009). Teachable moments for health behavior change: a concept analysis. *Patient Education and Counseling, 76*, 25-30. doi: 10.1016/j.pec.2008.11.002

Lee, S. S., Kim, S. H., Nah, S. S., Lee, J. H., Lee, Y. A., Hong, S. J., . . . Kim, S. K. (2010). Smoking habits influence pain and functional and psychiatric features in fibromyalgia. *Joint, Bone, Spine: Revue du Rhumatisme, 78*, 259-265. doi: 10.1016/j.jbspin.2010.07.018

Lichtenstein, E., & Hollis, J. (1992). Patient referral to a smoking cessation program: Who follows through? *The Journal of Family Practice, 34*, 739-744.

McCaul, K. D., Hockemeyer, J. R., Johnson, R. J., Zetocha, K., Quinlan, K., & Glasgow, R. E. (2006). Motivation to quit using cigarettes: A review. *Addictive Behaviors, 31*, 42-56. doi: 10.1016/j.addbeh.2005.04.004

McCracken, L. M., & Dhingra, L. (2002). A short version of the Pain Anxiety Symptoms Scale (PASS-20): preliminary development and validity. *Pain Research and Management, 7*, 45-50.

Michna, E., Ross, E. L., Hynes, W. L., Nedeljkovic, S. S., Soumekh, S., Janfaza, D., . . . Jamison, R. N. (2004). Predicting aberrant drug behavior in patients treated for chronic pain: importance of abuse history. *Journal of Pain and Symptom Management, 28*, 250-258. doi: 10.1016/j.jpainsymman.2004.04.007

Mohr, D. C., Spring, B., Freedland, K. E., Beckner, V., Arean, P., Hollon, S. D., . . . Kaplan, R. (2009). The Selection and Design of Control Conditions for Randomized Controlled Trials of Psychological Interventions. *Psychotherapy and Psychosomatics, 78*, 275-284. doi: 10.1159/000228248

Nakajima, M., & al'Absi, M. (2011). Enhanced pain perception prior to smoking cessation is associated with early relapse. *Biological Psychology, 88*, 141-146. doi: 10.1016/j.biopsycho.2011.07.006

Nezami, E., Sussman, S., & Pentz, M. A. (2003). Motivation in Tobacco Use Cessation Research. *Substance Use and Misuse, 38*, 25-50. doi: 10.1081/JA-120016564

Niaura, R., & Shadel, W. G. (2007). Assessment to inform smoking cessation treatment. In D. B. Abrams, R. Niaura, R. A. Brown, K. M. Emmons, M. G. Goldstein & P. M. Monti (Eds.), *The Tobacco Dependence Treatment Handbook: A Guide to Best Practices* (pp. 27-72). New York, NY: The Guilford Press.

Orhurhu, V. J., Pittelkow, T. P., & Hooten, W. M. (2015). Prevalence of smoking in adults with chronic pain. *Tobacco Induced Diseases, 13*, 17. doi: 10.1186/s12971-015-0042-y

Patel, N., Talwar, A., Reichert, V. C., Brady, T., Jain, M., & Kaplan, M. H. (2006). Tobacco and HIV. *Clinics in Occupational and Environmental Medicine, 5*, 193-207, xi.

Patterson, A. L., Gritzner, S., Resnick, M. P., Dobscha, S. K., Turk, D. C., & Morasco, B. J. (2012). Smoking cigarettes as a coping strategy for chronic pain is associated with greater pain intensity and poorer pain-related function. *Journal of Pain, 13*, 285-292. doi: 10.1016/j.jpain.2011.11.008

Perkins, K. A., Conklin, C. A., & Levine, M. D. (2008). *Cognitive-Behavioral Therapy for Smoking Cessation: A Practical Guidebook to the Most Effective Treatments*. New York, NY: Routledge.

Piper, M. E., & Curtin, J. J. (2006). Tobacco withdrawal and negative affect: an analysis of initial emotional response intensity and voluntary emotion regulation. *Journal of Abnormal Psychology, 115*, 96-102. doi: 10.1037/0021-843X.115.1.96

Pisinger, C., Jørgensen, M. M., Møller, N. E., Døssing, M., & Jørgensen, T. (2010). A cluster randomized trial in general practice with referral to a group-based or an internet-based smoking cessation programme. *Journal of Public Health, 32*, 62-70. doi: 10.1093/pubmed/fdp072

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*, 390-395.

Prochaska, J. O., Redding, C. A., & Evers, K. E. (2008). The Transtheoretical Model and Stages of Change. In K. Glanz, B. K. Rimer & K. Viswanath (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (4th ed., pp. 97-121). San Fransisco: CA: Jossey-Bass, a Wiley Imprint.

Raiff, B. R., Faix, C., Turturici, M., & Dallery, J. (2010). Breath carbon monoxide output is affected by speed of emptying the lungs: implications for laboratory and smoking cessation research. *Nicotine & Tobacco Research, 12,* 834-838. doi: 10.1093/ntr/ntq090

Riper, H., van Straten, A., Keuken, M., Smit, F., Schippers, G., & Cuijpers, P. (2009). Curbing problem drinking with personalized-feedback interventions: a meta-analysis. *American Journal of Preventive Medicine, 36,* 247-255. doi: 10.1016/j.amepre.2008.10.016

SAMHSA. (2012). *Brief interventions and brief therapies for substance abuse.* Treatment Improvement Protocol (TIP) Series, No. 34. HHS Publication No. (SMA) 12-3952. Rockville, MD: Substance Abuse and Mental Health Services Administration.

SAMHSA. (2013). Motivational Enhancement Therapy Retrieved 1/30/2014, from http://www.nrepp.samhsa.gov/ViewIntervention.aspx?id=347

Seligman, H. K., Wang, F. F., Palacios, J. L., Wilson, C. C., Daher, C., Piette, J. D., & Schillinger, D. (2005). Physician notification of their diabetes patients' limited health literacy. A randomized, controlled trial. *Journal of General Internal Medicine, 20,* 1001-1007. doi: 10.1111/j.1525-1497.2005.00189.x

Shiri, R., Karppinen, J., Leino-Arjas, P., Solovieva, S., & Viikari-Juntura, E. (2010). The association between smoking and low back pain: a meta-analysis. *American Journal of Medicine, 123,* 87 e87-35. doi: 10.1016/j.amjmed.2009.05.028

Tai-Seale, M., McGuire, T. G., & Zhang, W. (2007). Time allocation in primary care office visits. *Health Services Research, 42,* 1871-1894. doi: 10.1111/j.1475-6773.2006.00689.x

Toblin, R. L., Mack, K. A., Perveen, G., & Paulozzi, L. J. (2011). A population-based survey of chronic pain and its treatment with prescription drugs. *Pain, 152,* 1249-1255. doi: 10.1016/j.pain.2010.12.036

USDHHS. (2010). *Ending the tobacco epidemic: A tobacco control strategic action plan for the U.S. Department of Health and Human Services*. Washington, DC: Office of the Assistant Secretary for Health

Von Korff, M. (2011). Assessment of chronic pain in epidemiological and health services research. In D. C. Turk & R. Melzack (Eds.), *Handbook of Pain Assessment: Third Edition*. New York, NY: The Guilford Press.

Waldie, K. E., McGee, R., Reeder, A. I., & Poulton, R. (2008). Associations between frequent headaches, persistent smoking, and attempts to quit. *Headache, 48*, 545-552. doi: 10.1111/j.1526-4610.2007.01037.x

Weingarten, T. N., Moeschler, S. M., Ptaszynski, A. E., Hooten, W. M., Beebe, T. J., & Warner, D. O. (2008). An assessment of the association between smoking status, pain intensity, and functional interference in patients with chronic pain. *Pain physician, 11*, 643-653.

Weingarten, T. N., Podduturu, V. R., Hooten, W. M., Thompson, J. M., Luedtke, C. A., & Oh, T. H. (2009). Impact of tobacco use in patients presenting to a multidisciplinary outpatient treatment program for fibromyalgia. *Clinical Journal of Pain, 25*, 39-43. doi: 10.1097/AJP.0b013e31817d105e

Winn, D. M. (2001). Tobacco use and oral disease. *Journal of Dental Education, 65*, 306-312.

Zale, E. L., Ditre, J. W., Dorfman, M. L., Heckman, B. W., & Brandon, T. H. (2014). Smokers in Pain Report Lower Confidence and Greater Difficulty Quitting. *Nicotine & Tobacco Research, 16*, 1272-1276.

Zale, E. L., Maisto, S. A., & Ditre, J. W. (2016). Anxiety and Depression in Bidirectional Relations Between Pain and Smoking: Implications for Smoking Cessation. *Behavior Modification, 40*, 7-28. doi: 10.1177/0145445515610744

Zvolensky, M. J., Lejuez, C. W., Kahler, C. W., & Brown, R. A. (2003). Integrating an interoceptive exposure-based smoking cessation program into the cognitive-behavioral treatment of panic disorder: Theoretical relevance and case demonstration. *Cognitive and Behavioral Practice, 10*, 347-357. doi: 10.1016/S1077-7229(03)80052-4

VITA

NAME OF AUTHOR: Emily L. Zale

CONTACT INFORMATION:
430 Huntington Hall
Syracuse, NY 13244

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:
Syracuse University, Syracuse, NY
Texas A&M University, College Station, TX
University of Rochester, Rochester, NY

DEGREES AWARDED:
Master of Science, 2012, Texas A&M University
Bachelor of Arts in Psychology and Anthropology, 2007, University of Rochester