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PILOT STUDY INVESTIGATING THE EFFECT OF A SUPPRESSION VERSUS
MINDFULNESS-BASED STRATEGY IN COPING WITH CIGARETTE CRAVINGS

by

Jenny Rogojanski

Bachelor of Arts, Wilfrid Laurier University, 2007

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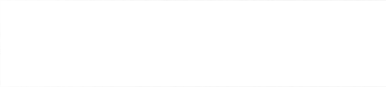
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Pilot Study Investigating the Effect of a Suppression Versus Mindfulness-Based Strategy in
Coping with Cigarette Cravings

Jenny Rogojanski

Master of Arts, 2009

Psychology, Ryerson University

Abstract

The current pilot study investigated the effectiveness of a brief suppression versus mindfulness-based strategy for coping with cigarette cravings. Participants ($N = 61$) were randomly assigned to one of the two coping strategies to manage cravings during an experimental cue exposure to cigarettes. Results indicate that participants in both conditions reported significantly reduced amounts of smoking and increased self-efficacy in coping with smoking urges at a seven-day follow-up. However, only participants in the mindfulness condition demonstrated reductions in negative affect, depressive symptoms, and reduced levels of nicotine dependence. These findings indicate that while both conditions were associated with improvements on smoking relevant outcomes, mindfulness was unique for its beneficial impacts on reported nicotine dependence and emotional functioning over the course of the study.

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Chapter 1: Introduction

It has been estimated that approximately 1.1 billion people smoke worldwide, a statistic that is expected to rise to over 1.6 billion by the year 2025 (Ghadirian, 2004). A national survey revealed that approximately 5 million Canadians aged 15 years and older self-identified as smokers in 2007 (Health Canada, 2007). Smoking has contributed to over 45,000 mortalities annually in Canada (Ellison, Mao, & Gibbons, 1995). In the United States, cigarette smoking contributes to approximately 438,000 deaths per year, making it the third leading cause of death in North America and costing over 75 billion dollars in direct medical expenses each year (Centers for Disease Control and Prevention, 2005). Consequently, smoking-related death is considered to be the leading preventable cause of mortality in both the United States (Substance Abuse and Mental Health Services Administration, 2004) and Canada (Ghadirian, 2004), and is associated with a decrease in lifespan among smokers of approximately eight years (Peto et al., 1996).

Despite the severity of health risks associated with smoking, relatively few smokers attempt to quit. Although approximately 80% of smokers report wanting to quit, only 43% report making a recent attempt (Weiss-Gerlach et al., 2008). Of those who do make a quit attempt, between 85 and 95% resume smoking within 12 months of cessation without formal intervention (Garvey, Bliss, Hitchcock, Heinold, & Rosner, 1992). Similarly, of those who receive a formal smoking cessation intervention, more than 50% resume smoking within 30 days, and 70 (Fiore et al., 2000) to 90% (Niaura et al., 1999) resume smoking within their first year of quitting.

Numerous factors have been proposed to account for the difficulties that smokers experience when attempting to quit smoking. Among these are the uncomfortable experiences of nicotine dependence and the associated symptoms of nicotine withdrawal (DiFranza & Wellman,

2005). Emotional factors, including depressed mood, negative affective states, and anxiety, also influence the difficulty one experiences when attempting to quit (Carmody, Vieten, & Astin, 2007). Furthermore, cognitive factors, including perceived self-efficacy in coping with cravings to smoke, particularly in stressful or triggering situations, can also influence how able someone is to deal with cravings as they emerge (Baer, Holt, & Lichtenstein, 1986). In addition, methods by which smokers attempt to cope with cravings, for instance, whether one relies on active attempts to suppress cravings (Haaga & Allison, 1994; Salkovskis & Reynolds, 1994; Toll, Sobell, Wagner, & Sobell, 2001), or attempts to deal with cravings by “riding them out” (Marlatt & Gordon, 1985), can impact on levels of success or subjective ease during efforts to quit smoking.

1.1 Role of Nicotine Dependence and Withdrawal Symptoms in Smoking

According to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000), nicotine dependence is characterized by a maladaptive pattern of nicotine use that results in clinically significant distress. This is manifested through the presence of three or more symptoms within the same 12-month period, including the development of tolerance to nicotine, and the experience of withdrawal symptoms after an abrupt cessation or reduction in nicotine consumption. Nicotine dependent individuals also frequently spend a considerable amount of time using nicotine, in some cases chain-smoking, and tend to use up their supply of cigarettes significantly faster than intended or anticipated. It is not uncommon for nicotine dependent individuals to avoid social, occupational, and recreational activities if these require them to be confined within a smoking-restricted environment. Moreover, most individuals who are nicotine

dependent will continue to use nicotine, despite knowledge or experience of smoking-related medical problems.

Nicotine withdrawal is the most common response to attempts to quit or cut down on smoking. Nicotine withdrawal is characterized by the experience of four or more of the following symptoms subsequent to an abrupt cessation or reduction in nicotine use (American Psychiatric Association, 2000): depressed mood, insomnia, irritability or anger, anxiety, concentration difficulties, restlessness, decreased heart rate, and increased appetite. These symptoms are typically experienced as aversive to the smoker, and often lead to cravings for one to use the substance in order to alleviate the symptoms they are experiencing (DiFranza & Wellman, 2005).

1.2 Role of Self-Efficacy in Coping with Cravings

Craving is the physiological and psychological urge to use a substance, and is central to most models of addiction. Various conditioning (Robinson & Berridge, 1993), social learning (Marlatt, 1985), and cognitive (Niaura, 2000; Tiffany, 1990) models have been proposed in an effort to elucidate the phenomenon of nicotine craving. Most of these models view cravings as developing as a consequence of a physical adaptation to a consistent state of nicotine satiation within the body (DiFranza & Wellman, 2005). From these perspectives, when the consumption of nicotine is reduced, such as during acute smoking cessation, withdrawal symptoms emerge. Cravings for nicotine serve the purpose of motivating the reinstatement of nicotine consumption, so as to alleviate the withdrawal symptomatology caused by a disruption in nicotine homeostasis (DiFranza & Wellman, 2005).

Nicotine craving is possibly one of the most difficult symptoms to tolerate, particularly because of its early onset, perseverance, and severity (Sommese & Patterson, 1995). Research

suggests that craving is central to the maintenance of nicotine addiction, and is possibly the factor most responsible for the high rate of relapse to smoking following a cessation attempt (e.g., Bagot, Heishman, & Moolchan, 2007; Baker, Morse, & Sherman, 1986; Shiffman, 1991; United States Department of Health and Human Services, 1988; West & Grunberg, 1991). Cravings have been shown to contribute to the maintenance of nicotine addiction among both adult and adolescent smokers (Bagot et al., 2007; Shiffman, 1991; West & Grunberg, 1991), and as a deterrent to successful smoking cessation (Orleans, Rimer, Cristinzio, Keintz, & Fleisher, 1991). Research suggests that withdrawal symptoms associated with early phases of smoking cessation result in a decrease in brain reward function that is comparable in duration and magnitude to that of other major drugs of abuse (Epping-Jordan, Watkins, Koob, & Markou, 1998). The resultant aversive mental states of depression, irritability, and anxiety are thought to maintain smoking addiction by increasing the likelihood of relapse in order to reduce or avoid the intensity of these sensations. For example, Piasecki and colleagues (2007) found that the desire to reduce cravings was the strongest motivator for cigarette smoking in a student sample, accounting for 62.8% of smoking occasions.

The ability to reduce one's level of craving, or to cope better with cravings as they emerge, may be among the critical factors that influence how well someone reduces or continues to abstain from smoking. Whereas smokers who experience low levels of craving are at a 60% risk for smoking relapse, those who experience severe craving are at a 90% risk for relapse to smoking (Stapleton, 1998). The relationship between self-efficacy, or confidence in one's ability to cope with cravings, and smoking relapse has been well established (Baer et al., 1986). Self-efficacy is typically evaluated by asking individuals with a substance addiction to imagine a number of potential situations that are likely to trigger craving to use that substance, and the

percent likelihood they would be able to resist (e.g., the Drug Taking Confidence Questionnaire; Annis & Martin, 1985). In the case of self-efficacy in coping with smoking cravings, one study found a positive correlation between self-efficacy in coping with cravings while participating in a smoking cessation program, and successful cessation attempts six-months later (Stuart, Borland, & McMurray, 1994). Another study showed self-efficacy to be a significant predictor of latency to first cigarette following introduction to a strategy for coping with cravings, and number of cigarettes smoked during a seven-day follow-up period (Bowen & Marlatt, in press).

In addition, the majority of smokers report that smoking helps them cope with emotional distress (Brandon & Baker, 1991). The role of emotional factors in increasing craving, reducing self-efficacy to cope with craving, and predicting smoking behavior and relapse is discussed next.

1.3 Role of Emotional Factors in Aggravating Craving and Undermining Self-Efficacy

Negative affect. Negative affect, defined as the acute experience of negative emotional states such as anger, sadness (depression), fear, and anxiety, tends to motivate individuals to avoid or reduce such aversive experiences (Carmody, Vieten, & Astin, 2007). According to the “negative affect model” of nicotine dependence, the initiation and maintenance of smoking addiction is due, in part, to the utilization of cigarettes as a means of reducing these aversive mental states (Carmody et al., 2007). This is particularly true among individuals with a tendency to experience negative affect, affect regulation deficits, and an intolerance of emotional distress (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Carmody et al., 2007; Kenford et al., 2002).

Smokers who experience high levels of negative affect have less success in quitting smoking (Anda et al., 1999). They also have worse withdrawal symptoms (Breslau, Kilbey, &

Andreski, 1992), and a higher frequency of relapse (Brandon, Tiffany, Obremski, & Baker, 1990). This high negative affective state can be understood as exceeding the negative affect that is characteristic of typical withdrawal symptoms, and therefore is a factor that incrementally predicts smoking above and beyond withdrawal alone (Myrsten, Elgerot, & Edgren, 1977). The emotional distress experienced at the onset of a quit attempt has also been found to be predictive of poorer cessation outcomes (Kinnunen, Doherty, Militello, & Garvey, 1996). The impact of stress and negative affect in relapse among smokers has been observed in both cross-sectional and longitudinal studies (Kenford et al., 2002; Shiffman & Waters, 2004). Furthermore, empirical findings suggest that stress and negative affect play a large role in the onset of tobacco use among adolescents, as well as the transition from experimentation to nicotine dependence (Brown, Lewinsohn, Seeley, & Wagner, 1996; Kassel, Stroud, & Paronis, 2003; Orlando, Ellickson, & Jinnett, 2001).

Depressed mood. Severity of nicotine dependence has been found to positively correlate with the severity of mood symptoms (Lerman et al., 1996). Studies suggest that individuals with Major Depressive Disorder (MDD) are more likely to smoke than individuals without MDD (Glassman et al., 1990). Moreover, those with mood disorders are far more likely to fail at their smoking cessation efforts than those without mood disorders (Covey, Glassman, & Stetner, 1990; Glassman, 1993; Glassman et al., 1990). Several studies indicate that, in a subset of smokers, smoking cessation can precipitate clinical depression (e.g., Hughes, 2006). Furthermore, increases in depressive symptoms are associated with smoking relapse following initial cessation (Covey, Glassman, & Stetner, 1997), particularly among smokers with past MDD (Hall et al., 1993; Thorsteinsson et al., 2001). Conversely, abstinence from smoking beyond the point at which withdrawal symptoms are abated is associated with having lower

levels of depressive symptoms (US Department of Health and Human Services, 1990). In other words, research suggests that smoking cessation can predict subsequent depression within a subset of individuals, which can in turn lead to smoking relapse. Furthermore, those individuals who are able to maintain abstinence from smoking are likely to experience an eventual reduction in their depressive symptoms.

Anxiety. Anxiety is another critical emotional factor associated with smoking. Anxiety is typically characterized by the subjective experience of uneasiness and apprehension. Research suggests that cigarette smoking can increase the risk for the development of certain anxiety disorders, such as panic disorder (Breslau & Klein, 1999; Isensee, Wittchen, Stein, Hofler, & Lieb, 2003) and generalized anxiety disorder (Johnson et al., 2000). Conversely, preexisting anxiety, particularly social anxiety, can increase the risk of the later development of nicotine dependence (Sonntag, Wittchen, Hofler, Kessler, & Stein, 2000). Studies generally find a high frequency of cigarette smoking among patients with anxiety disorders (Baker-Morissette, Gulliver, Wiegel, & Barlow, 2004; Kalman, Morissette, & George, 2005), with the exception of obsessive-compulsive disorder, which is generally associated with the lowest smoking frequency among the anxiety disorders (Baker-Morissette et al., 2004; McCabe et al., 2004) and psychiatric disorders more generally (Lasser et al., 2000).

Fear of anxiety, which is defined as “one’s tendency to catastrophically misinterpret or significantly dislike bodily sensations typical of nonpathological anxiety” (Asmundson, Norton, Lanthier, & Cox, 1996, p. 607), has also been implicated with cigarette smoking. In particular, anxiety sensitivity, or the tendency to fear physiological, mental, or observable anxiety sensations (Reiss & McNally, 1985), has been shown to be one of the emotion-based factors that maintain smoking behaviour. Anxiety sensitivity has been shown to be positively correlated with

the use of nicotine, primarily as an anxiety coping strategy among females (Stewart, Karp, Pihl, & Peterson, 1997). Anxiety sensitivity has also been linked to early relapse among treatment seeking and non-treatment seeking adults (Brown, Kahler, Zvolensky, Lejuez, & Ramsey, 2001; Zvolensky, Bernstein et al., 2007), and the expectation that smoking will alleviate negative affect (Zvolensky et al., 2004; Zvolensky, Bonn-Miller, Bernstein, & Marshall, 2006). Furthermore, higher levels of anxiety sensitivity are related to greater intensity of withdrawal symptoms (Zvolensky et al., 2004) and increased level of perceived barriers in quitting smoking (Gonzalez, Zvolensky, Vujanovic, Leyro, & Marshall, 2008). It is hypothesized that heightened anxiety sensitivity causes hypervigilance to aversive physiological sensations, which may increase the salience of negative affective cues (Carmody et al., 2007). Processes that motivate one to engage in addictive behaviour are then triggered in an effort to reduce negative affect and other aversive states (Baker et al., 2004; Khantzian, 1997; Wills & Shiffman, 1985; Zvolensky, Schmidt, & Stewart, 2003).

Summary. Thus, affective states such as depression and anxiety are among the factors associated with greater smoking behaviour, greater difficulties coping with cravings, and greater rates of relapse to smoking. In addition, anxiety sensitivity, or the extent to which one feels inclined to fear and avoid distressing feelings and sensations, may play a role in exacerbating these difficulties in coping with aversive emotional states, and associated addictive behaviours. Correspondingly, to address these emotional difficulties, various emotional regulation strategies have gained attention within the literature as a means of supporting smoking reduction and cessation.

1.4 Role for Emotion Regulation Strategies in Smoking Cessation

Coping strategies developed through smoking cessation interventions may be particularly effective if they impact on major emotion-related predictors of smoking outcomes. In particular, strategies that directly target the emotional states associated with smoking cessation might be expected to alleviate emotion-based factors that have been found to aggravate cravings and urges to smoke, including levels of anxiety sensitivity (Leyro, Zvolensky, Vujanovic, & Bernstein, 2008), negative affect, and depressed mood (Breslin, Zack, & McMain, 2002; Linehan, 1993a).

Such impacts of emotion regulation strategies have been found for a number of addictive substances. Studies on alcohol and substance addictions have focused on an emotional regulation strategy referred to as emotional-approach coping. Emotional-approach coping emphasizes the active processing and expression of emotion as an alternative to emotion suppression (Stanton, Danoff-Burg, Cameron, & Ellis, 1994). Emotional approach as a coping strategy is associated with lower incidence of alcohol and drug use (Forys, McKellar, & Moos, 2007). Additionally, in treatment studies, it has also been found to demonstrate superior treatment outcomes (e.g., Levin, Ilgen, & Moos, 2007).

Exposure-based treatments that incorporate interoceptive exposure, or systematic exposure to and prolonged non-avoidance of internal (physiological and emotional) cues, can be understood as a form of emotional-approach coping (Barlow, Allen, & Choate, 2004).

Interoceptive exposure has been studied largely, and shown to be effective, in the treatment of anxiety disorders (Barlow, 2002). Preliminary evidence suggests that interoceptive exposure is also effective in the alleviation of addictive problems. Evidence has begun to accumulate for the benefits of this strategy for coping with opiate dependency (Pollack et al., 2002) and alcohol dependency (Coffey, Stasiewicz, Hughes, & Brimo, 2006). Although interoceptive exposure is

not a mainstream approach to smoking cessation, and has not yet been explored experimentally with nicotine-dependent populations, it may have applications as an emotional-approach strategy for extinguishing smokers' responses to negative affect and other common smoking relapse triggers. For example, research suggests that individuals often cope with anxiety-related states by attempting to avoid them altogether (Feldner, Zvolensky, & Leen-Feldner, 2004), which may partially explain the association between anxiety sensitivity and early smoking lapse during cessation attempts (Brown et al., 2001).

1.5 Suppression versus Acceptance Strategies in Coping with Smoking Cravings

Suppression-based strategies. Suppression is an emotion-focused mental control strategy, whereby an individual deliberately tries to prevent a particular thought from coming to mind (Watkins & Moulds, 2007). As a coping strategy, suppression is phenomenologically nearly opposite to mindfulness, which involves relating directly to experience with open, nonjudgmental awareness. Studies have found that the suppression of thoughts results in rebound effects, whereby the suppressed thoughts are actually intensified (e.g., Wegner, 1997; Wegner, Schneider, Carter, & White, 1987). Additionally, researchers have found that thought suppression interferes with smoking cessation attempts (Haaga & Allison, 1994; Salkovskis, & Reynolds, 1994; Toll et al., 2001). However, it has been found that over a third of individuals use thought suppression strategies at least some of the time when they are dealing with cravings to smoke (Bowen & Marlatt, 2007). It has been found that when individuals diagnosed with anxiety and mood disorders are given instructions to either suppress or accept their emotions in response to an emotion-provoking film, those individuals engaging in acceptance display less negative affect following the viewing (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). Given the

prevalent use of suppression strategies, they serve as an informative comparison to mindfulness strategies in coping with cravings.

Mindfulness and acceptance-based strategies. Recently, the use of acceptance and mindfulness-based strategies has been explored within the context of addiction treatment (e.g., Davis, Fleming, Bonus, & Baker, 2007; Marlatt et al., 2004; Pollack et al., 2002; Toneatto, Vettese, & Nguyen, 2007; Vernig & Orsillo, in press; Vettese, 2007; Vieten, 2005). Mindfulness, a therapeutic approach that was initially described in its application for patients with chronic pain (Kabat-Zinn, 2005), is commonly defined as “paying attention in a particular way: on purpose, in the present moment, and non-judgmentally” (Kabat-Zinn, 1994, p. 4). It plays a central role in Buddhism, with Right Mindfulness being the seventh element of the Noble Eightfold Path, the practice of which is considered a prerequisite for the development of wisdom and insight (Dryden & Still, 2006). While the construct of mindfulness originated in some of the earliest Buddhist writings, it needn’t be either religious or esoteric in nature. Thus, within a secular context, mindfulness has been attracting increased attention among western scientific and medical communities as a non-pharmacological, emotion-focused strategy for alleviating psychological and physical distress.

Mindfulness skills are developed through meditative practices that encourage individuals to focus their attention on a target of interest, while maintaining nonjudgmental awareness of the present moment (Baer, 2003). When phenomena enter into an individual’s awareness during mindfulness practice, it is important for the phenomena to be attended to, without passing judgment on the nature of the phenomena. Interventions involving mindfulness training have been burgeoning within recent years, with mindfulness and acceptance-based treatments even being referred to as “the third wave of cognitive behavioural therapy” (Baer, 2005). Among the

first therapies to incorporate mindfulness techniques was Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 2005), which manualized the practice of mindfulness, allowing it to become an evidence-based therapeutic approach (Dryden & Still, 2006). Initially, MBSR was developed for the treatment of patients suffering from chronic pain, but it has since been modified for use with individuals suffering from stress-related ailments such as fibromyalgia and psoriasis (Goldenberg et al., 1994; Kabat-Zinn et al., 1998), chronic illness and disease (Specia, Carlson, Goodey, & Angen, 2000; Carlson, Ursuliak, Goodey, Angen, & Specia, 2001), generalized anxiety and panic disorder (Kabat-Zinn et al., 1992; Miller, Fletcher, & Kabat-Zinn, 1995), and binge eating disorder (Kristeller & Hallett, 1999).

Mindfulness techniques have also been incorporated into a number of different therapies for prevention of relapse in depression and treatment of borderline personality disorder and substance abuse (Baer, 2003; Clark et al., 2006). A meta-analysis conducted by Grossman, Niemann, Schmidt, and Walach (2004) comparing 20 studies on the effectiveness of MBSR suggests that mindfulness-based therapies are generally an effective means of alleviating the aforementioned conditions. These findings were also consistent with those of Baer (2003), whose meta-analytic study provides additional support for the effectiveness of MBSR.

Other therapies that have incorporated mindfulness techniques include Mindfulness-Based Cognitive Therapy (MBCT; Teasdale et al., 2000) for the prevention of depressive relapse, Dialectical Behaviour Therapy (DBT; Linehan, 1993a; Linehan, 1993b) for individuals with Borderline Personality Disorder, and Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999), for which there is preliminary evidence suggesting efficacy for a variety of problematic conditions, including chronic pain, addiction, depression, anxiety, psychosis, stress, diabetes management, and smoking cessation (Hayes, 2002).

Studies suggest that smokers tend to rely on avoidance strategies to cope with stress, which are predictive of future relapse (Kassel et al., 2003; Wegner & Zanakos, 1994). Suppression and distraction techniques have been found to be iatrogenic in studies of substance use, as they can be counterproductive and result in a rebound effect, whereby cravings are intensified (e.g., Haaga & Allison, 1994; Salkovskis & Reynolds, 1994; Toll et al., 2001). Conversely, mindfulness practices are conceptually analogous to interoceptive exposure practices (Carmody et al., 2007), such that they facilitate emotional approach coping and acceptance by encouraging individuals to engage in moment-by-moment awareness of negative affective cues without engaging in maladaptive responding (Baer, 2002). This in turn builds a tolerance to such cues and creates a new, more adaptive conditioned response to negative affective cues (Breslin et al., 2002). Specifically, mindfulness requires one to be aware of his or her thoughts and feelings without reacting to them or attempting control or change them, which can act as a form of covert exposure and translate into increased self-efficacy (Hayes et al., 1999). It has been suggested that the “repeated experience of observing rather than reacting to one’s urges or emotional responses to eliciting stimuli may engender a greater sense of control over the actual decision to use” (Breslin et al., 2002). This reduced reactivity, in turn, may reduce the likelihood of relapse to drug use among addicted populations.

Research suggests that mindfulness can enhance general feelings of self-efficacy and control (Bishop, 2002), including in the context of addiction. Mindfulness may be particularly useful in decreasing the avoidance of thoughts and increasing confidence to resist smoking urges, thereby reducing the likelihood of relapse triggers to smoking (Carmody et al., 2007). To test the effects of mindfulness strategies on smoking and self-efficacy, Bowen and Marlatt (in press) examined the effectiveness of a brief mindfulness-based instruction set on urges for cigarettes

and smoking behaviour following a cue exposure. Results from this study suggest that participants receiving brief mindfulness-based instructions, when compared to those in a comparison group who were asked to deal with the cue-evoked cravings as they usually would, smoked fewer cigarettes over the seven-day follow-up period. However, this study did not include an equally face valid control condition to the experimental condition, which limits the conclusions that can be drawn about the effectiveness of the mindfulness-based strategy. Furthermore, the follow-up assessment in this study took place over the telephone once participants had already been debriefed and notified of their group membership, which may have influenced participants' reporting.

Other recent research has shown adherence to an MBSR meditation practice to be positively associated with smoking cessation outcomes and reductions in emotional distress (Davis et al., 2007). Furthermore, Bowen and colleagues (2007) have shown that alcohol dependent individuals participating in a course of Vipassana mindfulness meditation reported a significant decrease in thought suppression as compared to individuals in a treatment as usual condition, which partially mediated the effects of the course. In addition, mindfulness training has been shown to correlate with improvements in positive and negative affect, and maintenance of these gains at four and eight-month follow-up (Davidson et al., 2003).

Summary. Preliminary theory and research points to potential benefits of mindfulness in the treatment of addiction, including smoking cravings. Mindfulness-based approaches are thought to cultivate nonreactivity and nonjudgmental acceptance of thoughts, urges, and sensations. In contrast, findings suggest that suppressing thoughts about using a substance can have the inverse effect of actually increasing the likelihood of use. Individual difference variables, such as dispositional mindfulness and anxiety sensitivity, may also influence the extent

to which an individual is able to successfully engage in and benefits from mindfulness strategies, including in the context of smoking cessation.

1.6 Individual Differences in Responsivity to Emotion-Based Coping Strategies

There may be variability in the extent to which individuals who want to quit smoking are actually receptive to emotional approach versus suppression strategies for dealing with smoking cravings, and the distressing emotional experiences that can be associated with them. For instance, being more mindful dispositionally, or otherwise more receptive to mindfulness practices, may impact on one's capacity to engage in coping strategies such as mindfulness or suppression, and the effectiveness of these strategies.

In this vein, there is a growing literature that has begun to explore mindfulness as an individual difference variable (e.g., Baer et al., 2004; Baer et al., 2008). This literature suggests that individuals may vary in how dispositionally mindful they are, regardless of actual prior exposure to mindfulness training or techniques (Baer et al., 2004; Brown & Ryan, 2003). Furthermore, research suggests that the active practice of meditation can nurture the development of mindfulness skills, which in turn, contribute to the psychological well-being of long-term practitioners (Baer et al., 2008). A positive correlation has been found between dispositional mindfulness, or the tendency to be more mindful, and well-being, such that increased mindfulness correlates with lower levels of neuroticism, anxiety, depression, and negative affect (Baer, Smith, & Allen, 2004; Brown & Ryan, 2003). Toneatto, Vettese, and Tsang (2007) have recently found that higher levels of mindfulness are related to lower levels of depression and anxiety. In addition, dispositional mindfulness has been related to lower severity of addictive and impulsive acting out behaviours among youths seeking treatment for problem substance use (Vettese, 2007). Thus, dispositional mindfulness may be an important predictor of

the extent to which an individual is able to engage in a mindfulness strategy for coping with cravings, and correspondingly, with the effectiveness of the strategy on smoking relevant outcomes.

In addition to individual differences in mindfulness, individuals vary widely on how anxiety sensitive they generally are, or become in response to coping strategies such as mindfulness or suppression. It has been suggested that smokers high in anxiety sensitivity might benefit from acceptance-based therapies, which could help reduce reactivity to cravings and the bodily sensations that accompany craving (Leyro et al., 2008). The experience of repeatedly observing cravings, rather than reacting to them, may increase one's sense of control by demonstrating that one can experience negative emotional states without having to avoid them or act upon them (Breslin et al., 2002). This may be relevant to smoking cessation treatment, as self-efficacy is one of the strongest predictors of long-term abstinence from smoking (Shiffman et al., 2000; Shiffman, Kassel, Gwaltnew, & McChargue, 2005).

Individuals who are characteristically more anxiety sensitive may tend toward more suppression and avoidance-oriented coping strategies when dealing with any kind of distressing emotional or physical experience (Carmody et al., 2007). Reliance on suppression may be problematic for these individuals insofar as avoidance strategies are predictive of future relapse following a smoking cessation attempt (Kassel et al., 2003; Wegner & Zanakos, 1994). Thus, the extent to which an individual is anxiety sensitive dispositionally, or in response to a coping strategy that asks them to be aware of or suppress bodily symptoms and cravings, may be another important variable that influences how one responds to a mindfulness or suppression strategy for smoking related cravings.

in coping with smoking cravings, and that these outcomes would be better than those found in the suppression condition. In addition, it was expected that at the one-week follow-up, participants in the mindfulness versus suppression condition would consume fewer cigarettes, and demonstrate lower nicotine dependence. The extent to which individual difference variables, including dispositional mindfulness and anxiety sensitivity, could help to explain any associations between study condition and smoking outcomes was also explored by examining the extent to which these variables moderated outcomes at the follow-up. Furthermore, the extent to which individuals are able to enter into a state of mindfulness, or are anxiety sensitive, following the intervention will be explored as potential moderators of outcomes at the follow-up assessment.

Chapter 3: Method

3.1 Participants

Recruitment procedures and study inclusion criteria. A total of 64 participants were recruited for the present study, however 3 were excluded from all analyses because they had either stopped smoking or significantly cut back on their smoking (i.e., reduced their smoking to less than 10 cigarettes per day) between the initial screening and the time when they arrived for their first study session. As such, participants included in the present study were 61 adults over the age of 18 who self-identified as cigarette smokers. Participants were recruited from either Ryerson University, or from the surrounding community. Twelve participants were recruited through the Ryerson University research participant pool, consisting of undergraduate students enrolled in a psychology course. These participants received a total of two course credits towards their introductory psychology course as compensation for participating in the two study sessions, with one credit being granted for participation in each of the two sessions. The remaining 49 participants were recruited through: (a) flyer postings at Ryerson University and the surrounding community; (b) advertisements posted on the Internet through free online classified advertisement websites, specifically Craigslist and Kijiji; and (c) advertisements in a free newspaper that is primarily available to commuters, the Toronto Metro. For the first two and a half months of recruitment, community participants received \$10.00 compensation for their involvement in the first session of the study. Additionally, those participants who agreed to partake in the seven-day follow-up received a \$5.00 gift card and were entered into a draw to win \$100.00. An additional compensation of \$15.00 was implemented shortly into the study to offset participant travel costs.

In order to be included in this study, participants were required to indicate that they: (a) smoked an average of 10 or more cigarettes per day over the past month; (b) did not have any significant difficulty reading, speaking, or writing in English; (c) did not have any significant difficulty using a computer to respond to questionnaires; (d) were over the age of 18; and (e) had thought about cutting back on their smoking, or have tried to quit smoking in the past. $N = 48$, or 78.69% of the sample was retained at follow-up. There were no significant differences between the study conditions on participant drop-out, and the participants who dropped out of the study did not differ from those who stayed in the study.

Participant characteristics. Thirty-six (59.02%) of the participants included in this study were males and 25 (40.98%) were females. Participants ranged in age from 19 to 64 ($M = 40.34$, $SD = 12.42$). Just over 77% were single, while 21.31% reported being married or in common-law relationships. Seventy-two percent of the sample self-identified as White, 6.56% identified as South Asian, 6.56% as Hispanic, 3.28% as Black, 1.64% as Aboriginal, 1.64% as East Asian, 1.64% as Southeast Asian, 1.64% as Middle Eastern, and 4.92% self-identified as a mix of these categories (1.64% mixed Black and White; mixed Aboriginal, Black, and Middle Eastern; and mixed Aboriginal and Black; respectively). Furthermore, majority of the participants reported that they had either completed high school, attended some college or university, or complete college/university (22.95%, 34.43%, and 24.59%, respectively), while 9.84% did not complete high school and 8.20% obtained at least some graduate level education (3.28% completed a graduate degree). Additionally, 54.10% of participants were employed (32.79% full-time, 21.31% part-time) at the time of assessment, and 18.33% were students. Sample characteristics separated by study condition are listed in Table 1. Comparisons between the suppression and

Table 1

Sample Characteristics Separated by Study Condition

	Suppression Condition	Mindfulness Condition
Age <i>M</i> (<i>SD</i>)	39.60 (14.29)	41.06 (10.48)
Gender (Frequency)		
Male	60.0% (18)	58.1% (18)
Female	40.0% (12)	41.9% (13)
Race/Ethnicity (Frequency)		
Aboriginal	0.0% (0)	3.2% (1)
Black	3.3% (1)	3.2% (1)
East Asian	0.0% (0)	3.2% (1)
South Asian	13.3% (4)	0.0% (0)
Southeast Asian	0.0% (0)	3.2% (1)
Hispanic	3.3% (1)	9.7% (3)
Middle Eastern	0.0% (0)	3.2% (1)
White	80.0% (24)	64.5% (20)
Mixed Race	0.0% (0)	9.7% (3)
Education (Frequency)		
Some high school	13.3% (4)	6.5% (2)
Completed high school	13.3% (4)	32.3% (10)
Some college/university	23.3% (7)	45.2% (14)
Completed college/university	33.3% (10)	16.1% (5)
Some graduate education	10.0% (3)	0.0% (0)
Completed graduate degree	6.7% (2)	0.0% (0)

Employment Status (Frequency)

Unemployed	20.0% (6)	32.3% (10)
Student	13.3% (4)	19.4% (6)
Employed full-time	36.7% (11)	29.0% (9)
Employed part-time	26.7% (8)	16.1% (5)
Student and Employed part-time	3.3% (1)	0.0% (0)

Marital Status (Frequency)

Single	80.0% (24)	74.2% (23)
Married/Common-law	20.0% (6)	22.6% (7)
Widowed	0.0% (0)	0.0% (0)

Experience with yoga (Frequency)

None (never tried it)	50.0% (15)	48.4% (15)
Minimal (at least once)	20.0% (6)	32.3% (10)
Some (several times)	23.3% (7)	16.1% (5)
Regular (once a month or more)	6.7% (2)	3.2% (1)
Often (once a week or more)	0.0% (0)	0.0% (0)
Daily (practice on most days)	0.0% (0)	0.0% (0)

Experience with meditation (Frequency)

None (never tried it)	46.7% (14)	41.9% (13)
Minimal (at least once)	13.3% (4)	19.4% (6)
Some (several times)	30.0% (9)	29.0% (9)
Regular (once a month or more)	3.3% (1)	6.5% (2)
Often (once a week or more)	0.0% (0)	0.0% (0)
Daily (practice on most days)	6.7% (2)	3.2% (1)

Note. $n(\text{suppression}) = 30$, $n(\text{mindfulness}) = 31$

* $p < .05$.

mindfulness conditions revealed no significant differences at baseline on key demographic variables.

Smoking Characteristics. On average, participants smoked 16.42 ($SD = 7.41$) cigarettes per day over the course of seven days prior to their participation in the study. Additionally, the mean score on the Fagerstrom Test for Nicotine Dependence (FTND) was 4.57 ($SD = 1.35$) out of 10, which constitutes a low level of nicotine dependence. There were no significant differences between the two study conditions on mean FTND scores, $t(59) = -.80, p > .05$ ($M = 4.43, SD = 1.45$ for suppression condition; $M = 4.71, SD = 1.24$ for mindfulness condition). At baseline, 6.56% of participants were classified as having very low nicotine dependence, 40.98% as low dependence, 26.23% as moderate dependence, and 26.23% as high nicotine dependence. No participants scored in the very high dependence range (a score of 8 – 10). Furthermore, participants' expired breath carbon monoxide (CO) level was measured at baseline, which was used to biologically confirm smoking status. The mean level of expired breath CO for the sample was 16.75 ($SD = 8.53$) parts per million (ppm). Moreover, 81.97% of the sample yielded a CO level of 10 ppm or above, a cut-off level that is frequently used in smoking studies to identify heavy smokers (e.g., Fonder et al., 2005).

3.2 Materials

Participants were instructed to bring a cigarette package containing at least two of their preferred brand of cigarettes to the first study session. These items were used for the cue exposure procedure, along with a cigarette lighter, an ashtray, and an opaque bowl used to cover these materials prior to cue induction. Cue exposure and intervention instructions were prerecorded on an audio CD and played through stereo headphones to participants, to ensure that all of the participants in the same study condition received identical instructions. Participants'

report of smoking behaviour was confirmed using the EC50 Micro III Smokerlyzer, an expired breath carbon monoxide monitor (Bedford Instruments, Bedford Scientific Ltd).

3.3 Measures

Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986). This 16-item scale asks respondents to rate their fear of physiological anxiety symptoms, such as rapid heartbeat and shortness of breath, on a scale from 1 (very little) to 4 (very much). Rather than measuring anxiety, the ASI measures a person's fear of anxiety-related symptoms. Research suggests that a four factor solution best fits the ASI, including fear of symptoms in public, fear of cardiorespiratory and gastrointestinal sensations, and fear of trembling and shaking (Vujanovic, Arrindell, Bernstein, Norton, & Zvolensky, 2007). Examples of items include "other people notice when I feel shaky," "unusual body sensations scare me," and "when I am nervous, I worry that I might be mentally ill." Scores on the ASI range from 0 to 64, with higher scores indicating greater level of anxiety sensitivity. The internal consistency of the ASI total score was found to be high (Cronbach's $\alpha = .83$; McNally, 2002). In the present study, the ASI was used as a measure of trait anxiety sensitivity and yielded a Cronbach's alpha coefficient of .90.

Body Sensations Questionnaire – State Version (BSQ-S; Chambless, Caputo, Bright, & Gallagher, 1984; adapted by Rogojanski, Vettese, & Antony, 2008). The BSQ-S is a 17-item questionnaire assessing the intensity of fear of somatic sensations associated with autonomic arousal. Research indicates that the original BSQ is significantly correlated with other common measures of fear of anxiety (Asmundson et al., 1996; McNally & Lorenz, 1987), including the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986) and the Agoraphobic Cognitions Questionnaire (Chambless et al, 1984), and assesses a dimension of anxiety that is distinct from trait anxiety (Asmundson et al., 1996). Although the ASI is one of

the most common measures of fear of anxiety, the structure of this questionnaire makes it very difficult to convert the items into a state measure. As such, within the present study, the BSQ was adapted to be a measure of state fear of physical sensations associated with anxiety, or state anxiety sensitivity. Respondents were asked to record how much they fear specified sensations at the current moment, on a five-point scale ranging from 1 (not at all) to 5 (extremely). Examples of items include sensations such as heart palpitations, dizziness, and shortness of breath. The original BSQ is highly internally consistent (Cronbach's $\alpha = .87$), and has good discriminant validity. Within the current study, the BSQ-S was also found to have very high internal consistency, yielding a Cronbach's alpha of .98.

Cognitive Affective Mindfulness Scale – Revised (CAMS-R; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007). The CAMS-R is a 12-item self-report measure of attention, awareness, present-focus, and acceptance/nonjudgment with respect to thoughts and feelings in general daily experience. Participants respond to a 4-point Likert-type scale ranging from 1 (rarely/not at all) to 4 (almost always) to questions such as, “it is easy for me to concentrate on what I am doing,” “I am preoccupied by the future,” and “I can tolerate emotional pain.” Scores on the scale are summed, with higher scores reflecting greater mindfulness. The scale authors have found internal consistencies ranging from Cronbach's alpha .74 to .80, and negative correlations with experiential avoidance, thought suppression, rumination, worry, depression, and anxiety. Positive correlations have been found with clarity of feelings, mood repair, cognitive flexibility, and well-being (Hayes & Feldman, 2004). In the present study, the CAMS-R was used as a measure of trait mindfulness and was found to have adequate internal consistency (Cronbach's $\alpha = .82$).

Credibility/Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000). The CEQ is a brief measure of treatment expectancy and rationale credibility frequently used in clinical outcome studies. This scale consists of two separate factors, expectancy and credibility, that have been shown to be stable across different populations. The scale includes items such as, “at this point, how logical does the therapy offered to you seem?” which are rated on either a 9-point scale or a 0 to 100% scale (set at 10% intervals). The scale demonstrates high internal consistency for the expectancy factor (standardized $\alpha = .79$ to $.90$) and for the credibility factor (Cronbach’s $\alpha = .81$ to $.86$). The entire scale yields a standardized alpha of between $.84$ and $.85$. Additionally, this scale has been shown to have good test-retest reliability over a 1-week period. Within the present study, the CEQ yielded a Cronbach’s alpha of $.89$ for the credibility factor, and standardized alpha’s of $.88$ for the expectancy factor. The standardized alpha for the entire scale was $.91$.

Depression Anxiety Stress Scales – 21-item version (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 a 21-item scale that measures depression, anxiety, and stress/tension over the past week. Items are rated on a 4-point severity/frequency scale, and include statements such as, “I find it hard to wind down,” “I was aware of dryness of my mouth,” and “I couldn’t seem to experience any positive feelings at all.” The DASS-21 has been found to be a reliable and valid measure, yielding high Cronbach’s alphas ($.94$ for the depression subscale, $.87$ for the anxiety subscale, and $.91$ for the stress subscale; Antony et al., 1998). Within the present study, the DASS-21 yielded Cronbach’s alphas of $.92$ for the depression subscale, $.71$ for the anxiety subscale, and $.89$ for the stress subscale.

Fagerstrom Test of Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). The FTND is a brief, 6-item scale that yields a score between 0 and 10,

testing smokers' level of nicotine dependence. Individuals respond to multiple choice type questions, with each answer corresponding to a score and higher scores indicating higher levels of dependence. Although there are no standard cutoff scores for the presence or absence of nicotine dependence, according to one suggested scoring system, a score of 1 – 2 suggests very low dependence, 3 – 4 suggests low dependence, 5 indicates moderate dependence, 6 – 7 constitutes high dependence, and 8 – 10 very high dependence (Fagerstrom, Heatherton, & Kozlowski, 1991). Examples of items include “how many cigarettes do you smoke per day?” and “how soon after you wake up do you smoke your first cigarette?” The FTND has been shown to produce reliable and valid scores under a variety of conditions (Shadel & Shiffman, 2005) that predict smoking cessation outcomes (Fagerstrom & Schneider, 1989). Heatherton and colleagues (1991) report the internal consistency of the FTND to be equal to Cronbach's alpha of .61. However, data from the present study demonstrated an even lower level of reliability (Cronbach's $\alpha = .44$). The low internal consistency of the FTND within the current study may be explained by the relatively low nicotine dependence of study participants, as well as the small number of items included in this scale. Although the internal consistency is quite low for this scale, it is one of the most commonly used measures of nicotine dependence.

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS is a 20-item self-report measure of affect. It consists of words that describe a variety of feelings and emotions, 10 positive and 10 negative. Participants are required to rate each item on a scale ranging from 1 (very slightly or not at all), to 5 (extremely). Examples of items include emotions such as interested, distressed, excited, upset, strong, guilty, scared, hostile, and proud. Previous research indicates that the PANAS is a reliable measure, yielding Cronbach's alpha's of .91 for the positive affect scale, and .89 for the negative affect scale (Jolly, Dyck, Kramer, &

Wherry, 1994). Within the current study, the PANAS was highly internally consistent, yielding a Cronbach's alpha's of .88 for the positive affect scale, and .84 for the negative affect scale.

Readiness to Change Questionnaire (RCQ; Rollnick, Heather, Gold, & Hall, 1992; adapted by Rogojanski, Vetteese, & Antony, 2008). The RCQ is a 12-item self-report questionnaire measuring readiness to change based on Prochaska and DiClemente's (1986) stages of change model. The RCQ was initially developed for use with alcohol dependent individuals, but was adapted for the present study to be used with nicotine dependent participants. Examples of items include, "I don't think I smoke too much," "I enjoy smoking, but sometimes I smoke too much," and "I am trying to smoke less than I used to." Items are rated on 5-point scale ranging from strongly agree to strongly disagree. The internal consistency of the original subscales is acceptable (precontemplation Cronbach's $\alpha = .73$; contemplation Cronbach's $\alpha = .80$; action Cronbach's $\alpha = .85$). The RCQ also has satisfactory test-retest reliability, with Pearson correlations ranging from .78 to .86. However, within the present study, the adapted version of the RCQ yielded significantly lower alpha values (precontemplation Cronbach's $\alpha = .26$; contemplation Cronbach's $\alpha = .58$; action Cronbach's $\alpha = .77$).

Relapse Situation Efficacy Questionnaire (RSEQ; Gwaltney et al., 2001). The RSEQ is a 43-item self-report measure assessing participants' confidence in their ability to resist the temptation to smoke in a wide variety of contexts. Items make up seven separate factors and include questions regarding triggering moods, such as tired, happy, and miserable, and triggering situations, such as the workplace or a bar. Participants must rate their confidence level on a 4-point scale ranging from 1 (not at all confident) to 4 (extremely confident). This measure has been shown to have adequate internal consistency for each of the seven factors (Cronbach's $\alpha = .77 - .91$). Within the current study, Cronbach's alpha values were as follows: .76 for low

arousal factor, .93 for negative affect factor, .88 for positive affect factor, .87 for restrictive situation factor, .79 for idle time factor, .80 for social situation/food factor, and .43 for the craving factor.

Timeline Follow-back (TLFB; Brown, Burgess, Sales, Evans, & Miller, 1998; Sobell et al., 1980). The TLFB is an interview used to determine the number of cigarettes an individual has consumed over a predetermined period of time. The interviewer first uses a calendar to identify events of personal interest (e.g., holidays, birthdays, illnesses, etc.) as anchors that help participants with recall. Participants are then asked to report the number of cigarettes they consumed daily over the past seven days, starting with the present day. Research indicates that the TLFB has good test-retest reliability and is strongly correlated with individuals' daily smoking diaries (Brown et al., 1998).

Toronto Mindfulness Scale (TMS; Lau et al., 2006). This 13-item inventory assesses state mindfulness following a meditation exercise by asking participants to indicate how well each statement describes the experience they just engaged in on a 5-point response scale. Response options range from 0 (not at all) to 4 (very much). Examples of items include "I was curious about each of the thoughts and feelings that I was having," and "I was receptive to observing unpleasant thoughts and feelings without interfering with them." Two separate factors are accounted for within this scale, Curiosity and Decentering. The Curiosity factor consists of items that reflect awareness of one's experience in the present moment with a quality of curiosity, and has been found to yield a Cronbach's alpha of .86. The Decentering factor consists of items that emphasize distance and disidentification with the recent experience, and has high internal consistency (Cronbach's $\alpha = .87$). In the present study, the TMS was used as a state measure of

mindfulness and yielded adequate to good internal consistency (Cronbach's $\alpha = .83$ for the curiosity factor and .72 for the decentering factor.

Visual Analogue Scale (VAS). The VAS is an instrument that measures a characteristic that varies across a continuum of values and cannot be easily measured otherwise (Gould, Kelly, Goldstone, & Gammon, 2001). The VAS is comprised of a 100 mm horizontal line that is anchored by word descriptors at each end of the line. Participants are asked the question "How strong is your urge to smoke right now?" and are asked to place a vertical mark across the line to indicate how much craving they are experiencing at the current moment. The response options range from "No urge at all" to "Very severe urge." A score is determined using a ruler to measure where the participant drew his or her mark along the horizontal line. The VAS has been identified as a reliable measure of subjective change within an individual (Wewers & Lowe, 1990).

3.4 Procedure

Telephone screen. The principal investigator administered a screening questionnaire (see Appendix A) to all interested subjects over the telephone to determine participants' eligibility for the present study. Participants who met all eligibility criteria and were interested in taking part in the study were scheduled to attend two research sessions, seven days apart.

Session 1. At the initial testing session, participants arrived at the laboratory with a package of their preferred brand of cigarettes. To eliminate differences between subjects based on length of smoking abstinence, participants were asked to smoke one cigarette 30 minutes prior to arriving for their first study session (Erblich & Bovbjerg, 2004). No longer smoking deprivation period was used in this study, as a number of studies have suggested that smoking deprivation alone may raise nicotine craving to levels at which cue-reactivity effects are no

longer noticeable due to ceiling effects (e.g., Fonder et al., 2005; Sayette, Martin, Wertz, Shiffman, & Perrott, 2001; Tidey, Rohsenow, Kaplan, & Swift, 2005).

Upon arrival to the first study session, participants were asked to present the experimenter with the package of their preferred brand of cigarettes, to be reintroduced later in the session. The investigator obtained informed consent from each participant prior to beginning the study procedure (see Appendix B), following which all participants were randomly assigned to either the mindfulness or suppression condition. Participants were asked to report the number of cigarettes smoked each day over the seven days prior to their baseline assessment, using the TLFB. Their smoking status was biologically verified using a CO monitor, and participants were asked to report approximately how many minutes prior to the session they consumed their last cigarette. On average, participants reported that they had smoked their last cigarette 47.98 minutes prior to the study session. Measures were administered at six different points during the study: one set of baseline assessment measures completed upon arrival on the first testing day (Time 1); three brief mid-session assessments administered between each of the two cue exposures and immediately following the cue induction procedure, and a set of measures administered immediately following the delivery of the craving reduction intervention (Time 2); and a follow-up set of assessment measures collected seven days post-intervention (Time 3). During the follow-up assessment, participants also received a second administration of the TLFB to assess the number of cigarettes they consumed each day for seven days following testing day.

Cue Exposure. The experimenter placed a tray on a table in front of the participant, with an upturned opaque bowl used to cover the participant's preferred brand of cigarettes, a lighter with no lighter fluid, and an ashtray. The instructions for the cue exposure were audio recorded and played for each participant through stereo headphones to ensure consistency. The audio

recording instructed participants to lift the bowl, pick up the pack of cigarettes, open the pack, and remove one cigarette. Participants were asked to hold the cigarette as they normally would, and then to place it into their mouth as they would when smoking. Participants were then instructed to bring the lighter towards the cigarette and attempt to light the cigarette. Although many studies involving in vivo cue exposure to cigarettes require participants to actually light the cigarette (e.g., Havermans, Debaere, Smulders, Wiers, & Jansen, 2003; Miranda, Rohsenow, Monti, Tidey, & Ray, 2008), the methodology for the present study was altered to avoid cue reactivity complications that may arise due to the release of nicotine from cigarette smoke. Participants were asked to repeat the cue exposure a total of two times.

Details of suppression and mindfulness conditions. Throughout the cue exposure, participants were provided with suggestions on how they might deal with the thoughts and cravings they were likely experiencing. Half of participants ($n = 31$) received instruction to accept their present-moment experience in a nonjudgmental way (see Appendix C for transcript of the Mindfulness Strategy). They were instructed to notice their thoughts and urges, without reacting to them or attempting to make them go away. Additionally, they were asked to imagine that their craving is a wave that reaches a peak and then naturally subsides if one is able to wait it out without succumbing to the temptation of using. These instructions were based on the Urge Surfing technique described by Marlatt and Gordon (1985) and Davis and colleagues (2007).

Participants in the suppression condition ($n = 30$) received instructions that encouraged them to forcefully subdue their present-moment experience by attempting to stop and ignore their thoughts and urges (see Appendix D for transcript of Suppression Strategy). The instructions given to both groups were delivered by the same voice on the audio recordings, and balanced for length of the instructions and the number of times that words pertaining to smoking

were used (e.g., smoking, urges, cravings, cigarette). The intervention instructions were given throughout the two cue exposures, and participants were asked to complete a visual analogue scale of their level of craving between each exposure and immediately following the delivery of the craving reduction intervention. Following the cue exposure and coping instructions, participants were asked to complete a package of post-intervention measures. Participants were then given their compensation for participating in the first study session.

Session 2. Participants returned to the lab seven days post-intervention to complete a set of follow-up measures and provide post-intervention cigarette use information using the TLFB. Following the follow-up assessment, participants were compensated for attending the second session and given a debriefing statement (see Appendix E) outlining the purpose of the study, which the researcher reviewed with them. Lastly, participants were given the opportunity to add themselves to a mailing list to receive information regarding the outcome of this study.

Chapter 4: Results

The primary variables of interest were tested for normality of distributions and outliers, which indicated that all variables were within an acceptable range and approximated a normal distribution. Comparisons between the suppression and mindfulness conditions revealed no significant differences at baseline on any of the primary outcome variables. See Table 2 for a summary of group means and standard deviations on the primary outcome measures.

4.1 Effect of Cue Induction and Treatment Credibility

Participants' ratings of their cravings immediately following the cue induction procedure indicated that this procedure was ineffective in increasing participants' subjective craving for a cigarette. This was the case in both the suppression ($t[29] = .67, p = .51$) and the mindfulness ($t[30] = .65, p = .52$) condition. There were also no group differences on perceived treatment credibility and expectancy, $t(59) = -1.57, p = .12, r = .20$. Thus, both groups viewed their study condition as providing them with an equally credible intervention (standardized $M = -1.00$ for the suppression condition, standardized $M = .97$ for the mindfulness condition). Furthermore, there were no significant differences between conditions on participants' percentage of time using the craving strategy over the course of the follow-up period, $\chi^2(1) = .01, p = .93$ (58.06% for mindfulness condition, 56.67% for suppression condition). Participants reported using their respective strategy an average of 3.68 days during the follow-up period ($M = 3.88, SD = 1.78$ for mindfulness condition; $M = 3.48, SD = 2.06$ for suppression condition), and gave the strategy an average rating of 4.59 on a 10-point scale in terms of its ability to improve their ability to cope with nicotine cravings ($M = 4.83, SD = 1.44$ for mindfulness condition; $M = 4.35, SD = 2.31$ for suppression condition). There were no significant group differences on pre-study

Table 2

Baseline Measures Separated by Study Condition

Measure	Suppression Condition		Mindfulness Condition		<i>t</i>	<i>df</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
TLFB	17.59	7.89	15.29	6.84	1.22	59
FTND	4.43	1.45	4.71	1.24	-.80	59
CAMS-R Total	33.97	6.51	33.76	7.03	.12	59
Attention	8.60	2.54	8.39	1.99	.37	59
Present Focus	8.97	1.85	8.84	2.44	.23	55.84
Awareness	8.00	2.30	8.39	2.17	-.68	59
Acceptance	8.40	2.33	8.15	2.45	.42	59
DASS-21 Stress	12.90	9.39	14.12	10.97	-.46	57
DASS-21 Anxiety	9.64	6.90	8.56	7.68	.57	57
DASS-21 Depression	9.03	10.87	11.00	10.63	-.70	57
PANAS Positive	31.10	7.47	29.39	9.71	.77	59
PANAS Negative	19.29	6.17	20.04	9.15	-.37	59
RSEQ Total	1.88	.44	1.93	.57	-.37	58
Negative Affect	1.45	.52	1.52	.73	-.43	59
Positive Affect	2.27	.76	2.20	.71	.37	59
Restrictive Situation	2.39	.65	2.45	.82	-.34	59
Idle Time	1.71	.45	1.77	.75	-.38	59
Social/Food	1.61	.45	1.66	.69	-.35	59

Low Arousal	1.97	.57	2.00	.61	-.19	59
Crave	1.78	.60	1.78	.72	.00	58

Note. TLFB = Timeline Follow-Back; FTND = Fagerstrom Test of Nicotine Dependence; CAMS-R Total = Total score of the Cognitive and Affective Mindfulness Scale - Revised; Attention = Attention subscale of Cognitive and Affective Mindfulness Scale; Present Focus = Present Focus subscale of Cognitive and Affective Mindfulness Scale; Awareness = Awareness subscale of Cognitive and Affective Mindfulness Scale; Acceptance = Acceptance subscale of Cognitive and Affective Mindfulness Scale; DASS-21 Stress = Stress subscale of the Depression Anxiety Stress Scale; DASS-21 Anxiety = Anxiety subscale of the Depression Anxiety Stress Scale; DASS-21 Depression = Depression subscale of the Depression Anxiety Stress Scale; PANAS Positive = Positive Affect subscale of the Positive and Negative Affect Scale; PANAS Negative = Negative Affect subscale of the Positive and Negative Affect Scale; RSEQ Total = Total score of the Relapse Situation Efficacy Questionnaire; Negative Affect = Negative Affect subscale of the Relapse Situation Efficacy Questionnaire; Positive Affect = Positive Affect subscale of the Relapse Situation Efficacy Questionnaire; Restrictive Situation = Restrictive Situation subscale of the Relapse Situation Efficacy Questionnaire; Idle Time = Idle Time subscale of the Relapse Situation Efficacy Questionnaire; Social/Food = Social/Food Situations subscale of the Relapse Situation Efficacy Questionnaire; Low Arousal = Low Arousal subscale of the Relapse Situation Efficacy Questionnaire; Crave = Craving subscale of the Relapse Situation Efficacy Questionnaire.

amounts of smoking ($t[45] = -.71, p = .48$) or post-study ratings of strategy usefulness ($t[36.52] = -.86, p = .39$).

Of additional relevance to the question of credibility, exploratory analyses were conducted to examine whether there were group differences in shifts in readiness to change from baseline to follow-up. Specifically, the progressive movement of participants to successive stages along the continuum of change was evaluated. Analyses revealed that 30.00% of participants in the suppression condition moved to a stage further along the continuum of change from baseline to follow-up assessment, and 25.81% of the participants in the mindfulness condition moved to a further stage at follow-up. There was no significant difference between conditions on number of participants who moved to a further stage of change, $\chi^2(1) = .17, p = .68$. Thus, both conditions were associated with clinically meaningful movement toward increasing readiness to change over the course of the experimental coping strategy.

Finally, independent samples t -tests were conducted on the TMS, a measure of state mindfulness administered immediately following the craving reduction intervention, as a manipulation check to evaluate whether participants in the mindfulness condition were significantly more mindful than those in the suppression condition *following* the intervention. Interestingly, and contrary to what would be expected, analyses revealed that there were no significant differences between conditions on measured levels of state mindfulness following the intervention, $t(59) = -1.00, p = .32$.

4.2 Intercorrelations Among Smoking Outcomes and Other Study Variables

Correlation analyses were initially conducted across conditions to examine whether the study variables were related at baseline. As would be expected, amount of smoking at baseline, as assessed by the TLFB, was positively correlated with nicotine dependence ($r = .42, p = .001$),

such that greater nicotine dependence was associated with more smoking. Furthermore, amount of smoking was negatively correlated with self-efficacy ($r = -.33, p = .009$), such that greater smoking amount was associated with less self-efficacy to refrain from smoking. Similarly, greater nicotine dependence was also associated with less self-efficacy to refrain from smoking, $r = -.57, p < .001$. Dispositional mindfulness at baseline was negatively associated with stress ($r = -.57, p < .001$), anxiety ($r = -.45, p < .001$), depression ($r = -.45, p < .001$), and negative affect ($r = -.62, p < .001$) at baseline, and positively associated with positive affect ($r = .48, p < .001$) and self-efficacy ($r = .31, p = .02$). Furthermore, depression at baseline was negatively associated with positive affect ($r = -.43, p = .001$) and positively associated with negative affect ($r = .63, p < .001$), such that individuals scoring higher on depression tended to report less positive affect and more negative affect. Table 3 summarizes correlational findings across conditions.

Correlational analyses were then re-run by study condition to establish whether correlations would emerge within condition over the course of the study (see Table 4 for summary). For these analyses, follow-up outcomes on smoking related variables were correlated with all of the other study variables, partialling each respective smoking variable at pre-intervention. Additionally, gender was controlled for in the correlations examining negative affect, stress, and anxiety, because analyses revealed a significant relationship of gender, specifically showing greater negative affect on the PANAS ($t[59] = 2.89, p = .005$), and stress ($t[57] = 2.19, p = .03$) and anxiety on the DASS-21 ($t[57] = 2.12, p = .03$) among women. These findings yielded a number of results. Table 4 summarizes correlational findings by study condition.

Table 3

Correlations Among Variables at Baseline Across Conditions

	TLFB	FTND	CAMS-R	Stress	Anxiety	Depress	Positive	Negative	RSEQ
TLFB	–	.42***	.28	-.05	.06	.04	.08	-.21	-.33**
FTND	–	–	-.08	.21	-.01	.15	-.22	.01	-.57***
CAMS-R	–	–	–	-.57***	-.45***	-.45***	.48***	-.62***	.31*
Stress	–	–	–	–	.62***	.67***	-.19	.70***	-.31*
Anxiety	–	–	–	–	–	.51***	-.00	.63***	-.21
Depress	–	–	–	–	–	–	-.43***	.63***	-.19
Positive	–	–	–	–	–	–	–	-.15	.40**
Negative	–	–	–	–	–	–	–	–	-.17
RSEQ	–	–	–	–	–	–	–	–	–

Note. $N = 61$. TLFB = Timeline Follow-Back; FTND = Fagerstrom Test of Nicotine Dependence; CAMS-R = Cognitive and Affective Mindfulness Scale – Revised; Stress = Stress subscale of the Depression Anxiety Stress Scale; Anxiety = Anxiety subscale of the Depression Anxiety Stress Scale; Depress = Depression subscale of the Depression Anxiety Stress Scale; Positive = Positive Affect subscale of the Positive and Negative Affect Scale; Negative = Negative Affect subscale of the Positive and Negative Affect Scale; RSEQ = Relapse Situation Efficacy Questionnaire.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Partial Correlations Among Outcome Variables at Follow-up Separated by Study Condition

	TLFB	FTND	CAMS-R	Stress	Anxiety	Depress	Positive	Negative	RSEQ
TLFB	–	.55	-.64*	.45	.46	.56	-.21	.22	.21
FTND	-.37	–	-.18	.47	.21	.72**	-.47	.22	.16
CAMS-R	.06	.14	–	-.08	-.15	-.26	.18	-.28	.02
Stress	-.14	.24	-.56	–	.43	.56	-.18	.27	.24
Anxiety	.48	-.31	-.12	.30	–	.45	-.30	-.41	.65*
Depress	.62*	-.16	-.15	.42	.79**	–	-.69*	.20	.08
Positive	-.08	-.04	.52	-.78	-.13	-.39	–	.02	-.41
Negative	.56	.28	.31	.11	.51	.51	.07	–	-.43
RSEQ	-.21	.55	-.45	.66*	-.04	.01	-.71*	.10	–

Note. All correlations listed above the diagonal line apply to the mindfulness condition ($n = 31$), and correlations below the diagonal line apply to the suppression condition ($n = 30$). TLFB = Timeline Follow-Back; FTND = Fagerstrom Test of Nicotine Dependence; CAMS-R = Cognitive and Affective Mindfulness Scale – Revised; Stress = Stress subscale of the Depression Anxiety Stress Scale; Anxiety = Anxiety subscale of the Depression Anxiety Stress Scale; Depress = Depression subscale of the Depression Anxiety Stress Scale; Positive = Positive Affect subscale of the Positive and Negative Affect Scale; Negative = Negative Affect subscale of the Positive and Negative Affect Scale; RSEQ = Relapse Situation Efficacy Questionnaire.

* $p < .05$. ** $p < .01$.

Correlational Findings in the Mindfulness Condition. As hypothesized, amount of smoking at follow-up was correlated with measured mindfulness in the mindfulness condition, $r = -.64, p = .02$, but not in the suppression condition, $r = .06, p = .85$. Thus, higher measured levels of mindfulness were associated with less smoking at the end of the study, but only among participants who had been exposed to mindfulness in response to the cue exposure. A positive relationship was found between levels of nicotine dependence and depression, but only within the mindfulness condition ($r = .72, p = .008$), such that greater subjective nicotine dependence was associated with greater levels of depression. Interestingly, analyses revealed a significant positive relationship between self-efficacy in coping with smoking urges and anxiety within the mindfulness condition, $r = .65, p = .02$, such that greater anxiety at follow-up was associated with greater self-efficacy to abstain from smoking.

Correlational Findings in the Suppression Condition. Correlational analyses further revealed a significant positive relationship between abstinence self-efficacy and stress levels within the suppression condition, $r = .66, p = .03$, suggesting that as participants' self-efficacy increased, so did their level of stress. However, this relationship was not evident within the mindfulness group, $r = .24, p = .46$. Furthermore, abstinence self-efficacy was found to be negatively related to positive affect, but only within the suppression condition, $r = -.71, p = .01$. Finally, amount of smoking correlated positively with levels of depression ($r = .62, p = .04$) and anxiety ($r = .79, p = .004$) at follow-up in the suppression condition, whereas these relationships were only marginally significant within the mindfulness group ($r = .56, p = .06$, and $r = .56, p = .06$, respectively).

4.3 Main Hypotheses

The primary hypotheses for this study pertained to group effects for the mindfulness versus suppression condition on post-intervention smoking amounts, self-efficacy, craving, nicotine dependence, affect, and depression. Hypotheses were tested using a mixed analysis of variance (ANOVA), with measures of the aforementioned outcome variables at either two (baseline and follow-up) or three (baseline, immediately following intervention, and follow-up) time points serving as the within-subjects factor, and condition (mindfulness or suppression) serving as the between-subjects factor. Statistical significance was set at $p < .05$.

Amount of Smoking. Change in amount of smoking was assessed using participants' scores on the TLFB at baseline and follow-up. There was a significant main effect of time, $F(1, 47) = 52.50, p < .001$, partial $\eta^2 = .53$, such that all participants reported smoking an average of 3.41 fewer cigarettes at the follow-up period, when compared to their baseline amount of smoking. However, contrary to hypotheses, there was no significant interaction between time and condition, $F(1, 47) = 1.98, p = .17$, partial $\eta^2 = .04$, indicating no significant differences between study conditions in amount of smoking at follow-up.

Self-Efficacy. Change in self-efficacy to abstain from smoking in a variety of contexts was assessed using participants' scores on the RSEQ as assessed at three time points over the study. As hypothesized, analyses revealed a significant main effect of time, $F(2, 90) = 6.81, p = .002$, partial $\eta^2 = .13$, indicating that participants increased in self-efficacy in coping with smoking urges across the study. However, there were no significant group differences in change in abstinence self-efficacy, $F(2, 90) = .72, p = .49$, partial $\eta^2 = .02$. Additional analyses conducted on each of the seven subscales of the RSEQ further revealed no significant group effects.

Craving. Changes in cravings were assessed using the VAS from immediately following the cue-induction procedure, which was methodologically designed to induce craving, and immediately following delivery of the mindfulness or suppression coping strategy. Contrary to hypotheses, there were no significant main effects of time, $F(1, 59) = .01, p = .94$, partial $\eta^2 = .00$, or time by condition, $F(1, 59) = .09, p = .76$, partial $\eta^2 = .01$. Therefore, contrary to hypotheses, these findings indicate that neither the mindfulness nor the suppression craving reduction interventions were successful in reducing cravings immediately following the cue induction procedure.

Affect. Changes in affect were assessed using the positive affect and negative affect subscales of the PANAS from baseline to follow-up. Analyses using the positive affect subscale revealed no significant main effect of time, $F(1, 44) = .00, p = .99$, partial $\eta^2 = .00$, or significant time by condition interaction, $F(1, 44) = 2.20, p = .15$, partial $\eta^2 = .05$. There was also no significant main effect of time on the negative affect subscale of the PANAS, $F(1, 45) = .12, p = .73$, partial $\eta^2 = .003$. However, the mixed ANOVA revealed a significant time by condition interaction for the negative affect subscale, $F(1, 45) = 8.11, p = .007$, partial $\eta^2 = .15$, such that the negative affect score of participants in the suppression condition increased by an average of 2.09 points, while the score of participants in the mindfulness condition decreased by an average of 2.68 points. In order to assess whether participants' negative affect scores changed significantly from baseline to follow-up, paired-samples t -tests were computed for each condition. Within the mindfulness condition, participants' negative affect score at baseline ($M = 20.09, SD = 9.82$) reduced significantly by the follow-up assessment ($M = 17.42, SD = 8.86$), $t(23) = 2.86, p = .009, r = .51$. However, this was not evident within the suppression condition,

$t(22) = -1.49, p = .15, r = .30$ ($M = 19.29, SD = 6.84$ at baseline; $M = 21.38, SD = 8.83$ at follow-up).

Depression. Group differences in change on depression were assessed using the depression subscale of the DASS-21 at the seven-day follow-up. Analyses revealed no significant main effect of time, $F(1, 44) = 1.05, p = .31$, partial $\eta^2 = .02$, but did show a significant time by condition interaction, $F(1, 44) = 8.09, p = .007$, partial $\eta^2 = .16$. Paired-samples t -tests indicated that while the depression scores for the suppression condition did not change significantly from baseline ($M = 10.61, SD = 11.59$) to follow-up ($M = 12.70, SD = 10.63, t(22) = -1.46, p = .16, r = .30$), they reduced significantly in the mindfulness condition, $t(22) = 2.47, p = .02, r = .47$ ($M = 12.70, SD = 11.11$ at baseline versus $M = 8.26, SD = 8.58$ at follow-up).

Nicotine Dependence. Group differences in changes on self-reported nicotine dependence on the FTND from baseline to follow-up were evaluated. A Mixed ANOVA revealed a marginally significant interaction between time and condition, $F(1, 45) = 3.46, p = .07$, partial $\eta^2 = .07$. Post-hoc paired-samples t -tests indicated that participants' nicotine dependence scores were marginally reduced from baseline to follow-up in the mindfulness condition, $t(23) = 2.22, p = .04$ ($M = 4.74, SD = 1.15$ at baseline; $M = 4.25, SD = 1.48$ at follow-up) but not in the suppression condition, $t(22) = -.61, p = .55$ ($M = 4.43, SD = 1.50$ at baseline; $M = 4.61, SD = 1.59$ at follow-up).

4.4 Exploratory Analyses: Factors Potentially Moderating Outcomes

In order to assess the potentially moderating roles of dispositional mindfulness or dispositional anxiety sensitivity on participants' responsiveness in the mindfulness versus suppression conditions, additional exploratory analyses were conducted. A series of forward

stepwise multiple regression analyses was conducted to establish whether dispositional mindfulness, as measured on the CAMS, moderated relationships that would have been expected between study condition and outcome. Similarly, forward stepwise multiple regression analyses were conducted to evaluate whether dispositional anxiety sensitivity at baseline, as assessed by the ASI, impacted on study outcomes. However, these analyses did not yield any significant findings, indicating that trait mindfulness and trait anxiety sensitivity were not related to study outcomes.

In addition, exploratory analyses were conducted to assess whether individual differences on measures of state mindfulness and state anxiety sensitivity following the craving reduction intervention would moderate outcomes at follow-up. A series of forward stepwise multiple regression analyses was conducted to establish whether state mindfulness, as measured on the TMS, moderated relationships between study condition and outcome. Similarly, regressions were conducted to establish whether state anxiety sensitivity played a moderating role in any relationships among study condition and outcomes. Significant outcomes are presented.

State Mindfulness. State mindfulness, as assessed by the TMS immediately following the craving reduction intervention, was found to be a significant predictor of level of depression at follow-up, $b = -.35$, $t(45) = -3.16$, $p = .003$. Furthermore, mindfulness explained a significant proportion of variance in depression scores, $R^2 = .58$, $F(1, 34) = 9.98$, $p = .003$ (see Table 5 for regression analyses), and was a significant predictor of amount of smoking at follow-up, $b = -.12$, $t(46) = -2.10$, $p = .04$, also explaining a significant amount of variance in smoking amount, $R^2 = .83$, $F(1, 46) = 4.40$, $p = .04$ (see Table 6 for regression analyses). Mindfulness ($b = -.02$, $t[43] = 2.54$, $p = .02$) and study condition ($b = 1.22$, $t[43] = 2.79$, $p = .008$) were both found to be significant predictors of abstinence self-efficacy at follow-up. Furthermore, this regression model

Table 5

Summary of Hierarchical Forward Stepwise Multiple Regression Analysis for State Mindfulness Predicting Depression Scores at Follow-up (N =46).

Variable	B	SE B	β
Step 1			
Baseline depression score	.63	.10	.69*
Step 2			
Baseline depression score	.63	.09	.69***
State mindfulness score	-.35	.11	-.31**

Note. $R^2 = .48$ for Step 1; $\Delta R^2 = .58$ for Step 2 ($p = .003$).

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 6

Summary of Hierarchical Forward Stepwise Multiple Regression Analysis for State Mindfulness Predicting Amount of Smoking at Follow-up (N = 49).

Variable	B	SE B	β
Step 1			
Baseline amount of smoking	.91	.06	.90**
Step 2			
Baseline amount of smoking	.87	.07	.86**
State mindfulness score	-.12	.06	-.13*

Note. $R^2 = .81$ for Step 1; $\Delta R^2 = .83$ for Step 2 ($p = .04$).

* $p < .05$. ** $p < .001$.

yielded a significant interaction between state mindfulness and condition membership, $b = -.04$, $t(43) = -2.99$, $p = .005$, such that greater state mindfulness following the craving reduction intervention was associated with an increase in the self-efficacy at follow-up in the suppression condition, but this association was not evident within the mindfulness condition. Figure 1 illustrates the interaction between state mindfulness and condition membership. This model accounted for a significant proportion of variance in self-efficacy score, $R^2 = .58$, $F(3, 42) = 3.15$, $p = .04$ (see Table 7 for regression results).

State Anxiety Sensitivity. State level of anxiety sensitivity ($b = .29$, $t[43] = 2.96$, $p = .005$), as assessed by the BSQ-S immediately following the craving reduction intervention, and study condition ($b = .59$, $t[43] = 2.31$, $p = .03$) were both found to be significant predictors of abstinence self-efficacy at follow-up. This regression model also yielded a significant interaction between state anxiety sensitivity and condition membership, $b = -.34$, $t(43) = -2.97$, $p = .005$, such that higher level of state anxiety sensitivity following the intervention was associated with greater self-efficacy at follow-up in the suppression condition, but it was associated with reduced levels of self-efficacy within the mindfulness condition. Figure 2 illustrates the interaction between state anxiety sensitivity and condition membership. Furthermore, this model accounted for a significant amount of variance in self-efficacy scores, $R^2 = .59$, $F(3, 40) = 3.19$, $p = .03$ (see Table 8 for regression results).

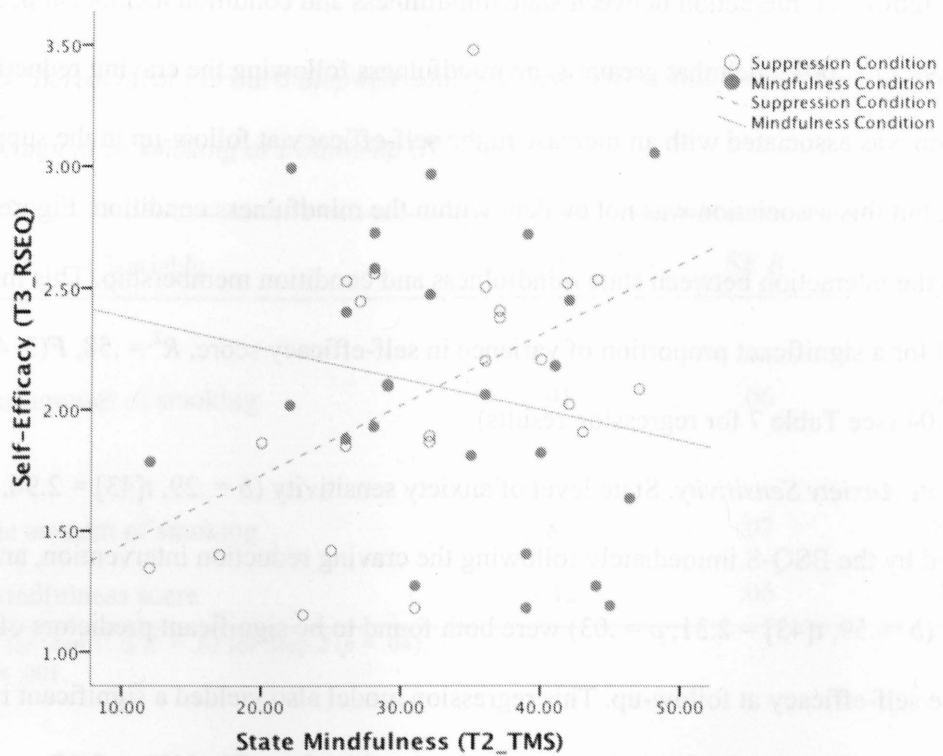


Figure 1. Interaction Between State Mindfulness and Condition in Predicting Self-Efficacy at Follow-up.

Table 7

Summary of Hierarchical Forward Stepwise Multiple Regression Analysis for State Mindfulness Predicting Self-Efficacy at Follow-up (N =48).

Variable	<i>B</i>	<i>SE B</i>	β
Step 1			
Baseline self-efficacy score	.77	.12	.70***
Step 2			
Baseline self-efficacy score	.75	.11	.68***
State mindfulness score	.02	.01	.36*
Study condition	1.22	.44	1.10**
State mindfulness by condition interaction	-.04	.01	-1.25**

Note. $R^2 = .49$ for Step 1; $\Delta R^2 = .58$ for Step 2 ($p = .04$).

* $p < .05$. ** $p < .01$. *** $p < .001$.

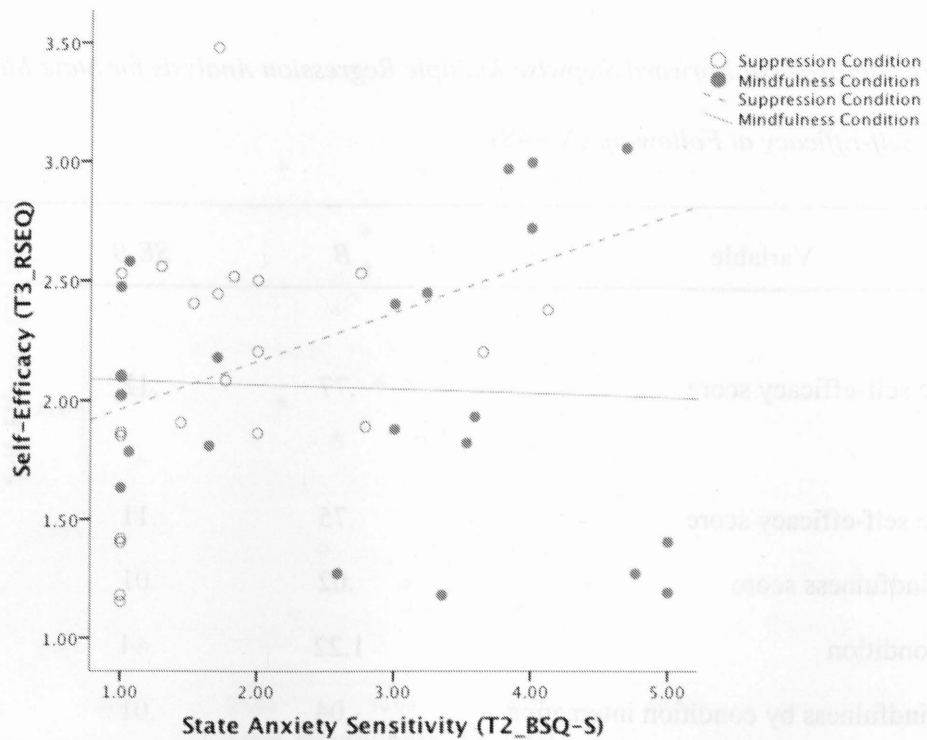


Figure 2. Interaction Between State Anxiety Sensitivity and Condition in Predicting Self-Efficacy at Follow-up.

Table 8

Summary of Hierarchical Forward Stepwise Multiple Regression Analysis for State Anxiety Sensitivity Predicting Self-Efficacy at Follow-up (N = 48).

Variable	<i>B</i>	<i>SE B</i>	β
Step 1			
Baseline self-efficacy score	.77	.12	.70***
Step 2			
Baseline self-efficacy score	.81	.11	.73***
State anxiety sensitivity	.29	.10	.64**
Study condition	.59	.25	.53*
State anxiety sensitivity by condition interaction	-.34	.11	-1.00**

Note. $R^2 = .49$ for Step 1; $\Delta R^2 = .59$ for Step 2 ($p = .03$).

* $p < .05$. ** $p < .01$. *** $p < .001$.

5.1 Summary of Findings

The aim of the present pilot study was to investigate the effects of a brief mindfulness-based versus suppression strategy for craving reduction, nicotine use, dependence, and self-efficacy in coping with urges, among cigarette smokers. Findings from the current study indicate that all participants reported greater levels of self-efficacy to refrain from smoking across a variety of contexts from baseline to follow-up, regardless of study condition. Furthermore, all participants, regardless of study condition, exhibited reductions in smoking quantity from baseline to follow-up.

Notably, participants' ratings of their level of craving for a cigarette did not appear to change as a result of the cue induction procedure. This is inconsistent with previous research, which indicates that similar cue induction procedures were capable of influencing participants' craving ratings (e.g., Miranda et al., 2008). It is possible that the cue induction procedure utilized in the current study was not long enough to influence craving ratings, as participants engaged in only one induction phase prior to receiving instructions on how to cope with their cravings as they arise. Furthermore, participants' baseline craving ratings were quite low. This may be due to the fact that most participants reported being quite low in nicotine dependence, and thus the cue exposure may not have been as effective in the current study as in previous research because of this.

Surprisingly, although the craving reduction strategies were introduced immediately following a cue induction procedure to evaluate whether they can effectively attenuate the experience of craving immediately as well as over a follow-up period, no significant immediate reductions in self-reported craving were found. Additionally, there were no significant between-

group differences on measured levels of state mindfulness following the craving intervention, suggesting that receiving the mindfulness-based intervention did not manipulate participants' levels of mindfulness to a greater degree than the suppression condition, at least as captured by this self-report measure.

There are a number of plausible explanations for why group differences on the aforementioned variables were not evident within the current study. First, given the relatively small sample size of this pilot study, it is possible that the analyses conducted lacked sufficient statistical power to detect an effect, increasing the probability of a Type II error. However, given the relatively small effect sizes of the null findings, as noted by the partial η^2 statistic, it is unlikely that a power issue can fully account for these results.

Alternatively, given the relatively brief nature of the intervention strategies taught in the study conditions, it is possible that participants were not given the appropriate “dose” of treatment necessary to affect immediate change, at least to such a degree that between-group differences would be evident. Researchers have noted that there is a paucity of empirical research on the relationship between the duration and frequency of mindfulness practice and outcomes, and as such little is known about whether mindfulness practices can be successfully delivered using practice times shorter than 45 minutes (Vettese, Toneatto, Stea, Nguyen, & Wang, in press). However, one study found that participation in 10-minute mindfulness exercises, as part of a mindfulness course for clinical psychologists in training, was associated with greater levels of self-reported mindfulness at post-intervention (Moore, 2008). As such, it would not be unreasonable to suspect that the intervention administered in the current study would result in changes in state mindfulness within the mindfulness condition.

Another possible reason why between-group differences on these variables were not detected may involve the cue induction procedure that participants engaged in prior to learning their respective craving reduction strategy. During the cue induction procedure, participants were asked to pay close attention to a cigarette and other cues associated with smoking by using their sense of sight, touch, smell, and taste. The exposure practice could conceivably be conceptualized as similar to a common mindfulness practice, called the "raisin exercise," which requires participants to mindfully eat a raisin, using all of their senses to fully experience the process of eating the object (Segal, Williams, & Teasdale, 2002). Given that all participants engaged in the cue induction procedure, it is possible that this exercise increased all participants' present moment awareness, which is a core feature of mindfulness (Kabat-Zinn, 1994). As such, this exposure procedure alone may have been more powerful than the respective strategy that the participant engaged in subsequently, reducing the expected differences between the conditions.

Furthermore, the suppression strategy itself may have given participants mixed messages regarding coping with their cravings. Specifically, participants were asked to pay attention to what they were doing, while at the same time being instructed to suppress thoughts associated with that experience. In most research involving a suppression strategy, participants are instructed to first pay attention to a given thought or stimulus for a number of minutes, and then actively suppress their thoughts regarding that stimulus (e.g., Clark, Ball, & Pape, 1991). However, within the current study, cue induction and coping strategies were interwoven such that participants were instructed to use their respective coping strategy while engaging in the cue exposure. This may have elicited confusion among participants in the suppression condition, who may have been using mindfulness-based skills to some extent, despite being in the suppression condition. As such, the suppression condition may not have been adequately distinguished from

the mindfulness condition, as it likewise involved a deliberate exposure to thoughts, emotions, and visceral experiences related to craving. To remedy this potential overlap of suppression with mindfulness strategies, future research could vary the instructions for the suppression condition, for instance, by suggesting simply that participants repeatedly suppress any and all urges to smoke without also evoking greater awareness of the urges to begin with. Furthermore, research could invoke mindfulness by educating participants about the concept of thought and emotional suppression more generally, and asking participants to apply this approach to their urges to engage in smoking.

In contrast to the similarity of findings across conditions with respect to the above smoking variables, a number of interesting between-group findings did emerge. As hypothesized, analyses indicated that participants' nicotine dependence scores reduced marginally significantly from baseline to follow-up in the mindfulness condition, but not within the suppression condition. Thus, participants came to experience lower levels of dependence on smoking, as suggested on subjective reports seven days following the experimental interventions. However, it is important to note that the FTND does not specify a particular period of time that the respondents are required to think about when making their ratings, so it is possible that participants' ratings at the follow-up overlapped with their baseline ratings. Nonetheless, only participants in the mindfulness condition reported a marginal decrease on this measure, which suggests that it was the effect of the intervention that made the differences in scores.

Furthermore, negative affect and depression decreased from baseline to follow-up for participants within the mindfulness condition, but this change was not evident within the suppression group. In contrast, participants in the suppression condition reported a marginal increase in their negative affect and depression over the same study period. Taken together, these

findings suggest that, although all study participants showed similar improvements in terms of amount of smoking and abstinence self-efficacy at follow-up, only participants in the mindfulness condition reported reductions on subjective indicators of nicotine dependence, and feeling better at follow-up, as indicated by their self-report decrease in negative affect and depression.

These findings are consistent with those of previous research indicating that mindfulness training is associated with reductions in negative affect and mood disturbance, as well as inclinations to respond more adaptively to otherwise stressful situations. Davidson and colleagues (2003) found that mindfulness meditation training was associated with greater left-sided anterior brain activation, which has been linked with more adaptive responding to, and faster recovery following, negative events. Similarly, Arch and Craske (2006) found that a brief, focused breathing exercise that is an analogue of mindfulness leads to increased behavioural willingness to tolerate unpredictable, negative stimuli. Previous research also indicates that mindfulness training is associated with reduced symptoms of depression (e.g., Ree & Craigie, 2007). Reductions in negative emotional outcomes, although not specifically correlated with smoking outcomes in the current analyses, may become factors that help to reduce emotional reactivity to cravings and urges to smoke, and as a consequence, may eventually help in reducing actual amounts of smoking.

Given that the cue induction procedure used in the current study was designed to induce craving, which is associated with increases in subjective negative affect, one would expect that individuals who were asked to suppress thoughts related to their craving during the cue induction would experience more negative affect. Previous research findings indicate that mood states that exist during the initial suppression of a thought will become reinstated when that thought is later

expressed (Wenzlaff, Wegner, & Klein, 1991). Such findings may explain why individuals in the suppression condition within the current study demonstrated trends toward negative affect and depression at follow-up, while individuals in the mindfulness conditions reported improvements on these measures.

Although there were no group differences on trait mindfulness at baseline or follow-up, trait mindfulness at the follow-up period was negatively correlated with amount of smoking at follow-up within the mindfulness condition, such that greater levels of trait mindfulness at follow-up were associated with fewer smoked cigarettes over the course of the follow-up period. Furthermore, the current study indicates that individual differences on dispositional mindfulness and anxiety sensitivity at baseline were not moderators of smoking related outcomes, such that participants' response to the interventions were not apparently moderated by their trait levels of mindfulness or anxiety sensitivity. However, state mindfulness following the craving reduction intervention was a significant predictor of depression and amount of smoking at follow-up in both study conditions. This set of findings suggests that all participants with greater levels of state mindfulness following the intervention, or greater trait mindfulness at follow-up, regardless of the study conditions that they were in, benefitted at follow-up with better mood and lower amounts of smoking.

Moreover, state mindfulness moderated the effect of condition when predicting self-efficacy at follow-up, such that greater state mindfulness following the craving reduction intervention was predictive of increased self-efficacy at follow-up in the suppression condition. However, this association was not evident within the mindfulness condition. This finding suggests that although both conditions improved in terms of their self-efficacy to abstain from smoking at follow-up, for participants in the suppression condition, this was particularly the case

if they were more mindful. This finding may again be accounted for by the similarity between the two conditions.

Interestingly, state anxiety sensitivity following the cue induction procedure was found to be a significant predictor of level of self-efficacy at follow-up. Specifically, it was found that higher level of state anxiety sensitivity following the intervention was associated with greater self-efficacy at follow-up in the suppression condition, and lower levels of self-efficacy within the mindfulness condition. Although this finding is initially surprising, it may be interpreted to suggest that individuals who are high in state anxiety sensitivity following the brief craving reduction intervention are less able to cope with the stress of craving if they are asked to use a mindfulness-based strategy, and thus may be better off using a suppression-based strategy in the short-term. Anecdotally, therapists leading mindfulness-based treatment programs often report that certain individuals who are novice practitioners of mindfulness meditation experience a worsening of their symptoms when they first begin to practice being mindful (e.g., Segal, Williams, & Teasdale, 2002, p.126; Hayes & Feldman, 2004). As such, it is possible that individuals who are dispositionally fearful of anxiety-related physical sensations feel better in the short-term when they are asked to suppress or push away such feelings, rather than asked to pay even more attention to them. Given that the therapeutic benefits of mindfulness-based programs are thought to be acquired through the regular practice of mindfulness meditation, the regular practice of this skill set is thought to be one of the critical change factors in mindfulness-based programs (Vettese et al., in press). As such, it may be the case that individuals who are high in anxiety sensitivity require more training in the skill of being mindful before they can begin to experience the benefits associated with mindfulness meditation.

Another notable outcome was that a large proportion of participants in both study conditions moved forward in terms of their stage of readiness to change their smoking behaviours. This finding is interesting clinically, given that research shows that the stage of change model predicts outcome and dropout from smoking cessation treatment programs (Prochaska & DiClemente, 1992). This finding is also interesting insofar as it may point to a means of increasing willingness to engage in treatment, given that the participants in this research were not specifically treatment-seeking to begin with, but rather came to the study having had a history of interest in quitting or quit attempts.

The advancement in readiness to change finding may be attributed to participants' overall increase in self-efficacy to refrain from smoking in triggering contexts. Specifically, participants' abstinence self-efficacy was evaluated by asking participants how confident they would be that they could resist the temptation to smoke in a variety of environmental contexts and emotional states. Given that all participants reported increases in self-efficacy from baseline to follow-up, it is not surprising that up to a third of participants within each study condition reported moving to a more advanced stage of change at follow-up.

5.2 Methodological Strengths and Limitations

The current study is the first empirical investigation to directly compare the effectiveness of a brief, mindfulness-based strategy for coping with smoking urges to an alternative suppression-based strategy. The isolation and direct comparison of these two strategies is a significant strength of the current methodology, because it allowed for an investigation of the impact of these two particular strategies without the additive effects of other variables typically included within a larger treatment protocol. Additionally, both strategies were face valid and viewed as credible forms of intervention by the participants. Furthermore, the cue induction and

craving interventions were pre-recorded, which allowed for consistency between participants and study conditions. All instructions were also counterbalanced between conditions for length of instructions and the number of times that smoking-related words were stated within the instruction sets. Moreover, the current study included a biological measure of CO to verify participants' smoking status.

While findings from the current study provide some preliminary support for the use of mindfulness-based strategies for smoking, there are several limitations to consider. First, these findings are based on a relatively small and homogeneous sample, which may limit the external validity of the findings. Further, the participants included in the current study were not necessarily treatment seeking, which would again limit the generalizability of the findings to individuals who are actually seeking assistance with smoking cessation. Participants also reported a relatively low level of nicotine dependence at baseline, which may have contributed to some of the null findings in the current study. Additionally, all measures utilized within the current study were self-report and the methodology did not incorporate a manipulation check following the craving reduction intervention to ensure that participants understood the instructions of their respective craving reduction strategy. Further, given that some of the self-report measures used within the present study were shown to not be highly internally consistent, the current findings should be interpreted cautiously until future replication.

5.3 Future Directions

The current study was designed as a pilot study to investigate the effects of a mindfulness-based strategy for coping with cigarette cravings, as compared to a suppression-based strategy. As such, the findings from the current investigation warrant replication with a

larger and less homogeneous sample, which would ideally substantiate the development of mindfulness-based interventions for nicotine dependence and other addictive problems.

It would be beneficial for future research to incorporate some physiological measures of the stress associated with craving, in order to corroborate the self-report measures used in the current study. In addition, future replications of this study should include a manipulation check to ensure that participants have a clear understanding of what their respective craving reduction strategy entails. Additionally, given that the cue induction procedure may have inadvertently confounded the instructions given to participants in the suppression condition, it is recommended that future research utilize an alternative to an instruction-based cue induction procedure. For example, it may be possible to use a virtual reality smoking cue induction paradigm to induce craving (e.g., Traylor, Bordnick, & Carter, 2008), rather than an in vivo cue exposure.

Furthermore, it would be interesting to see whether including more extensive mindfulness and suppression training would yield greater differences between conditions. For instance, given that state anxiety sensitivity was found to be a predictor of worse outcomes at follow-up in terms of abstinence self-efficacy, the inclusion of more thorough mindfulness training may result in better smoking cessation outcomes for individuals who tend to become highly anxiety sensitive when they initially use the strategy. For example, Davis and colleagues (2007) recently conducted a pilot study of Mindfulness Based Stress Reduction for smokers, which was shown to be effective at a six-week follow-up. Thus, a larger comparative trial that also incorporates a control condition is warranted. Similarly, future research would benefit from including a longitudinal design, and include an at-home practice component and homework check, to allow for a more extensive evaluation of the effectiveness of the interventions over time and with practice.

Moreover, given that both the suppression and mindfulness strategy yielded similar outcomes in terms of smoking amount and self-efficacy to refrain from smoking at follow-up, future research could fruitfully investigate what specific individual difference factors predict who would benefit more from which coping strategy. It may be the case that some individuals are simply better suited for one strategy over the other, and identifying the factors that contribute to this distinction could be extremely useful clinically. For example, a study conducted by Barnier and colleagues (2004) suggests that individuals with a repressive coping style, which is characterized by low scores on self-report measures of anxiety but high scores on measures of defensiveness, are highly effective at using thought suppression strategies. They also tend to rate their suppression attempts as being less effortful than others, and experience no rebound effect of those thoughts. These, and other personality characteristics, could be explored to elucidate variables that can help match individuals with particular craving coping strategies.

5.4 General Conclusion

Findings from the current study provide preliminary support for the use of mindfulness-based strategies for coping with smoking urges, as well as some evidence for the benefits of suppression of smoking urges. Both mindfulness and suppression are associated with smoking fewer cigarettes and greater self-efficacy in refraining from smoking in the days following learning these brief strategies. Interestingly, only participants in the mindfulness condition reported reductions in negative affect, depressive symptoms, and subjective nicotine dependence. Thus, the use of mindfulness-based techniques for coping with cigarette cravings appears to provide some additional benefits not obtained when coping with smoking cravings through suppression. Future studies comparing more extensive mindfulness and suppression interventions for smoking cessation, and with participants who are specifically seeking smoking cessation,

would help to clarify further the relative merits of mindfulness versus suppression strategies in coping with cravings, as well as smoking and emotion-based outcomes.

Appendix A:

Telephone Screen

☐ Eligible / ☐ Not Eligible / ☐ Not Interested

☐ Booked / ☐ Need to Book / ☐ No Show

Participant ID: _____

Date contact called us: _____

Contact name: _____

Contact telephone number: _____ or: _____

Best time(s) to phone: _____

Contact attempt dates: Attempt 1: _____ ☐ Reached ☐ Left msg ☐ No msg & cannot reach

Attempt 2: _____ ☐ Reached ☐ Left msg ☐ No msg & cannot reach

Attempt 3: _____ ☐ Reached ☐ Left msg ☐ No msg & cannot reach

Comments: _____

“Hello. Thanks for contacting us about the smoking study.”

“This study is looking at comparing the effectiveness of two strategies for coping with the urge to smoke when a cigarette is not available. In order to determine if you are eligible for this study, I am going to ask you a few questions. Do you have time to do this right now? It should only take about 5 minutes.”

☐ Yes (*Continue below*) ☐ No (*Thank for their time and discontinue interview*)

☐ Not now – Better time to call back: _____

“Now I will ask some initial questions to determine if you might be eligible for this study. The information you give me is strictly confidential and is used to evaluate whether you’d be an appropriate participant for this study. Do you have any questions before we begin?”

Criteria	Eligible	Ineligible
1. When is your birthday? (Must be over the age of 18 – born 1990 or earlier) D.O.B. (dd/mm/yyyy) / /	Y	N
2. Do you have any difficulties reading, speaking, or writing English? If yes: What kind of difficulties? _____ * If significant difficulties, ineligible for study.	N	Y
3. Do you have any difficulties using the computer? * If significant difficulties, ineligible for study.	N	Y
SMOKING HISTORY:		
4. Over the past month, approximately how many cigarettes have you smoked per day? (Note how many on average per day _____) [*must be ≥10]	Y	N
5. Have you thought about cutting back on your smoking, or tried to quit smoking in the past?	Y	N
WILLINGNESS:		
6. This study would require you to attend two study sessions at Ryerson University. The first session will take you approximately 1 hour to complete. You would be paid \$15.00 for your time. Are you okay with this and willing to participate?	Y	N
7. The second session, which will only last about 15 to 25 minutes, takes place 7 days after your initial session. As compensation, you would receive another \$15.00 and be entered into a draw for \$100.00 in cash. Is that okay with you?	Y	N

“Thank you for participating in this portion of the screening.”

If you are NOT SURE about the candidate’s eligibility:

“I will check with the study coordinator to determine your eligibility for this study. We will call you back within 24 hours to let you know. Is that okay? (If they **say yes**, then ask if you can leave a confidential voice message. If they **say yes**, then tell them you will call them back and leave a message at the number. If they **say no**, then ask if they would call you back, or if there is a way you can contact them, such as email).”

Can I leave a confidential voicemail (circle one) Y N

Best time to contact them: _____

If candidate is INELIGIBLE, then please say the following:

“Based on your response to the screening questions, it appears that you are not currently eligible for this study. Thank you so much for your time!”

If candidate is **ELIGIBLE**, then please say the following:

“Your answers to these questions indicate that you are eligible for this study. If you would be willing, we can schedule you to come in to complete our study. When you arrive, you will be asked to complete a consent form, engage in an exposure to cigarette cues, and respond to some questionnaires that should take about 60 minutes. You will be paid \$15.00 for the first portion of the study.

Once you have completed this portion of the study, you will be scheduled to come back 7 days later to complete some more questionnaires, which should only take you about 15 to 25 minutes. As compensation, you will receive another \$15.00 and be entered into a draw to win \$100.00 in cash.

May I schedule an appointment?”

Appointment Date: _____

Appointment Time: _____

(Provide candidate with instructions for getting to the appointment).

Comments: _____

Appendix B:

Consent Form

Ryerson University Consent Agreement

Effect of a Mindfulness-Based Strategy for Smoking Cravings

You are being asked to participate in a research study. Before you give your consent to be a volunteer, it is important that you read the following information and ask as many questions as necessary to be sure you understand what you will be asked to do.

Investigators:

Jenny Rogojanski, B. A., Ryerson University graduate student, is conducting this study as part of a Master's thesis project.

Supervisors: Dr. Lisa Vettese, Ph.D.
Department of Psychology, Ryerson University
350 Victoria Street, Toronto, ON
Tel: 416-979-5000 extension 2267
Email: lisa.vettese@psych.ryerson.ca

Dr. Martin M. Antony, Ph.D., Ryerson University.
Department of Psychology, Ryerson University
350 Victoria Street, Toronto, ON
Tel: 416-979-5000 extension 2631
Email: mantony@psych.ryerson.ca

Purpose of the Study:

The aim of this study is to investigate and compare the effectiveness of two strategies that smokers can use to cope with their cravings for a cigarette. The researchers are aiming to recruit a total of 60 participants for this study. You are eligible to participate in this study if you are over the age of 18, currently smoke 10 or more cigarettes a day, and have thought about quitting/reducing smoking in the past or are currently thinking about quitting or reducing your smoking.

Description of the Study:

This study will last approximately one and a half hours. You have been asked to refrain from smoking for 30 minutes prior to your appointment. When you arrive, you will be asked to breathe into a carbon monoxide monitor in order to verify that you smoke 10 or more cigarettes per day. Following this, you will be asked to refrain from smoking for the duration of the study procedure. As part of this study, you will be exposed to smoking cues in order to cause you to experience some craving for a cigarette. During this procedure, you will receive instructions on how to deal with the cravings that arise. You will be asked to complete a number of questionnaires before, during, and after this procedure. You are also asked to participate in a

follow-up assessment in seven days from today. As part of this follow-up, you will be asked to complete a few questionnaires, which should only take you approximately 15 to 30 minutes.

What is Experimental in this Study:

The technique you will be asked to use to cope with your craving during the smoking cue exposure is experimental in nature. In addition, the information you provide us with through your responses to the questionnaires will be used for our analysis of your experience.

Risks or Discomforts:

As a result of your participation, you may feel some discomfort from being exposed to smoking cues without being allowed to smoke a cigarette. This will cause you to experience craving and will temporarily feel uncomfortable for you. However, the technique that we will be asking you to use to cope with the craving may alleviate or lessen some of the discomfort you are experiencing.

You will also be asked to complete questionnaires regarding your smoking habits, emotions, and personality characteristics. If you feel uncomfortable with any aspect of the procedure, you may discontinue your participation at any time.

Benefits of the Study:

You will have the opportunity to take part in a research study on a technique used to cope with cigarette cravings. This investigation will benefit individuals with nicotine dependence as it may lead to an enhancement of treatments for nicotine addiction. You may also find this technique helpful to use yourself at times when you are not able to smoke, or when trying to cut back on your smoking of cigarettes. We cannot guarantee, however, that you will receive any benefits from participating in this study.

Confidentiality:

Your name will not appear on any of the research materials. You will be given a participant ID number, which will not be linked to your name and will only be used to ensure that all of the data collected from you stays together. Once data is collected, it will be kept in a securely locked filing cabinet. Only Jenny Rogojanski, Dr. Lisa Vettese, and Dr. Martin Antony will have access to the data. Data will be analyzed as a whole and may be presented at scientific meetings and submitted for publication. Only aggregate data will be presented. You will not be identified in any dissemination of this research. All of your data will be destroyed seven years after the publication of the findings.

Incentives to Participate:

If you are a PSY 102 or PSY 202 student recruited through the Ryerson University participant pool, you will receive 1 credit towards your course for participating in this study. If you choose to prematurely discontinue your participation in this study because you are uncomfortable with the procedure, you will still be compensated. In addition, if you participate in the 7-day follow-up, you will receive 1 additional credit towards your course for your participation.

If you have been recruited through flyer postings in the community, you will be paid \$15.00 as compensation for your participation in this study. If you choose to prematurely discontinue your

participation in this study because, you will still be compensated. In addition, if you participate in the 7-day follow-up, you will receive a \$15.00 and be entered into a draw to win \$100.00 in cash. This draw will take place following the completion of this study.

Voluntary Nature of Participation:

Participation in this study is voluntary. Your choice of whether or not to participate will not influence your future relations with Ryerson University. If you decide to participate, you are free to withdraw your consent and to stop your participation at any time without penalty or loss of benefits to which you are allowed. At any particular point in the study, you may refuse to answer any particular question or stop participation altogether.

Questions about the Study:

If you have any questions about the research now, please ask. If you have questions later about the research, you may contact:

Jenny Rogojanski
416-979-5000 extension 2053

If you have questions regarding your rights as a human subject and participant in this study, you may contact the Ryerson University Research Ethics Board for information.

Research Ethics Board
c/o Office of the Vice President, Research and Innovation
Ryerson University
350 Victoria Street
Toronto, ON M5B 2K3
416-979-5042

Agreement:

Your signature below indicates that you have read the information in this agreement and have had a chance to ask any questions you have about the study. Your signature also indicates that you agree to be in the study and have been told that you can change your mind and withdraw your consent to participate at any time. You have been given a copy of this agreement.

You have been told that by signing this consent agreement you are not giving up any of your legal rights.

Name of Participant (please print)

Signature of Participant

Date

Signature of Investigator

Date

Appendix C:

Cue Induction Script – Mindfulness Condition

Hello, and thank you for participating in our study. Please listen carefully to these instructions, and follow them using the materials in front of you.

Open the booklet in front of you to page 1. Take a moment to complete this questionnaire.

Now, lift the bowl that is in front of you to reveal the materials hidden underneath. Look at the materials in front of you. Imagine opening your cigarette pack and pulling out a cigarette... imagine lighting it... imagine placing it between your lips and beginning to smoke. Imagine inhaling the smoke that is released from the cigarette... the feeling of the nicotine entering your body.

Notice what thoughts are going through your mind... the emotions, and the physical sensations that arise, and breathe. What physical sensations are you experiencing in your body? If you feel overwhelmed by urges and sensations, you can always go back to just observing your breath, so as to not give in to your desire to smoke. Remember that you are making the choice to not act on any cravings to smoke that arise right now... just stay with them and observe what is happening in your body and mind.

Now open the cigarette pack and remove a cigarette, and hold it between your fingers. Notice the feel of the cigarette in your hand. Now raise the lighter and hold it in the opposite hand. Take the cigarette and place it in your mouth, as though you are getting ready to light it. Again notice the thoughts going through your mind... the emotions that arise... pay attention to the physical sensations in your body. Bring the lighter closer to the cigarette, as though you are about to light it. Hold down the button to spark the lighter and light your cigarette. Imagine the flame of the lighter sparking your cigarette. Now take the cigarette between your fingers and begin inhaling it.

Now imagine your urge to smoke the cigarette to be an ocean wave, and that you are a surfer, riding that wave of craving with your breath, using your breath as your surfboard. Your job is to ride the wave of desire to smoke, from the beginning of desire, as it grows, staying with it through the peak of its intensity... keeping your balance while the wave of desire rises, until it naturally subsides. You are riding this wave of desire and staying on top of it rather than succumbing to it and being wiped out by it. Continue inhaling and imagining the smoke from the cigarette... and then exhaling the smoke into the room. Watch the urge or craving to smoke as it rises and then falls... trusting that without any action on your part, all the waves of craving and desire, like the waves of the ocean, rise and fall, and eventually fade away.

Now notice how you can simply stay present with this wave of craving instead of immediately reacting to it. Notice the thoughts that pass through your mind... and the sensations you are experiencing in your body. Be present with the craving to smoke and ride it like a surfer rides a wave. Accept the craving, without giving into the urge to smoke, without acting on it, or having

to make it go away. Realize that whatever cravings arise will eventually fall and fade away without you having to give in to the urge.

Now, take the time you need, and gently place the cigarette into the ashtray in front of you along with the lighter. Place the bowl back over the items. Now open the booklet in front of you to page 2, and complete the questionnaire.

Now turn to page 3 of your booklet and refer to the diagram.

Most of us have the idea that once a craving or urge begins, it will increase in intensity and nothing will stop it until we do something to fix it. We often imagine it as a diagonal line, continuing upwards until we alleviate it by smoking. We believe it will continue to get worse until we do something to stop it. In reality, craving is less like a line and more like a wave; it ebbs to a peak, and then, if we wait it out, it will naturally subside. Each time we do this, the intensity decreases a little bit, and we get better at waiting it out, becoming more confident that we can ride this wave of craving without getting wiped out.

Cravings to smoke can arise and pass many times in a day. This “surfing” can be done over and over again. It gets easier with practice and the cravings get less intense. If this feels too difficult, then notice what you just did; you experienced craving and stayed present without acting on it.

Now again lift the bowl in front of you to reveal the materials hidden underneath. Look at the materials in front of you. Imagine opening your cigarette pack and pulling out another cigarette... imagine lighting it just like before... placing it between your lips and beginning to smoke it. Imagine inhaling the smoke that is released from the cigarette... the feeling of the nicotine entering the body.

Notice what thoughts are going through your mind. Notice emotions, and the physical sensations that arise. Notice the physical sensations are you experiencing. Notice what this feels like in your body. If you begin to feel overwhelmed, you can always go back to just observing your breath, so as to not give in to your desire to smoke. Remember, you are making the choice to not act on the cravings to smoke that are arising... just stay with them and observe what is happening in your body and mind.

Now open the cigarette pack and remove another cigarette, and hold it between your fingers. Notice the feel of the cigarette in your hand. Now raise the lighter and hold it in the opposite hand. Take the cigarette and place it in your mouth, as though you are getting ready to light it. Again notice the thoughts going through your mind... the emotions that arise... pay attention to the sensations in your body. Bring the lighter closer to the cigarette, as though you are about to light it. Hold down the button to spark the lighter and light your cigarette. Imagine the flame of the lighter sparking your cigarette. Now take the cigarette between your fingers and begin smoking it.

Again, imagine your urge to smoke the cigarette to be an ocean wave, and that you are a surfer, riding this wave with your breath, using your breath as your surfboard. Your job is to ride the wave of desire to smoke, from the beginning of desire, as it grows, staying with it through the

peak of its intensity... keeping your balance while the wave of desire rises, until it naturally subsides. You are riding this wave of desire and staying on top of it rather than succumbing to it and being wiped out by it. Continue imagining inhaling the smoke from the cigarette... and then exhale the smoke into the room. Watch the urge to smoke as it rises and then falls... trusting that without any action on your part, all the waves of craving and desire, like the waves of the ocean, rise and fall, and eventually fade away.

Notice how you can simply stay present with this wave of craving instead of immediately reacting to it. Notice the thoughts passing through your mind... and the sensations you are experiencing in your body. Be present with the craving to smoke and ride it like a surfer rides a wave. Accept the craving, without giving into the urge to smoke, without acting on it, or having to make it go away. Realize that whatever cravings arise will eventually fall and fade away without you having to give in to them.

Now, place the cigarette into the ashtray in front of you along with the lighter. Place the bowl back over the items. Turn to page 4 in the booklet in front of you, and complete the questionnaire.

You are now finished this part of the study. The investigator will tell you the next steps.

Appendix D:

Cue Induction Script – Suppression Condition

Hello, and thank you for participating in our study. Please listen carefully to these instructions, and follow them using the materials in front of you.

Open the booklet in front of you to page 1. Take a moment to complete this questionnaire.

Next, lift the bowl that is in front of you to reveal the materials hidden underneath. Look at the materials in front of you. Imagine opening your cigarette pack and pulling out a cigarette... imagine lighting it... imagine placing it between your lips and beginning to smoke. Imagine inhaling the smoke that is released from the cigarette... the feeling of the nicotine entering your body.

If you notice negative thoughts are going through your mind, actively stop these thoughts from staying in your awareness. If you become overwhelmed by urges to smoke, just suppress these thoughts and any other negative emotions that arise. If any physical sensations arise, attempt to suppress these as well, so as to not give in to your cravings. Ignore what this feel like in your body. Remember that you are making the choice to not act on any urges or cravings that arise... just suppress them as best you can by attempting to not focus too much on what is happening in your body and mind.

Now open the cigarette pack and remove a cigarette, and hold it between your fingers. Notice the feel of the cigarette in your hand. Now raise the lighter and hold it in the opposite hand. Take the cigarette and place it in your mouth, as though you are getting ready to light it. Again suppress any thoughts that arise in your mind... the emotions that arise... and the physical sensations that may be coming up in your body. Bring the lighter closer to the cigarette, as though you are about to light it. Hold down the button to spark the lighter and light your cigarette. Imagine the flame of the lighter sparking your cigarette. Now take the cigarette between your fingers and begin inhaling it.

Now imagine a wall between you and your craving or urge for the cigarette, and that you are constructing a wall between you and your cravings. Your job is to push away your desire, even as you wish to smoke grows more and more. Keep your focus on pushing away wanting to smoke until the desire to smoke naturally subsides. You are putting up a wall and pushing the desire away rather than succumbing to it and being wiped out by it. Continue inhaling and imagining the smoke from the cigarette... and then exhaling the smoke into the room. Remember that there is a wall between you and the craving to smoke, just riding it out. Trust that if you focus on pushing away the desire to smoke, the wish to smoke will eventually fade away as well.

Now notice how you can simply put up a wall between you and the craving instead of immediately reacting to it. Actively push away the thoughts passing through your mind... and the sensations you are experiencing in your body. Suppress the craving and distance yourself from it by putting up a wall. Reject the craving, without giving into the urge, without acting on it,

or having to make it go away. Realize that whatever cravings arise will eventually be suppressed without you having to give in to the urge.

Now, take the time you need, and gently place the cigarette into the ashtray in front of you along with the lighter. Place the bowl back over the items. Now open the booklet in front of you to page 2, and complete the questionnaire.

Now turn to page 3 of your booklet and refer to the diagram.

Most of us have the idea that once the desire to smoke begins, it will increase in intensity and nothing will stop it until we do something to fix it. We often imagine desire as a diagonal line, continuing upwards until we alleviate it by smoking. We believe that it will continue to get worse until we do something to stop it. In reality, the wish to smoke can be lessened if we are able to suppress the thoughts and emotions that arise with our urges to use. Each time we do this, the intensity decreases a little bit, and we become more confident that we are able to suppress the craving without getting wiped out.

The desire to smoke can arise and pass many times in a day. The suppression of the cravings can be done over and over again. It gets easier with practice and the desire gets less intense. If this feels too difficult, then just suppress it without acting on it.

Now again lift the bowl in front of you to reveal the materials hidden underneath. Look at the materials in front of you. Imagine opening your cigarette pack and pulling out another cigarette... lighting it just like before... placing it between your lips and beginning to smoke it. Imagine inhaling the smoke that is released from the cigarette... the feeling of the nicotine entering the body.

If you notice negative thoughts are going through your mind, actively stop these thoughts from staying in your awareness. If you feel overwhelmed by urges to smoke, suppress these thoughts and any negative emotions that arise. If any physical sensations arise, attempt to suppress these as well, so as to not give in to your cravings. Ignore what this feels like in your body. Remember that you are making the choice to not act on any urges or cravings that arise... just suppress them as best you can by attempting to not focus too much on what is happening in your body and mind.

Now open the cigarette pack and remove another cigarette, and hold it between your fingers. Take notice of the feel of the cigarette in your hand. Now raise the lighter and hold it in the opposite hand. Take the cigarette and place it into your mouth, as though you are getting ready to light it. Again suppress any thoughts that arise in your mind... the emotions that arise... and the physical sensations that may be coming up in your body. Bring the lighter closer to the cigarette, as though you are about to light it. Hold down the button to spark the lighter and light your cigarette. Imagine the flame of the lighter sparking your cigarette. Now take the cigarette between your fingers and begin smoking it.

Again imagine a wall between you and your craving or urge for the cigarette, and that you are constructing a wall between you and your cravings. Your job is to push away your desire, even

as you wish to smoke grows more and more. Keep your focus on pushing away wanting to smoke until the desire to smoke naturally subsides. You are putting up a wall and pushing the desire away rather than succumbing to it and being wiped out by it. Continue imagining inhaling the smoke from the cigarette... and then exhaling the smoke into the room. Remember that there is a wall between you and the craving to smoke, just riding it out. Trust that if you focus on pushing away the desire to smoke, the wish to smoke will eventually fade away as well.

Notice how you can simply put up a wall between you and the craving instead of immediately reacting to it. Push away the thoughts passing through your mind... and the sensations you are experiencing in your body. Suppress the craving and distance yourself from it by putting up a wall. Reject the craving, without giving into the urge, without acting on it, or having to make it go away. Realize that whatever cravings arise will eventually be suppressed without you having to give in to the urge.

Now, take the time you need, and gently place the cigarette into the ashtray in front of you along with the lighter. Place the bowl back over the items. Now turn the page in the booklet in front of you to page 4, and complete the questionnaire.

You are now finished this part of the study. The investigator will tell you the next steps.

Appendix E:

Debriefing Form

Ryerson University

Debriefing Form

Effect of a Mindfulness-Based Strategy for Smoking Cravings

The aim of the current study is to examine, among cigarette smokers, the influence of a mindfulness-based strategy on the experience of craving, self-efficacy in coping with smoking urges, and actual amounts and frequencies of smoking behaviour. Specifically, the relative benefits of a mindfulness-based strategy over another strategy commonly employed among individuals attempting to cope with smoking urges, suppression, will be examined. Suppression is an emotion-focused coping strategy that is nearly opposite to what one is taught to do in mindfulness, which involves relating directly to experience with open, nonjudgmental awareness. Studies have found that the suppression of thoughts result in rebound effects, whereby the suppressed thoughts are actually intensified (e.g., Wegner, 1997; Wegner, Schneider, Carter, & White, 1987). Additionally, researchers have found that thought suppression interferes with smoking cessation attempts (Haaga & Allison, 1994; Salkovskis, & Reynolds, 1994; Toll, Sobell, Wagner, & Sobell, 2001). However, research suggests that over one third of individuals use thought suppression strategies at least some of the time when they are coping with the craving to smoke (Bowen & Marlatt, 2007).

Furthermore, research suggests that when individuals diagnosed with anxiety and mood disorders are given instructions to either suppress or accept their emotions in response to an emotion-provoking film, those individuals engaging in acceptance displayed less negative emotion following the viewing (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). Given the prevalent use of suppression strategies among individuals coping with smoking cravings, it serves as an informative comparison to mindfulness strategies in coping with cravings. This study expands upon research recently conducted by Bowen and Marlatt (2007). This previous study examined the effectiveness of brief mindfulness-based instructions on the urge to smoke and smoking behaviour following a cue exposure. Results from this study suggest that participants receiving brief mindfulness-based instructions, when compared to participants who were asked to deal with their cravings as they usually would, smoked fewer cigarettes over the seven-day follow-up period. The present study expands upon previous work by including a controlled comparison group (the suppression condition), and altering several components of the study procedure that may have confounded some of the results. This is a valuable extension of the previous research because it may reveal important information regarding the usefulness of mindfulness-based strategies in smoking cessation treatment. This investigation will benefit individuals with nicotine dependence as it may lead to an enhancement of treatment for nicotine addiction.

Thank you for your participation in this study.

If you have any questions about your participation in this study or about the study itself, please contact Jenny Rogojanski, Department of Psychology, Ryerson University, at (416) 979-5000, extension 2053 (email: jenny.rogojanski@psych.ryerson.ca). **If you are experiencing an increase in negative emotion because of this study, please contact the Centre for Student Development and Counselling at Ryerson University at (416) 979-5195, located in Room JOR-07C, Lower Ground Floor, Jorgenson Hall.**

Additionally, if you interested in this research area, you may wish to review the following:

Davis, J. M., Fleming, M. F., Bonus, K. A., & Baker, T. B. (2007). A pilot study on mindfulness based stress reduction for smokers. *BMC Complementary and Alternative Medicine*, 7, 2.

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