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Effects of mindfulness on body image, affect, and smoking in women

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EFFECTS OF MINDFULNESS ON BODY IMAGE, AFFECT, AND SMOKING IN WOMEN

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Recent research has shown that body image stimuli increase negative affect and smoking urges among female smokers. Mindfulness (paying attention to present-moment experience with an attitude of nonjudgmental acceptance) may be a useful technique to minimize the influence of body image issues on negative affect, smoking urges, and smoking behavior. The present study investigated whether mindfulness can influence the way female college smokers respond to a body image challenge. The study used a 2 x 2 factorial design with body image challenge (trying on a bathing suit vs. observing a purse) crossed with instructions (mindfulness vs. silence). Female smokers (n = 64) were randomly assigned to one of 4 conditions: Purse + Control (n = 16), Body Image + Control (n = 15), Purse + Mindfulness (n = 15), and Body Image + Mindfulness (n = 18). Participants had a mean age of 20.03 (±1.77) and were 87.5% Caucasian. There were significant interactions indicating that self-reported state mindfulness increased for those who listened to mindfulness instructions versus silence. In addition, participants receiving the mindfulness intervention did not show significant increases in weight dissatisfaction and negative affect associated with trying on a bathing suit, versus participants in the silent condition. Experimental groups did not differ in self-reported urges to smoke or likelihood of accepting the experimenter's offer to smoke directly after the session. However, among participants who tried on a bathing suit, those who received mindfulness instructions reported that they planned to wait longer to smoke. Furthermore, mindfulness moderated the relationship between negative affect and smoking urges, such that among participants who received the mindfulness instructions, negative affect was not related to smoking urges. The results provide preliminary support for the use of mindfulness-based treatments for female smokers in coping with body image concerns.

INTRODUCTION

Despite increases in public knowledge about health risks of smoking and availability of evidence-based smoking cessation treatments, smoking continues to be the leading cause of preventable morbidity and mortality in the United States. In 2007, 19.8% (43.4 million) of all American adults were current smokers. Smoking rates are somewhat higher among young adults; 22.2% of Americans aged 18-24 reported being current smokers in 2007 (CDC, 2008a). Smoking is associated with a number of serious health risks, including lung cancer, emphysema, heart disease, and stroke, and costs the U.S. health care system up to $73 billion annually (Satcher, Thompson, & Koplan, 2002).

Smoking may incur even more health risks for women, including cervical cancer, infertility, menstrual dysfunction, and complications in pregnancy and childbirth. In 2006, 22.4% of American women reported being current smokers; in Louisiana the percentage was even higher (25.2%; CDC, 2008b). Historically, rates of smoking were lower in women than in men. However, women's smoking rates increased greatly from the 1950's through the 1970's, and as a consequence women's death rates from lung cancer have increased by 600% since 1950. Currently lung cancer accounts for 25% of all female cancer deaths, which is greater than deaths attributable to breast, uterine, and ovarian cancers combined. Smoking in high school girls and young women is of particular concern; in 2000, 29.7% of high school girls reported having smoked cigarettes in the past month. Smoking at an early age increases risk for heavier smoking patterns, associated health risks, and difficulty quitting later in life (Satcher et al., 2002).

Weight Concerns, Body Image, and Smoking in Women

Many female smokers believe that smoking helps them to control their eating and body weight, and concerns about weight gain often interfere with efforts to quit smoking (Clark et al., 2006; Copeland & Carney, 2003; Levine, Perkins, & Marcus, 2001; Ogden & Fox, 1994; Perkins, Levine, Marcus, & Shiffman, 1997; Williamson, Madans, Anda, Kleinman, Giovino, & Byers, 1991). Women who express concerns about smoking-related weight gain report less intention to quit, are more likely to drop out of smoking cessation treatment, and are less likely to achieve abstinence in smoking cessation treatment (Copeland, Martin, Geiselman, Rash, & Kendzor, 2006; Jeffery, Hennrikus, Lando, Murray, & Liu, 2000; Weekley, Klesges, & Reylea, 1992).

In addition to general weight concerns, body dissatisfaction is a specific variable that may affect smoking urges and behavior. Tobacco companies often target women by suggesting that women who smoke cigarettes are sexually attractive and thin (Satcher et al., 2002). Research suggests that compared to non-smokers, female smokers report greater body shape concerns, body dissatisfaction, and feelings of unattractiveness (Ben-Tovim & Walker, 1991; Kendzor, Adams, Stewart, Baillie, & Copeland, 2009; King, Matacin, Marcus, Bock, & Tripolone, 2000). In addition, body dissatisfaction may prompt initiation of smoking and also interfere with attempts to quit smoking (King, Matacin, White, & Marcus, 2005; Stice & Shaw, 2003). King et al. (2005) found that women with greater body dissatisfaction and body size overestimations were less likely to achieve abstinence in smoking cessation treatment. King et al. (2005) proposed two possible explanations for the relationship between body image dissatisfaction and smoking behavior. Women dissatisfied with their bodies might smoke to compensate directly for their perceived large body size (e.g., by suppressing appetite). Alternatively, the relation between

body image and smoking might be mediated by psychological distress; that is, female smokers with body image concerns might smoke to cope with negative affect associated with body image dissatisfaction.

Lopez, Drobes, Thompson, and Brandon (2008) conducted an experimental study investigating the effect of a short-term manipulation designed to prime body image issues on urges to smoke among female college smokers. Female smokers were shown either thin models (body image challenge) or neutral cues (inanimate objects unrelated to body image), in the context of either smoking cues (e.g., images of lit cigarettes) or neutral cues. Dependent variables were weight dissatisfaction, urge to smoke, and skin conductance responses. Results showed that compared to neutral images, viewing thin models produced greater weight dissatisfaction. This is consistent with past research showing that experimental manipulations presenting participants with images of the "thin beauty ideal" produces more negative body image (for a review, see Groesz, Levine, & Murnen, 2002). In addition, both the thin models and smoking cues independently increased urges to smoke. As there was no interaction between body image and smoking cues, the authors concluded that the body image and smoking manipulations had "independent, additive effects rather than synergistic effects" (p. S246) on smoking urges. In addition, both the body image and smoking cues increased skin conductance responses, showing that they independently affected physiological responses. However, in this case there was a significant interaction suggesting a synergistic effect, such that participants showed the highest skin conductance response when exposed to both the thin models and smoking cues. This study was the first to show that a manipulation designed to prime body image issues and weight dissatisfaction increased urges to smoke, even in absence of smoking cues.

As a follow-up study, Lopez Khoury, Litvin, and Brandon (2009) investigated the effects of a different body image manipulation (trying on a bathing suit) on body dissatisfaction, mood, and smoking urges, as well as negative affect as a potential mediator. Female college smokers were randomly assigned to either try on a bathing suit in front of a full-length mirror (body image manipulation) or observe a purse (control), in the presence or absence of smoking cues (cigarettes and lighter). Participants also rated their mood, smoking urges (on the Questionnaire for Smoking Urges–Brief [QSU-Brief], which includes separate scores indicating desire to smoke in expectation of pleasure and desire to smoke in attempt to relieve negative affect), and body image/weight dissatisfaction. Because results did not reveal any main effects or interactions of the smoking manipulation, Lopez Khoury et al. focused on the effects of the body image manipulation.

Results of Lopez Khoury et al.'s study (2009) showed that, as expected, trying on a bathing suit in front of a mirror produced more body dissatisfaction than observing a purse. Interestingly, the body image manipulation did not affect smoking urges in anticipation of pleasure; however, it did increase smoking urges in anticipation of relieving negative affect. Furthermore, negative affect completely mediated the relationship between the body image challenge and urge to smoke. These results support the hypotheses that priming body image issues increases body dissatisfaction and negative affect, and that female college smokers have increased urges to smoke in order to relieve negative affect associated with body image dissatisfaction. Overall, these two studies support the impact of body image manipulation on smoking urges and suggest that this effect is mediated by negative affect. Lopez Khoury and colleagues (2009) suggested that smoking treatments for women with body image and weight

concerns address not only body image dysfunction but also the negative affect associated with body image dissatisfaction.

Body Image, Negative Affect, and Information Processing

Consistent with Lopez Khoury et al.'s (2009) findings, additional research suggests that priming body image issues can induce negative affect (Pinhas, Toner, Ali, Garfinkel, & Stuckless, 1999). Some researchers have suggested that the negative affect associated with body image issues may be related to cognitive biases with which many women process body image information (Williamson, 1996; Williamson, Stewart, White, & York-Crowe, 2004). Williamson and colleagues proposed an information-processing model of body image that recognizes the interacting roles of individual characteristics, environmental stimuli, self-schema related to body image, cognitive biases, and negative emotion. In this model, individuals with certain characteristics (e.g., fear of fatness, overconcern with body size/shape, internalization of the thin ideal) are more likely to have cognitive biases related to body image. When susceptible individuals are confronted with certain stimuli (e.g., body or food-related information), self-schema and cognitive biases are activated. Cognitive biases may include attentional or memory biases, or overestimating of one's body size. Negative affect also plays an important role in the model. Cognitive biases can activate negative emotion and self-schema, which can then further activate cognitive biases, perpetuating a cycle of negative affect and cognitive biases.

For women smokers who are concerned about their body size/shape, these processes may also be linked to beliefs and expectancies about cigarette smoking to control weight, as well as urges to smoke. Perhaps smoking in reaction to distorted cognitions and negative affect provides short-term relief from focus on body dissatisfaction and negative emotion, thus further reinforcing smoking in reaction to body image dissatisfaction.

Smoking, Negative Affect, and Information Processing

Much research supports the notion that smokers often smoke in reaction to negative affect (e.g., Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Brandon, 1994; Brandon, Wetter, & Baker, 1996; Payne, Schare, Levis, & Colletti, 1991). Experimental studies have shown that negative affect inductions increase desire to smoke and change smoking topography (i.e., greater number of puffs, larger amount of the cigarette smoked, and longer puff duration; Payne et al., 1991; Perkins & Grobe, 1992). Negative affect has also been linked to difficulties in cessation and relapse (Brandon, 1994). More recently, Baker and colleagues (2004) proposed a reformulated model of negative reinforcement that also emphasizes the role of negative affect and further suggests that the relation between negative affect and drug use is mediated by biased information processing. For example, negative affect reduces the influence of controlled cognitive processing, increasing the likelihood that well-learned, automatic behaviors (e.g., smoking) will occur.

Breaking Connections between Body Dissatisfaction, Negative Affect, and Smoking

Because body dissatisfaction and associated negative affect can trigger smoking urges, it is crucial to develop effective treatments that target body image issues and weight concerns in women smokers. Responding to this need, Perkins et al (2001) developed a cognitive behavioral treatment (CBT) to reduce weight concerns in smokers. Perkins et al. investigated the differential effects of behavioral weight loss treatment and CBT to reduce weight concerns in conjunction with standard smoking cessation treatment among female smokers. The CBT intervention taught participants to challenge maladaptive thoughts about smoking and weight gain and emphasized that the health risks associated with an average 10-pound weight gain after smoking cessation are significantly less than the health risks of continued smoking (Levine, Marcus, & Perkins, 2003).

Results showed that, compared to behavioral weight loss treatment and standard treatment, CBT was more effective in reducing long-term weight gain and also improved smoking cessation outcomes at 1, 6, and 12 months (Perkins et al., 2001).

Whereas cognitive-behavioral techniques clearly have merit for reducing weight concerns, Stewart (2004) proposed that mindfulness and acceptance-based strategies might be more acceptable to women with body image concerns. For women with rigid beliefs about the importance of being thin and over-valuation of body image, the idea of refuting these thoughts may not be an acceptable goal. Learning to view their bodies with emotional neutrality may seem a more reasonable goal than challenging dysfunctional thoughts. Mindfulness, a concept originating from Buddhism and other eastern spiritual traditions, has gained a great deal of attention in recent scientific research and presents an alternative method for dealing with negative thoughts and emotions related to body image (Stewart, 2004). Mindfulness skills present a potential strategy for promoting adaptive reactions to body dissatisfaction and negative affect, as well as encouraging more effective regulation of smoking behavior.

Defining Mindfulness

Jon Kabat-Zinn, a pioneer in mindfulness research in the United States, defined mindfulness as "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (1994, p. 4). Shapiro, Carlson, Astin, and Freedman (2006) posited three aspects, or "axioms" of mindfulness: *Intention*, *Attention*, and *Attitude*. These three components illustrate that mindfulness is the act of purposefully paying attention, with an attitude of non-judgment, acceptance, and compassion. Baer, Smith, Hopkins, Krietemeyer, and Toney (2006) conducted a factor analysis of all items on five psychometrically sound mindfulness questionnaires and found five main facets of mindfulness: nonreactivity to inner experience,

observing sensations, acting with awareness, describing/labeling feelings with words, and nonjudging of experience. Overall, mindfulness is a way of fully paying attention to the present environment (including personal thoughts and emotions, as well as physical sensations and external events), with an attitude of acceptance. This form of non-judgmental attention should cultivate abilities to observe and describe sensations, avoid reacting in impulsive ways, and maintain an attitude of self-acceptance and compassion.

Mindfulness has been characterized as both a cognitive and behavioral skill (Witkiewitz et al., 2005). Teasdale, Segal and Williams (1995) referred to mindfulness as a meta-cognitive state that changes the way individuals view and relate to their thoughts. The goal of mindfulness techniques is not to change thoughts or feelings but to enhance acceptance and awareness of whatever sensations occur. For example, interventions that incorporate mindfulness often focus on viewing thoughts as "just thoughts" that do not necessarily reflect reality (e.g., Acceptance and Commitment Therapy [ACT], Blackledge & Hayes, 2001). Witkiewitz and colleagues (2005) described a key difference between cognitive and mindfulness-based therapies: "Traditional cognitive therapy techniques attempt to change the *content* of thoughts (e.g., challenge maladaptive thoughts), whereas mindfulness techniques attempt to change a person's attitude toward their thoughts, feelings, and sensations" (p. 219). In other words, whereas CBT attempts to rid individuals of negative reactions, mindfulness-based therapy can be described as mitigating or lessening the impact of negative thoughts on mood.

In addition, mindfulness differs from traditional relaxation strategies (e.g., progressive muscle relaxation). Although mindfulness might promote a state of relaxation, the goal of mindfulness training is not to induce relaxation but to teach nonjudgmental observation, which may or may not result in relaxation (Baer, 2003). Furthermore, research indicates that the effects

of mindfulness are not attributable to relaxation alone (e.g., Ortner, Kilner, & Zelazo, 2007). Thus, while mindfulness might promote relaxation, it is unlikely that relaxation is the primary mechanism by which mindfulness affects psychological and physical health.

Mindfulness practices can also be distinguished from concentration-based types of meditation (e.g., Transcendental Meditation [TM]), which encourage concentrating strictly on one stimulus (e.g., a word or object) while avoiding any distractions (Baer & Krietemeyer, 2006). In TM, when thoughts unrelated to the meditation object arise, they are to be pushed away in order to regain focus on the original object. Quite the contrary, mindfulness meditation encourages awareness, acknowledgement, and acceptance of any thoughts that may arise; mind wandering is natural and not something to disregard or judge. Baer and Krietemeyer (2006) described the mindfulness meditation process:

> Instruction in mindfulness meditation often begins with concentration-based practices (e.g., the breath) in which participants focus on a specific stimulus (e.g., the breath) and return their attention to this stimulus whenever they notice it has wandered. However, mindfulness instruction then proceeds to practices involving nonjudgmental observation of the constantly changing stream of stimuli as they naturally arise in time, including thoughts, memories, fantasies, bodily sensations, perceptions, emotions, and urges. In these practices, mind wandering is simply another event to be observed (p. 5).

Mindfulness-based treatment programs that have received empirical support include mindfulness-based stress reduction (MBSR) for chronic pain, anxiety, and coping with chronic disease (Baer, 2003; Grossman, Niemann, Schmidt, & Walach, 2004; Kabat-Zinn, 1982, 1990, 1992; Kabat-Zinn, Lipworth, & Burney, 1985), mindfulness-based cognitive therapy (MBCT) for preventing depressive relapse (Lau & Segal, 2007; Segal, Williams, & Teasdale, 2002), dialectical behavior therapy (DBT) for Borderline Personality Disorder and Binge Eating

Disorder (Linehan, 1993; Wiser & Telch, 1999), and Acceptance and Commitment Therapy (ACT; Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Hayes, Strosahl, & Wilson, 1999). Mindfulness-based therapies which have recently been developed and have preliminary empirical support include mindfulness-based relapse prevention for substance abuse (Witkiewitz, Marlatt, & Walker, 2005), mindfulness-based eating awareness training (MB-EAT; Kristeller, Baer, & Quillian-Wolvever, 2006), mindfulness-based weight loss treatment (Tapper, Shaw, Ilsley, Hill, Bond, & Moore, 2009), and mindfulness-based body image treatment (Delinsky & Wilson, 2006; Stewart, 2004; Wilson, 1999, 2004).

Mindfulness and Psychological Well-Being

Mindfulness may promote psychological well-being in at least two main ways: 1) reducing negative affect in the context of distressing stimuli, and 2) changing responses to negative affect when it occurs, promoting more adaptive emotion regulation and self-regulation. Several studies indicate that trait mindfulness is associated with lower negative affect, anger, depression, and anxiety (e.g., Brown & Ryan, 2003; McKee, Zvolensky, Solomon, Bernstein, & Leen-Feldner 2007). Brown and Ryan (2003) assessed intra-individual fluctuations in mindfulness over two and three-week periods using experience-sampling methodology. When participants were in a more mindful state, they reported greater autonomy (regulating their behavior in accordance with personal values and goals rather than external influences), more positive affect, and lower negative affect. Similarly, Jain and colleagues (2007) reported that four sessions of mindfulness meditation led to decreased distress and increased positive states of mind. Davidson et al. (2003) reported that after 8 weeks of mindfulness meditation, individuals had increased left-side anterior brain activation, which has been associated with positive affect.

In addition to reducing negative affect, mindfulness might also promote more adaptive responses to negative affect when it occurs. Raes, Dewulf, Van Heeringen, and Williams (2009) tested the hypothesis that MBCT is effective in preventing depressive relapse because it reduces "cognitive reactivity," or the tendency for negative mood to reactivate negative thinking patterns. MBCT is designed to help individuals to recognize when their mood begins to worsen, and to observe any changes in their mood and thoughts with a nonjudgmental, nonreactive attitude. Raes et al. (2009) found that trait mindfulness and mindfulness training within the context of MBCT were both associated with less cognitive reactivity to sad mood. Furthermore, the effects of MBCT on cognitive reactivity were mediated by an increase in mindfulness skills.

Similarly, Ortner and colleagues (2007) hypothesized that mindfulness improves responses to negatively-valenced stimuli, or reduces the extent to which exposure to emotional stimuli interferes with cognitive processing. Ortner et al. found that individuals with more mindfulness meditation experience showed less affective interference on the cognitive task. In a separate controlled study comparing the effects of 7 weeks of mindfulness meditation versus relaxation meditation, Ortner and colleagues found that whereas both mindfulness and relaxation led to increases in subjective and psychological well-being, only mindfulness produced less emotional interference. The authors suggested that mindful attention to the present moment reduces excessive focus on negative emotional stimuli, thus minimizing the impact that overwhelming negative emotions can have on cognitive functioning.

Arch and Craske (2006) investigated the acute effects of a 15-minute mindfulness induction on emotional reactions. They randomly assigned participants to mindfulness, unfocused attention, or worry conditions. Both before and after the experimental manipulation, participants viewed positive, negative, and neutral images and then rated their emotional state.

Results showed that the mindfulness group rated their emotional state as more positive after the neutral slides than did the unfocused attention or worry groups. In addition, the mindfulness group reported less negative affect and less change in affect, especially after viewing negative slides, compared to the other groups. The mindfulness group also reported greater willingness to continue to view negative images. The authors concluded that a short mindfulness induction led participants to maintain more positive affect, become less overwhelmed by negative slides, and respond more adaptively to negative stimuli for at least 10 minutes after the brief induction.

Adams and Leary (2007) investigated the effects of a brief self-compassion induction, which included fostering a mindful, nonjudgmental attitude, on affect and eating behavior among restrictive eaters. In their study, restrictive eaters who were forced to eat an unhealthy food reported increased negative emotion and subsequently ate more unhealthy food (presumably in effort to relieve negative affect). However, participants who were encouraged to treat themselves compassionately and avoid being self-critical or overwhelmed by negative emotions reported less negative affect and subsequently regulated their eating more effectively. Adams and Leary (2007) suggested that dieters who respond self-compassionately and mindfully to overeating are able to regulate their eating more effectively because they are less motivated to eat in effort to relieve intense negative affect.

Mindfulness might promote improved self-management (Baer, 2003), helping individuals to consciously engage in a range of coping skills rather than automatically reacting in impulsive ways to negative emotional experience. Acceptance and Commitment Therapy (ACT) emphasizes that when clients view negative affect as something to be escaped or avoided, they are more likely to engage in impulsive behavior such as excessive drinking or drug use in attempt to change their emotional experience. However, when individuals allow themselves to

fully experience rather than avoid emotions, they are more likely to consider response options and choose to act in accordance with personal values (Blackledge & Hayes, 2001). Brown and Ryan (2003) noted that mindfulness might improve self-regulation because it promotes conscious awareness and attention rather than automatic processing. Consistent with this notion, research suggests that conscious attention is often necessary in order to consider alternative behaviors, override impulses to engage in unwanted responses, and act in accordance with one's personal goals (Baumeister, Heatherton, & Tice, 1994).

Shapiro and colleagues (2006) provided an example of how mindfulness can promote more adaptive emotional responding and self-regulation:

> If anxiety arises, and we strongly identify with it, there will be a greater tendency to react to the anxiety unskillfully and subsequently regulate it by some behavior such as drinking, smoking or overeating, Reperceiving allows us to step back from the anxiety, to see it clearly as simply an emotional state that is arising and will in time pass away. Thus, this knowledge of the impermanence of all mental phenomena allows a higher level of tolerance for unpleasant internal states (p. 380).

Mindfulness, Substance Use Disorders, and Smoking

Witkiewitz and colleagues (2005) proposed mindfulness-based relapse prevention as an intervention for substance use disorders that encourages both cognitive-behavioral and mindfulness techniques for coping with cravings in high-risk situations. When clients maintain awareness and acceptance of craving sensations, they should no longer react impulsively by using drugs in order to escape craving. Rather, they should consider behavioral alternatives and choose to react consciously and deliberately. In addition, by inducing a state of relaxation, mindfulness may be reinforcing in itself. Witkiewitz et al. explained,

> A state of meta-cognitive awareness and relaxation replaces the positive and negative reinforcement previously associated with engaging in the addictive behavior. In this sense, mindfulness may serve as an alternative addiction; more than just a coping strategy for dealing with urges and temptations, but rather as a gratifying replacement behavior (pp. 219-20).

Breslin, Zack, and McMain (2002) discussed how mindfulness might be beneficial in preventing substance use relapse from an information-processing perspective. They described how both classical and instrumental conditioning are involved in substance use related to negative affect. Substance users, who often engage in substance use in order to avoid or reduce negative affect, experience many pairings between negative affect and substance use. When confronted with negative emotional stimuli, urges and automatic thoughts become conditioned responses. Substance use in response to these urges and thoughts is negatively reinforced because it produces a reduction in urges and obsessive thoughts related to the substance. Breslin et al. suggested that mindfulness is a useful technique for preventing substance use relapse in the face of negative affect because of its effects on information processing in two key ways: 1) helping individuals to process drug-related stimuli less automatically and more consciously (e.g., increasing awareness of automatic responses to relapse triggers); and 2) promoting detached observation of urges and emotions so that they are less likely to result in impulsive responses to regulate these feelings. In other words, mindfulness can promote awareness of linkages between negative affect, thoughts, urges, and substance use, as well as reduced need to escape negative emotion via substance use.

Although limited research has been conducted on mindfulness and smoking to date, some research supports the use of mindfulness training in aiding smoking cessation (Davis, Fleming, Bonus, & Baker, 2007). As mindfulness has been shown to decrease psychological distress and

negative affect (Jain et al., 2007), which can be triggers for smoking (Baker et al., 2004; Brandon, 1994; Brandon et al., 1996; Payne et al., 1991), mindfulness is a logical tool for aiding smoking cessation. In addition, research suggests that among smokers, mindfulness is related to lower levels of negative affect and higher levels of positive affect (Waters et al., 2009). Furthermore, Vidrine et al. (2009) reported that among smokers, those with lower trait mindfulness had higher levels of nicotine dependence and more severe withdrawal symptoms. In a pilot study, Davis and colleagues (2007) conducted 8 weeks of MBSR as a smoking intervention. In order to adapt MBSR for smoking cessation, participants were provided with a quit date, carbon monoxide levels were assessed, and the course focused on ways in which mindfulness skills could be applied to coping with nicotine craving and withdrawal. Results showed that 10 of 18 original participants (56%) attained biologically confirmed 7-day smoking abstinence at 6 weeks post-quit. Notably, 5 participants dropped out of treatment, and 10 of 13 participants who followed through with treatment achieved abstinence. Furthermore, participants who complied more with the meditation were more likely to attain abstinence and also showed reductions in stress and affective distress. The authors suggested that one mechanism of mindfulness may be reduced stress and negative affect.

Bowen and Marlatt (2009) investigated the effects of a short-term mindfulness induction on affect, smoking urges, and smoking behavior. Participants who were given brief mindfulness instructions based on the "urge surfing" technique, in which they were taught to visualize their urge as an ocean wave that grows in intensity but eventually will subside; they were encouraged to "ride the wave" without acting on it, waiting for it to pass (Marlatt, 2002). Results showed that the mindfulness group did not differ from a control group in negative affect or urges. However, the relationship between urges and negative affect was stronger for participants in the control

group than in the mindfulness group. Furthermore, participants in the mindfulness group smoked fewer cigarettes over a 7-day follow-up period. Thus, mindfulness did not lower urges or negative affect in this study, but changed the relationship between urges and negative affect, perhaps reducing the tendency to smoke in reaction to urges or negative affect. This research also suggests that even a short-term mindfulness induction can have longer lasting (at least 7 days) effects.

Mindfulness and Body Image

An information-processing model of body image (see above; Williamson et al., 2004) posits that for individuals who are over-concerned with their body size/shape, body image-related environmental stimuli (e.g., viewing thin models, trying on a bathing suit) activate cognitive biases, negative affect, and negative self-schema. Stewart (2004) proposed mindfulness as a way to "neutralize" biased information processing in the face of body image-related stimuli. In mindfulness-based body image treatment, individuals are taught to observe their bodies with an attitude of non-judgment and acceptance, which decreases intense negative emotional reactions and accompanying impulsive behavior. Mindfulness may also promote attention to one's values and goals, rather than acting impulsively in the moment. Stewart explained,

> As one cultivates awareness of one's behavior, triggers to that behavior and related thoughts and emotions are observed, and insight regarding the intention of the behavior is often achieved. By cultivating awareness for one's intentions and purpose in his or her actions, one gains the ability and power to recognize and change impulsive, undesirable, or destructive behaviors before they occur (p. 791).

One mindfulness-based body image treatment strategy is mirror exposure (ME), proposed by Wilson (1999, 2004) as a technique to promote nonjudgmental acceptance among clients with

eating disorders. Mindfulness-based ME is contrasted with ME within CBT, in which clients are asked to view their bodies with the goal of changing negative thoughts about weight and shape (e.g., Tuschen-Caffier, Pook, & Frank, 2001). Instead, mindfulness-based ME encourages clients to observe and describe their bodies, without evaluating anything, and while remaining in the present moment. Wilson (1999, 2004) suggested that this exercise requires clients to directly experience negative affect without evaluating it or trying to change it, and that this may enhance clients' ability to cope with affective distress in general. Delinsky and Wilson (2006) reported that three sessions of mindfulness-based mirror exposure, combined with homework assignments designed to reduce body checking and avoidance behaviors, produced decreases in body checking, body image avoidance, and concerns about shape/weight, and increases in self-esteem, above and beyond that produced by nondirective supportive therapy for body image concerns.

Related to the present study, mindfulness techniques might help women smokers to view their bodies in a less harsh, judgmental way. This might result in lowered negative affect. However, even if women do experience negative affect during the body image challenge, observing their experience mindfully should help them to have greater awareness of their thoughts and emotions, help them distance themselves from these thoughts and emotions (e.g., recognizing that "thoughts are just thoughts, not reality"), and react more adaptively and less impulsively to negative emotion (which should be evidenced as lower urge to smoke).

Summary and Rationale for the Proposed Study

Activating body image issues in female smokers induces negative affect, which can lead to increased urges to smoke cigarettes (Lopez et al., 2008; Lopez Khoury et al., 2009). Additional research suggests that negative affect can increase smoking urges and intensify smoking behavior (Baker et al., 2004; Brandon, 1994; Brandon et al., 1996; Payne et al., 1991).

Both the relations between body dissatisfaction and negative affect, and negative affect and smoking, might involve biased information processing. See Figure 1 for a visual depiction of these hypothesized relationships. The top portion of Figure 1 is adapted from Williamson et al.'s (2004) information processing model of body image, which posits that for susceptible individuals (i.e. those who have significant body image concerns and have internalized the thin ideal), body image stimuli activate self-schema and biased cognitions (e.g., overestimating one's body size). This biased information processing then activates negative affect, which further activates cognitive biases, perpetuating a cycle of negative affect and cognitive biases. In the case of weight-concerned smokers, biased cognitions are likely to include rumination about body dissatisfaction and expectancies that smoking will reduce appetite and body weight.

The lower portion of Figure 1 is adapted from Breslin et al.'s (2002) information-processing analysis of substance use and Baker et al.'s (2004) affective processing model of negative reinforcement. When female smokers experience negative affect related to body image, biased information processing related to beliefs that smoking will relieve negative affect are activated. These thoughts and smoking urges have become conditioned responses through repeated pairings of negative affect and smoking. Smoking in response to these urges and thoughts is negatively reinforced because it produces a reduction in urges and obsessive thoughts related to the substance, and the cycle of body dissatisfaction, biased information processing, negative affect, and smoking is more likely to recur.

Mindfulness might interrupt several of the pathways in Figure 1. Mindfulness has been shown to reduce negative affect (perhaps via less biased information processing and rumination; Jain et al., 2007; Sears & Kraus, 2009), and mindfulness can change the way in which people respond to negative affect, reducing urges and enhancing self-regulation in the face of negative

affect (Arch & Craske, 2006; Baer, 2003; Ortner et al., 2007; Raes et al., 2009; Shapiro et al., 2006). In the present study, I expected that mindfulness would have two main effects. First, mindfulness should prevent biased information processing related to body image, promoting acceptance and lowered negative affect. Second, mindfulness should change the way participants respond to negative affect, reducing the need to smoke to relieve negative affect, which should reduce smoking urges. This should also be evident in a weakened relationship between affect and smoking urges.

Purposes of Present Study

The present study addressed three main questions. *First*, can mindfulness instructions reduce negative affect and smoking urges after a body image challenge? *Second*, can mindfulness instructions change the way that women respond to negative affect? Does mindfulness weaken the relationship between negative affect and smoking urges that participants report in response to a body image challenge? *Third*, how does mindfulness influence actual smoking behavior?

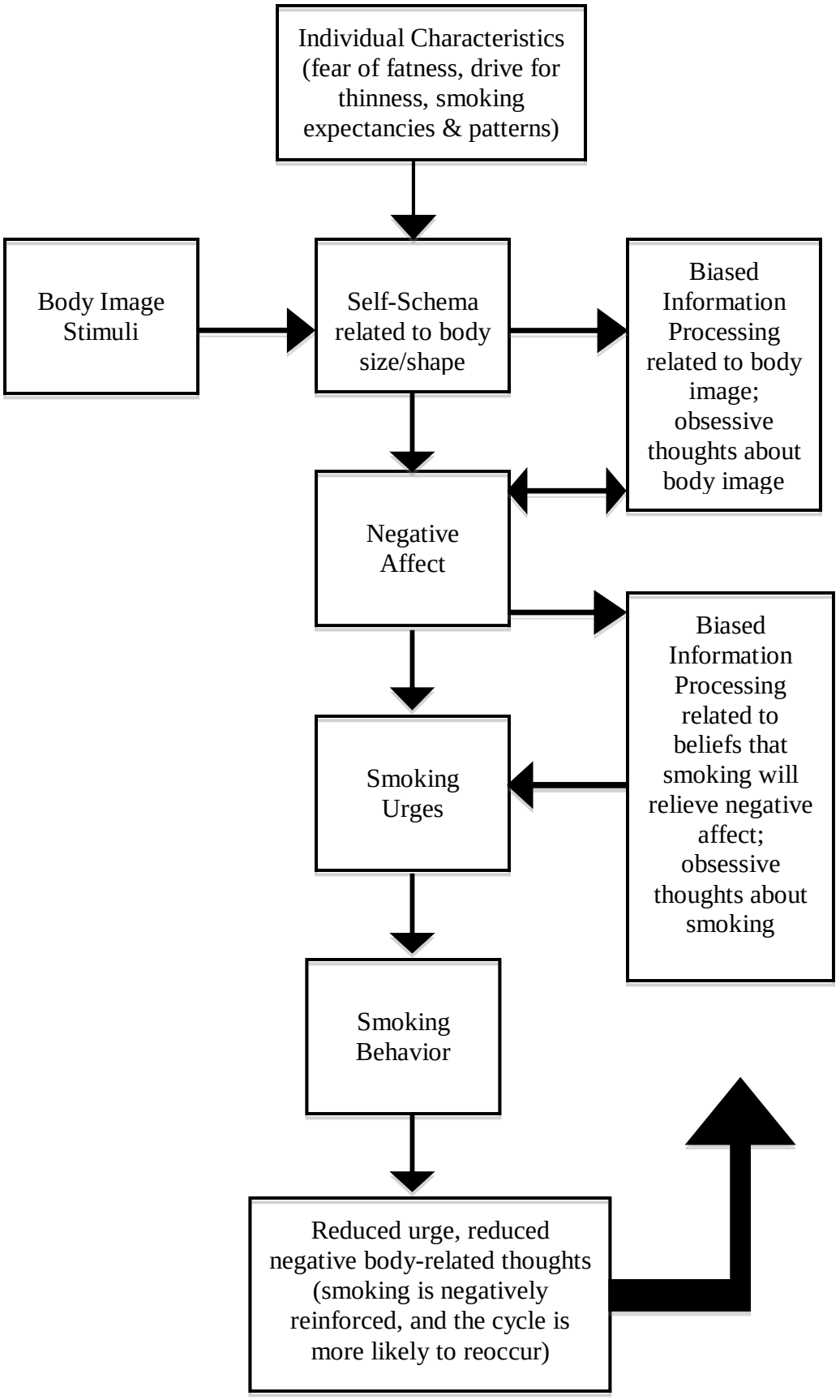

Figure 1. Relationships between body dissatisfaction, negative affect, information processing, and smoking. Upper portion is adapted from Williamson et al. (2004). Lower portion is adapted from Breslin et al. (2002) and Baker et al. (2004).

METHOD

Participants

Participants were college women (ages 18-26) who identified themselves as smokers. Eligible participants were not required to smoke a certain number of cigarettes per day because college students tend to be light smokers. Research suggests that of college student smokers, the heaviest smokers (28%) smoke 6-10 cigarettes per day, "moderate smokers" (22%) smoke 10-19 days per month (2-5 cigarettes per smoking day), "social smokers" (19%) smoke mostly on weekends (3-5 days per month, 2-5 cigarettes per smoking day), and "puffers" (26%) smoke 1-2 days per month (≤1 cigarette per smoking day; Sutfin, Reboussin, McCoy, & Wolfson, 2009). Eligibility was determined based on an initial screening session. Based on self-report, eligible participants could not have clinically elevated scores on self-report measures of anorexic, bulimic, body dissatisfaction, or depressive symptoms. These individuals were referred to the LSU Psychological Services Center. Also, participants in either the underweight or obese range of body mass index (BMI <18.5 or >29.9) were excluded. Eligible participants were asked to refrain from smoking for 6 hours prior to their scheduled session in order to induce a consistent level of nicotine deprivation.

Materials

Expired Carbon Monoxide (Vitalograph Incorporated, Lenexa, KS, USA; CO) levels were measured with a portable Vitalograph ecolyzer. According to the Society for Research on Nicotine and Tobacco (SRNT) Subcommittee on Biochemical Verification (2002), CO levels of ≥ 8 parts per million (ppm) suggest recent cigarette smoking with a sensitivity and specificity of approximately 90 percent for heavier smokers. However, the half-life of CO may range from one to eight hours depending on a variety of factors including time of day, daily smoking rate,

recency of smoking, and physical activity levels (SRNT Subcommittee on Biochemical Verification, 2002). CO levels are expected to be relatively low in a sample of college student smokers. CO levels were used in the present study as biochemical verification of self-reported smoking behavior.

Smoking Status Questionnaire (SSQ). The SSQ is a background questionnaire that assesses demographics (gender, age, ethnicity), smoking status (e.g., "Do you smoke cigarettes every day?"), and nicotine dependence (as assessed by the *Fagerström Test for Nicotine Dependence* (FTND), a widely-used measure of nicotine dependence; Heatherton, Kozlowski, Frecker, & Fagerström, 1991). The SSQ also includes a single item assessing concerns about postcessation weight gain ("How concerned are you about gaining weight if you quit smoking?") that is rated on a 0-9 Likert scale ranging from "not at all concerned" to "extremely concerned."

The Smoking Stages of Change (SOC) is a 3-item self-report measure that assesses desire and readiness to quit smoking. Participants are asked to report how many times they have quit smoking in the last year and to report if they are thinking of quitting smoking in the next year/in the next 30 days. The SOC was used in the present study to characterize the extent to which participants were interested in quitting smoking, and to assess any differences in these variables among experimental conditions.

Clothing Sizes. Participants were asked to indicate the sizes of clothing that they typically wear in one-piece bathing suits, shirts/tops and shorts/pants. The sizing chart included women's sizes in both numerical (0-18) and letter (XS-XXL) sizes. Participants could also indicate if they wear other sizes not in the chart (e.g., petite, plus size). Sizing charts were adapted from Target Brand's online sizing charts (Target, 2009). These estimations were then

used to select the size of bathing suit that each participant would try on in the experimental study.

The Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987) is a 34-item self-report measure of body shape concern. Research has supported the psychometric properties of this measure, and the BSQ showed excellent reliability in the present study (Cronbach's alpha (α) = .96). BSQ scores of less than 81 suggest little or no worry about body shape, scores of 81-110 suggest slight worry, scores of 111-140 suggest moderate worry, and scores greater than 140 suggest extreme worry about body shape (Cooper & Taylor, 1988). Participants who scored >140 were excluded from the study, as the body image challenge may have been too distressing for them.

The Eating Attitudes Test (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982) is a 26-item self-report measure of eating disorder symptoms, which contains three subscales: 1) Dieting, 2) Bulimia and Food Preoccupation, and 3) Oral Control. Research has supported the reliability and validity of the EAT-26, and internal consistency in the present study was adequate (α = .82). Participants with scores $\geq$ 20 were excluded from the present study, as these scores have been associated with a diagnosis of Anorexia Nervosa (Garner et al., 1982)

The Bulimia Test – Revised (BULIT-R; Thelen, Farmer, Wonderlich, & Smith, 1991) is a 36-item self-report measure of Bulimia Nervosa symptoms, which contains five subscales: 1) Bingeing/Control/Body Image, 2) Radical Measures/Fasting, 3) Exercise, 4) Vomiting/Laxatives, and 5) Diuretics. Participants with scores $\geq$ 104 were excluded from the present study, as these scores have been associated with a diagnosis of Bulimia Nervosa (Thelen et al., 1991). Reliability of the total BULIT-R in the present study was excellent (α = .93).

The Multifactorial Assessment of Eating Disorders Symptoms (MAEDS; Anderson, Williamson, Duchmann, Gleaves, & Barbin, 1999) is a 56-item self-report measure of symptoms associated with eating disorders. The MAEDS yields six subscale scores: 1) Depression, 2) Binge Eating, 3) Purgative Behavior, 4) Fear of Fatness, 5) Restrictive Eating, and 6) Avoidance of Forbidden Foods. The MAEDS has shown good internal consistency as well as convergent and discriminant validity. T-scores $\geq$70 are considered clinically elevated. In the present study, participants with Depression subscale scores $\geq$70 were excluded from the experimental session. The Depression subscale showed good internal consistency in the present sample (α = .89).

The Five-Factor Mindfulness Questionnaire (FFMQ; Baer et al., 2006) is a 39-item self-report questionnaire created by combining existing measures of mindfulness. The scale yields five factors, which are empirically supported aspects of mindfulness: 1) Nonreactivity to Inner Experience, 2) Observing/Noticing/Attending to Sensations/Perceptions/ Thoughts/Feelings, 3) Acting with Awareness/Automatic Pilot/Concentration/Distraction, 4) Describing/Labeling with Words, and 5) Nonjudging of experience. Baer and colleagues (2006) reported that the measure has adequate reliability and validity. Reliability of the overall scale in the present study was good (α = .89).

The Questionnaire of Smoking Urges – Brief (QSU-brief; Cox, Tiffany, & Christen, 2001) is a 10-item self-report measure that has been supported as a reliable and valid measure of craving to smoke. The scale yields two factors: Factor 1 assesses desire to smoke in anticipation of pleasure or reward, and Factor 2 measures desire to urge to smoke in effort to relieve negative affect. Although these two factors are positively related, they appear distinct and may represent urges to smoke in anticipation of positive versus negative reinforcement. In the present study

these subscales were used to assess smoking urges before and after experimental manipulations and showed excellent reliability at both time points (M_{α} = .92).

Visual Analogue Scales (VAS) were used to provide additional measures of urge and affect, and also to assess body image dissatisfaction before and after experimental manipulations. On each scale, participants were asked to indicate their response by drawing a vertical line through a 100 mm horizontal line. The same scales used by Lopez Khoury et al. (2009) were employed. Items were: Urge to Smoke, Affect, Weight Dissatisfaction, Appearance Dissatisfaction, Level of Excitement, Interest, and Boredom (the latter three items were included to strengthen credibility of the cover story, as suggested by Lopez Khoury et al., 2009).

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is a widely used 20-item self-report measure of positive and negative emotion. Participants rate each item (e.g., distressed, ashamed, enthusiastic, excited) on a Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). In the present study, participants rated their affect for the present moment, both before and after the experimental manipulation. The PANAS has been shown to yield two factors (Positive Affect and Negative Affect) and has consistently shown good evidence for reliability and validity (Lopez Khoury et al., 2009; Watson et al., 1988). Both factors showed good internal consistency in the present study, as administered both before and after experimental manipulations (M_{α} = .81).

The Toronto Mindfulness Scale (TMS; Lau et al., 2006) is a 13-item self-report measure of state mindfulness. Whereas the majority of mindfulness measures assess inter-individual differences in trait mindfulness, Lau et al. acknowledged that mindfulness can vary intra-individually over time and designed the TMS as a measure of state mindfulness at a particular moment in time. The measure yields two factors: Curiosity (attending to the present

moment with an attitude of curiosity and openness to experience) and Decentering (observing thoughts and feelings without over-identifying with them). The measure shows good internal consistency, and TMS scores increase with meditation experience or participation in 8 weeks of MBSR. The TMS was used as a manipulation check to confirm that the mindfulness instructions increase self-reported state mindfulness. The subscales of the TMS showed good internal consistency both before and after experimental manipulations (M_{α} = .81).

Procedure

All procedures were reviewed and approved by Louisiana State University's Institutional Review Board (IRB). Participants were recruited through fliers posted around the LSU campus, as well as the LSU psychology participant pool in which students are able to participate in research for course credit. Female college students who were self-reported smokers and between the ages of 18 and 26 were invited to attend the initial screening session for either course credit or monetary compensation ($10). The nature of the screening session was explained, and participants signed an informed consent document if they agreed to participate. During this session, CO level, height, and weight were measured, and participants completed the SSQ (including the FTND) SOC, Clothing Sizes, BSQ, EAT-26, BULIT-R, MAEDS, and FFMQ (see Appendix A). Participants who were eligible (self-reported current smokers, EAT-26 < 26, BULIT-R < 104, BSQ < 140, MAEDS Depression < 52 [T<70], BMI 18.5-29.9) and willing to participate for additional course credit or monetary compensation ($10) were scheduled for an experimental session. Participants were asked to refrain from smoking for 6 hours prior to the experimental session. Participants were told that the purpose of the study was to investigate factors (e.g., background sounds, informational messages, lighting, product presentation) that affect consumers' attitudes and preferences about products.

When participants arrived for the experimental session, the experimenter explained the informed consent document, which participants signed if they agreed to participate. Eligible participants were randomly assigned to one of four conditions: Purse + control, Body Image + Control, Purse + Mindfulness, or Body Image + Mindfulness. The recruitment goal for the present study was 140 participants (35 in each group), as the G*Power program suggested a sample size of 140 in order to detect a small to medium effect with power of .80 (Faul, Erdfelder, Lang, & Buchner, 2007). Data were collected between January and December 2010. The experiment was divided into five phases:

Phase 1: Pre-Manipulation Questionnaires

Participants completed the QSU-Brief, PANAS, VAS scales (including smoking urge, affect, and body dissatisfaction), and TMS (see Appendix B).

Phase 2: Manipulation

Participants either tried on a bathing suit or observed a purse while listening to an audio recording of the mindfulness instructions or in silence.

Body Image Challenge Condition. In this condition, participants were given a bathing suit to try on. The size chosen for each participant was the size that she indicated she typically wears in the screening session (all bathing suits were black, one-piece, and identical except for size: XS, S, M, L, XL, XXL). If the participant chose more than one size, the larger one was chosen. Participants were asked to leave their undergarments on while trying on the swimsuit, and a hygienic pad was placed inside each swimsuit just as it would be in a department store. Participants tried on the bathing suit while alone in a room in front of a full-length mirror, surrounded by a divider for extra privacy.

Mindfulness Instructions. The mindfulness group listened to two sets of mindfulness instructions on a tape player, each lasting 10 minutes (see Appendix C). The first tape, adapted from Kabat-Zinn (1994, 2002) and the five facets of mindfulness (Baer et al., 2006), instructed participants to focus on their breath, purposefully paying attention to their moment-to moment experience with an attitude of nonjudgment and acceptance. Participants were encouraged to notice thoughts and emotions that came up, acknowledging them and letting them pass. Thus, participants learned mindfulness skills before they tried on the bathing suit or observed the purse. Next, participants listened to a second set of mindfulness instructions while they tried on the bathing suit or observed the purse. These mindfulness instructions encouraged participants to use the same mindfulness skills they just learned to observe and describe their experience with the bathing suit or purse. In addition, the mindfulness instructions for the body image condition incorporated Delinsky and Wilson's (2006) recommendations for mindfulness-based mirror exposure. An expert in both body image and mindfulness was consulted in creating the mindfulness instructions.

Phase 3: Post-Manipulation Questionnaires

Participants completed the QSU-Brief, PANAS, VAS scales (including smoking urge, affect, and body dissatisfaction), and TMS. In addition, participants rated products (bathing suit or purse) on a 100-point scale (0 = strongly dislike, 100 = strongly like) based on quality, color, material/fabric, size, shape, and overall rating. These items were added to strengthen the cover story.

The experimenter returned to the room and asked two questions: "Overall, what did you think of the product?" and "When do you plan to have your next cigarette?" The experimenter recorded the participant's response verbatim. Then, the experimenter coded this response on a 1

to 5 scale (1 = within 15 minutes, 2 = between 15 minutes and 1 hour, 3 = between 1 and 3 hours, 4 = later today, 3+ hours after experiment, 5 = tomorrow or later; see Appendix D).

Phase 4: Smoking Behavior

Next, participants were told that they needed to wait a few minutes before completing one last questionnaire. The experimenter offered a pack of the participants' preferred cigarettes and told them that they were welcome to take a smoke break. The experimenter recorded whether or not the participant chose to smoke a cigarette.

Phase 5: Debriefing

All participants were informed of the actual purpose of the study and given the opportunity to ask questions. Participants were questioned about any psychological distress related to the body image challenge, and none indicated significant distress. Participants in the Body Image + Control and Purse + Control conditions (who did not hear mindfulness instructions) were given the opportunity to listen to a mindfulness tape before they left.

Hypotheses

- **Hypothesis 1: Effects of body image challenge and mindfulness on negative affect.**

A significant interaction between Body Image and Mindfulness conditions was expected, such that participants in the Body Image + Control group would experience elevated negative affect, but that mindfulness would prevent increased negative affect.

- **Hypothesis 2: Effects of body image challenge and mindfulness on smoking urges.**

A significant interaction between Body Image and Mindfulness conditions was expected, such that participants who received the body image challenge without mindfulness instructions would report increased urges to smoke and shorter amounts of time until they planned to have their next cigarette. The body image challenge should increase urges to smoke only for

participants who are not given mindfulness instructions. In other words, mindfulness should moderate the relationship between the body image challenge and smoking urges.

- **Hypothesis 3: Effects of body image challenge and mindfulness on smoking.**

A significant interaction between Body Image and Mindfulness conditions was expected, such that participants who received the body image challenge but not mindfulness instructions would be more likely to accept the experimenter's offer to smoke directly after the manipulation. In other words, I expected that mindfulness would moderate the relationship between the body image challenge and smoking behavior.

- **Hypothesis 4: Negative affect as a mediator of the effects of mindfulness.**

If the mindfulness instructions did indeed decrease negative affect, urges, and smoking intensity associated with the body image challenge, then I planned to test whether the effects of mindfulness were mediated by reduced negative affect. It is possible that mindfulness reduces smoking urges and intensity after a body image challenge by reducing negative affect. It is also possible that mindfulness does not decrease negative affect but changes the relationship between negative affect and smoking. This hypothesis would be supported if the Body Image + Mindfulness group reports as much negative affect as the Body Image + Control group, but that in the Body Image + Mindfulness group negative affect is less strongly related to smoking urges.

- **Hypothesis 5: Effects of mindfulness on the relationship between negative affect, urges, and smoking.**

Consistent with Bowen and Marlatt's (2009) results, it was expected that mindfulness would weaken the relationship between negative affect and smoking urges. In other words, I expected a significant interaction between mindfulness condition and negative affect in predicting smoking urges.

RESULTS

A total of 113 participants completed the screening session. Of these, 75 (66.4%) were eligible for the experimental session, and 65 of these chose to participate either for course credit (*n* = 56; 86%) or monetary compensation (*n* = 9; 14%). Reasons for exclusion were: underweight (*n* = 1), obese (*n* = 9), elevated EAT-26 (*n* = 7), elevated BULIT-R (*n* = 2), elevated BSQ (*n* = 12), and elevated MAEDS Depression (*n* = 6). In order to compare eligible participants who chose to participate (*n* = 65) versus those who declined to participate (*n*=10), independent samples t-tests were conducted for continuous variables including age, BMI, BSQ, FFMQ, smoking rate, FTND, and CO levels at the screening session. Next, Chi Square analyses were conducted to examine any differences in race and smoking stages of change, as categorical variables, among eligible participants who chose to participate versus declined to participate. None of these analyses were significant (*p*s > .05), suggesting that individuals who chose to participate did not differ from those who declined participation on relevant variables.

Experimental data were checked for univariate outliers and normality as suggested by Tabachnick and Fidell (2007). Because I planned to perform analyses with grouped data, I sought outliers separately for each experimental group. Among baseline variables examined (age, BMI, BSQ, FFMQ, smoking frequency, FTND, CO at screening, CO at experimental, hours since last cigarette), only the "hours since last cigarette" variable included a value over 3.3 standard deviations from the mean. This participant reported that she had not smoked for 96 hours prior to the experimental session. Since this level of nicotine deprivation was extremely different from the rest of the sample and likely to affect smoking urges, this case was deleted.

Participant Characteristics

Participants in the experimental session (n = 64) had a mean age of 20.03 (±1.77) and were 87.5% Caucasian. The majority of participants (n = 50; 78.1% of the sample) were daily smokers. These daily smokers reported smoking an average of 8.30 cigarettes per day (±4.74; range 2-20) and had an average CO level of 6.63 (±4.53) at the screening session. Their average FTND score of 1.68 (±1.63) suggested relatively low nicotine dependence. Daily smokers reported having smoked daily for an average of 2.79 years (±1.71) and having made an average of 1.51 (±1.56) serious quit attempts in the past. Non-daily smokers (n = 15) reported smoking an average of 16.38 cigarettes per week (±24.13) and had an average CO level of 2.13 (±1.64) at screening.

Among the total experimental sample, 49.2% indicated that they were seriously considering quitting smoking within the next 6 months, and 12.7% indicated that they were planning to quit within the next 30 days. Seventy-one percent reported that they had quit at least once for at least 24 hours in the past year.

Participants' average BMI was in the normal range (M = 22.72 ±2.56). Average levels of eating disorder symptoms and body image concerns were also in the normal range (EAT-26: M = 6.19 ±4.94; BULIT-R: M = 48.14 ±13.79; BSQ: M = 80.66 ±26.37). The average score on the MAEDS Depression subscale was 28.47 (±9.18). The mean total FFMQ score was 126.32 (±13.34); on average, participants rated mindfulness items as "sometimes true" for them. This sample reported relatively low concern about postcessation weight gain on average. On a 0-5 scale (with 5 indicating greatest concern about postcessation weight gain), the average response was 1.52 (±1.26; range 0-5). On the BSCQ-Weight Concern subscale, the mean score was also relatively low (M = 2.88 ±2.07, range 0-9).

Participants were randomly assigned to one of four conditions: Purse + Control (n = 16), Body Image + Control (n = 15), Purse + Mindfulness (n = 15), and Body Image + Mindfulness (n = 18).

Baseline Tests for Equivalence of Groups

A series of preliminary one-way analyses of variance (ANOVAs) were conducted to test for baseline differences in continuous variables including age, BMI, BSQ, FFMQ, smoking rate, FTND, CO levels at screening and experimental sessions, and hours since last cigarette at experimental session among the four experimental conditions. Chi Square analyses were conducted to examine any group differences in race and smoking stages of change as categorical variables. None of these analyses were significant (ps > .14), suggesting that experimental groups did not differ from one another on relevant variables at baseline. Baseline characteristics for each group, as well as p-values testing differences between conditions, are shown in Table 1.

Participants' self-reported levels of state mindfulness, body image, and affect (both before and after experimental manipulations) in each experimental condition are shown in Table 2. In addition, participants' ratings of smoking urges, when they planned to have their next cigarette, and likelihood of accepting the experimenter's offer to smoke are shown in Table 3. For all variables that were measured prior to experimental manipulations (i.e., state mindfulness, body dissatisfaction, appearance dissatisfaction, affect, smoking urges), one-way ANOVAs were conducted to determine differences between groups. None of these analyses showed baseline differences between groups, ps > .34.

Relationships between Baseline/Demographics and Dependent Variables

Before conducting primary analyses, bivariate correlations were conducted between baseline/demographic variables (i.e., BMI, age, minority status, smoking frequency, time since

last cigarette, trait mindfulness [FFMQ]) and dependent variables to be tested (state mindfulness [TMS], ratings of body and appearance dissatisfaction, affect [PANAS and VAS], smoking urges [QSU, VAS, when participants planned to have their next cigarette]), and whether or not participants accepted the experimenter's offer to smoke directly after the experiment. Baseline variables that were significantly correlated with dependent variables were statistically controlled in later analyses. This is consistent with Weinfurt's (2004) and Tabachnick and Fidell's (2007) suggestion that covariates should only be used if there is a statistically significant linear relationship between the covariate and dependent variables. Specifically, BSQ scores and BMI were related to greater body and appearance dissatisfaction (*r*s: .26-.59, *p*s < .05), and participants with greater BMI's were less likely to accept the experimenter's offer to smoke, $r = -.31$, $p = .01$. Age was not significantly related to any of the dependent variables, *p*s > .09. Minority status was related to more positive affect ($r = .27$, $p = .03$), higher state mindfulness ($r = .29$, $p = .02$), less body dissatisfaction ($r = -.30$, $p = .02$), planning to wait longer until smoking ($r = .35$, $p = .003$), and less likelihood of accepting the experimenter's offer to smoke, $r = -.28$, $p = .03$. Smoking frequency was related to increased smoking urges (*r*s: .37 - .47, *p*s < .01) and planning to smoke sooner after the experiment ($r = -.28$, $p = .03$).

Table 1. Baseline characteristics for the total sample and by experimental group (standard deviations in parentheses).

	Total (N = 64)	PC (n = 16)	BC (n = 15)	PM (n = 15)	BM (n = 18)	p
Age	20.03 (1.77)	20.25 (1.81)	20.33 (1.95)	20.20 (1.52)	19.44 (1.79)	.43
Race						.36
%Caucasian	87.5%	93.8%	86.7%	86.7%	83.3%	
% Asian	4.7%	6.3%	13.3%	0%	0%	
% African American	1.6%	0%	0%	0%	5.6%	
% Hispanic	1.6%	0%	0%	0%	5.6%	
% Other	4.7%	0%	0%	13.3%	5.6%	
BMI	22.72 (2.56)	23.46 (3.23)	23.53 (2.11)	22.01 (2.39)	21.99 (2.14)	.14
BSQ	80.66 (26.37)	88.25 (23.33)	80.67 (20.08)	75.40 (30.94)	78.28 (29.86)	.57
% Daily Smokers	78.1%	75.0%	86.7%	73.3%	77.8%	.82
Cigarettes per Week	48.95 (35.81)	50.71 (40.34)	51.67 (34.04)	40.44 (25.48)	52.43 (42.07)	.78
FTND	1.59 (1.67)	1.57 (1.45)	1.29 (1.54)	1.85 (2.08)	1.67 (1.71)	.86
CO at screening	5.65 (4.48)	6.16 (5.25)	5.20 (3.17)	6.47 (4.84)	4.89 (4.55)	.72
CO at experimental	3.51 (3.74)	3.53 (3.04)	4.00 (4.42)	3.53 (4.53)	3.06 (3.13)	.92
Hours since last cigarette	14.56 (7.92)	13.27 (4.30)	14.93 (7.76)	12.23 (4.34)	17.25 (11.59)	.29
FFMQ	126.32 (13.34)	128.88 (15.97)	128.93 (13.56)	127.67 (13.08)	120.21 (10.05)	.24
% considering quitting in next 6 mos.	49.2%	50%	57.1%	40.0%	50.0%	.84
% planning to quit in next 30 days	12.7%	12.5%	7.1%	13.3%	16.7%	.89
% having quit for 24 hrs in past yr	71.4%	68.8%	71.4%	86.7%	61.1%	.45

PC = Purse + Control; BC = Body Image + Control; PM = Purse + Mindfulness; BM = Body Image + Mindfulness; BMI = Body Mass Index; BSQ = Body Shape Questionnaire; FTND = Fagerström Test for Nicotine Dependence; CO = Carbon Monoxide; FFMQ = Five-factor Mindfulness Questionnaire

Table 2. Mindfulness, body image, and affect scores by experimental group (standard deviations in parentheses).

	PC (n = 16)	BC (n = 15)	PM (n = 15)	BM (n = 18)
TMS-Decenter (Pre)	13.06 (5.11)	12.27 (3.79)	12.67 (6.37)	12.11 (5.89)
TMS-Decenter (Post)	13.81 (6.57)	13.60 (3.18)	17.73 (4.67)	17.39 (5.10)
TMS-Curiosity (Pre)	11.63 (5.26)	12.53 (4.45)	11.13 (4.84)	11.06 (5.36)
TMS-Curiosity (Post)	13.13 (6.77)	14.73 (3.81)	15.93 (4.51)	15.06 (5.95)
VAS Body Dissatisfaction (Pre)	45.47 (19.99)	37.60 (17.17)	32.53 (20.04)	40.17 (23.48)
VAS Body Dissatisfaction (Post)	40.77 (19.62)	42.53 (18.29)	34.20 (18.05)	40.31 (23.35)
VAS Appearance Dissatisfaction (Pre)	47.53 (17.88)	41.40 (19.93)	36.80 (20.15)	45.94 (19.24)
VAS Appearance Dissatisfaction (Post)	43.87 (18.90)	43.13 (19.10)	36.40 (21.00)	41.11 (19.57)
VAS Affect (Pre)	53.27 (14.45)	61.00 (9.99)	56.60 (11.52)	53.69 (15.34)
VAS Affect (Post)	58.80 (16.73)	54.02 (11.94)	57.43 (11.00)	52.72 (18.23)
PANAS Negative Affect (Pre)	15.31 (5.08)	13.87 (2.56)	14.67 (2.58)	16.33 (6.56)
PANAS Negative Affect (Post)	14.31 (5.20)	14.60 (4.98)	13.53 (2.70)	14.51 (4.05)
PANAS Positive Affect (Pre)	25.25 (6.75)	28.80 (5.73)	26.67 (7.91)	25.94 (6.31)
PANAS Positive Affect (Post)	24.69 (9.15)	26.60 (4.87)	24.40 (9.63)	24.61 (8.18)

PC = Purse + Control; BC = Body Image + Control; PM = Purse + Mindfulness; BM = Body Image + Mindfulness; TMS = Toronto Mindfulness Scale; VAS = Visual Analogue Scale; PANAS = Positive and Negative Affect Schedule

Table 3. Smoking urges and behavior by experimental group (standard deviations in parentheses).

	PC (n = 16)	BC (n = 15)	PM (n = 15)	BM (n = 18)
QSU-Negative Affect (Pre)	21.50 (18.73)	25.60 (20.32)	26.95 (24.77)	24.59 (23.44)
QSU-Negative Affect (Post)	26.25 (23.81)	30.43 (26.88)	28.73 (25.98)	19.89 (21.22)
QSU-Desire (Pre)	59.51 (22.73)	63.07 (28.31)	68.67 (24.81)	63.49 (29.11)
QSU-Desire (Post)	64.31 (30.60)	65.91 (32.75)	66.33 (31.58)	57.78 (30.97)
VAS Urge (Pre)	59.33 (10.78)	60.20 (18.93)	57.07 (19.70)	59.11 (22.87)
VAS Urge (Post)	60.73 (15.49)	61.40 (17.36)	50.40 (16.64)	58.06 (21.22)
Plan next cigarette	2.31 (1.08)	1.73 (1.03)	2.00 (1.51)	2.78 (1.48)
Accepted offer to smoke?	18.8%	35.7%	33.3%	50%

PC = Purse + Control; BC = Body Image + Control; PM = Purse + Mindfulness; BM = Body Image + Mindfulness; QSU = Questionnaire of Smoking Urges-Brief; VAS = Visual Analogue Scale

Manipulation Checks

Two repeated-measures mixed-model analyses of covariance (ANCOVAs) were conducted to examine changes in state mindfulness (Decentering and Curiosity subscale scores) from pre- to post-manipulation by experimental group. The within-subjects factors were pre-post Decentering scores and pre-post Curiosity scores, and the between-subjects factors were dichotomized mindfulness condition (mindfulness vs. silence) and dichotomized body image condition (bathing suit vs. purse). Minority status was entered as a covariate in each analysis. In order to ensure that assumptions of ANCOVA were met (in these as well as all following ANCOVAs), Box's test of equality of covariance matrices (which tests the null hypothesis that covariance matrices of the dependent variables are equal across groups) and Levene's Test of Equality of Error Variances (which tests the null hypothesis that the error variance of the dependent variable is equal across groups) were performed.

Results indicated a significant interaction between pre-post Decentering scores and mindfulness condition, $F(1,59) = 9.61$, $p = .003$, $\eta p^2 = .14$. Follow-up paired samples t-tests indicated that whereas TMS Decentering scores increased in the mindfulness groups ($t(32) = 4.65$, $p < .001$, mean increase 5.18 points), Decentering scores did not change in the groups that did not receive mindfulness instructions, $p = .12$). See Figure 2.

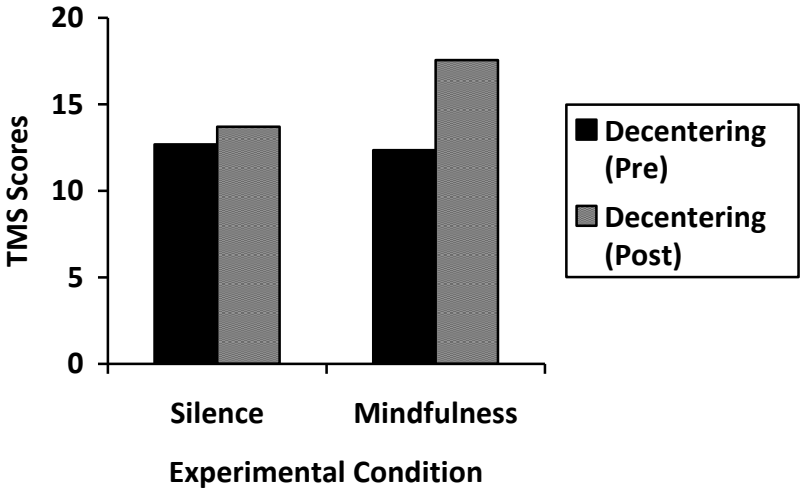

Figure 2. Levels of Decentering mindfulness pre- and post- experimental manipulations.

PC = Purse + Control; BC = Body Image + Control; PM = Purse + Mindfulness; BM = Body Image + Mindfulness; TMS = Toronto Mindfulness Scale

Results also indicated a significant interaction between pre-post Curiosity scores and mindfulness condition, $F(1, 59) = 6.40$, $p = .01$, $\eta p^2 = .10$. Follow-up paired-samples t-tests indicated that TMS Curiosity scores increased to a greater extent in the mindfulness conditions than the silence conditions (mindfulness conditions: $t(32) = 5.35$, $p < .001$, mean increase 4.36 points; silence conditions: $t(30) = 3.05$, $p = .01$, mean increase 1.84 points). See Figure 3.

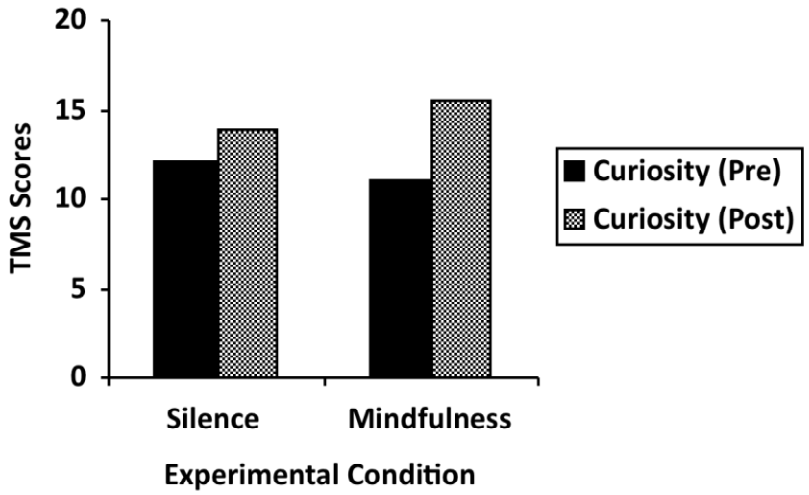

Figure 3. Levels of Curiosity mindfulness pre- and post- experimental manipulations.

PC = Purse + Control; BC = Body Image + Control; PM = Purse + Mindfulness; BM = Body Image + Mindfulness; TMS = Toronto Mindfulness Scale

Next, a repeated measures mixed-model ANCOVA was conducted to examine changes in body weight dissatisfaction (VAS Body Weight Dissatisfaction) from pre- to post-manipulation by experimental group. The within-subjects factor was pre-post VAS Body Weight Dissatisfaction, and the between-subjects factors were dichotomized mindfulness condition (mindfulness vs. silence) and dichotomized body image condition (bathing suit vs. purse). BMI, BSQ, and minority status were entered as covariates. Results indicated a significant interaction between pre-post Body Weight Dissatisfaction ratings, mindfulness condition, and body image condition, $F(1, 56) = 7.35$, $p = .009$, $\eta p^2 = .12$. Follow-up paired t-tests indicated that whereas weight dissatisfaction decreased in the Purse + Control group, $t(14) = 2.11$, $p = .05$, weight dissatisfaction increased in the Body Image + Control group, $t(14) = 2.40$, $p = .03$. However, ratings of weight dissatisfaction did not change in either the Purse + Mindfulness group ($p = .34$) or the Body Image + Mindfulness group ($p = .96$). See Figure 4.

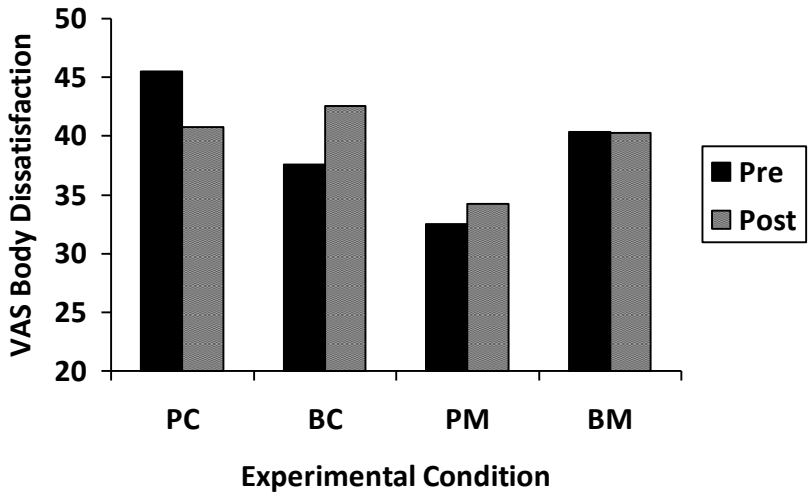

Figure 4. Levels of body dissatisfaction pre- and post- experimental manipulations.

PC = Purse + Control; BC = Body Image + Control; PM = Purse + Mindfulness; BM = Body Image + Mindfulness; VAS = Visual Analogue Scale

Next, a repeated measures mixed-model ANCOVA was conducted to examine changes in appearance dissatisfaction (VAS Appearance) from pre- to post-manipulation by experimental group. The within-subjects factor was pre-post VAS Appearance Dissatisfaction, and the between-subjects factors were dichotomized mindfulness condition (mindfulness vs. silence) and dichotomized body image condition (bathing suit vs. purse). BMI, BSQ, and minority status were entered as covariates. Results indicated a marginally significant interaction between pre-post Appearance Dissatisfaction ratings, mindfulness condition, and body image condition, $F(1,56) = 2.99$, $p = .09$, $\eta p^2 = .05$. Follow-up pairwise comparisons suggested that VAS Appearance Dissatisfaction did not change in the Purse + Control ($p = .18$), Body Image + Control ($p = .66$), or Purse + Mindfulness ($p = .85$) groups. However, ratings of appearance dissatisfaction showed a marginally significant decrease in the Body Image + Mindfulness condition, $t(17) = 1.76$, $p = .096$.

Effects of Experimental Conditions on Negative Affect and Smoking Urges

A series of repeated measures mixed-model analyses of variance (ANOVAs) multivariate analyses of variance (MANCOVAs) were used to assess the effects of the body image manipulation and mindfulness induction on negative affect (*Hypothesis 1*) and smoking urges (*Hypothesis 2*). Related dependent variables were grouped in the same analyses in order to reduce Type I error. For each of these analyses, Box's M test was used to assess homogeneity of variance, and Mahalanobis distance (D^2) was calculated to test for multivariate outliers (Tabachnick & Fidell, 2007). Follow-up ANOVAs and tests of simple effects were conducted to examine significant multivariate effects.

Repeated measures mixed-model ANCOVAs were conducted to test the effects of the body image manipulation and mindfulness induction on negative affect. Within-subjects factors were pre-post VAS Affect ratings and pre-post PANAS Negative Affect scores, and between-subjects factors were dichotomized mindfulness condition (mindfulness vs. silence) and dichotomized body image condition (bathing suit vs. purse). BSQ, FFMQ, and minority status were entered as covariates. There was a significant interaction between pre-post VAS Affect ratings, mindfulness condition, and body image condition, $F(3,55) = 3.68$, $p = .02$, $\eta p^2 = .03$. Follow-up pairwise comparisons indicated that whereas affect became more positive in the Purse + Control group, $t(14) = 3.65$, $p = .003$, affect became more negative in the Body Image + Control group, $t(14) = 2.79$, $p = .01$. Affect ratings did not change from pre- to post-manipulation in either of the mindfulness groups, ps > .71. In other words, mindfulness did not reduce the amount of negative affect that participants reported; rather, mindfulness prevented increases in negative affect associated with trying on a bathing suit. See Figure 5.

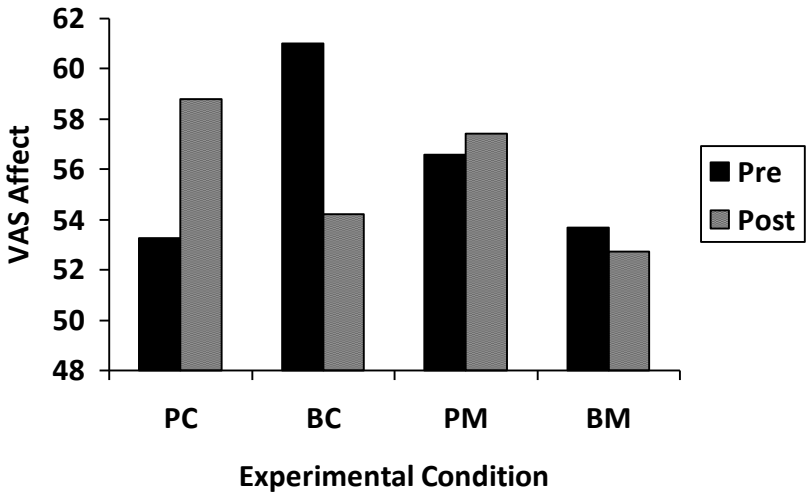

Figure 5. VAS affect ratings pre- and post- experimental manipulations.

PC = Purse + Control; BC = Body Image + Control; PM = Purse + Mindfulness; BM = Body Image + Mindfulness; VAS = Visual Analogue Scale

To test effects of experimental conditions on smoking urges, a repeated measures mixed-model MANCOVA was conducted. Within-subjects factors were pre-post measures of smoking urges (QSU-Negative Affect, QSU-Desire, and VAS urge ratings), and between-subjects factors were dichotomized mindfulness condition and dichotomized body image condition. BMI, minority status, and smoking frequency were entered as covariates. Multivariate analyses were not significant for any of the hypothesized relationships, *p*s > .40.

An ANCOVA was conducted to investigate between-group differences in when participants planned to have their next cigarette. Independent variables were mindfulness condition and body image condition. BMI, minority status, and smoking frequency were entered as covariates. Results indicated a significant interaction between mindfulness and body image, $F(1, 56) = 8.75$, $p = .005$, $\eta p^2 = .14$. Follow-up analyses predicting when participants planned to have their next cigarette indicated that among participants who observed the purse, mindfulness

did not affect when participants planned to have their next cigarette, $p = .18$. However, among participants who tried on the bathing suit, mindfulness instructions were associated with waiting longer to smoke, $t(29) = 3.07$, $p = .006$. Group means are as follows (higher scores indicate that participants plan to wait longer to have their next cigarette): Body Image + Control: $M = 1.73$ ±1.03; Purse + Mindfulness: $M = 2.00$ ±1.51; Purse + Control: $M = 2.31$ ±1.08; Body Image + Mindfulness: $M = 2.78$ ±1.48. In other words, participants who tried on the bathing suit with mindfulness instructions reported the greatest planned latency to smoke after the experiment. Whereas participants in the Body Image + Control condition indicated that they would smoke within an hour after the experiment, participants in the Body Image + Mindfulness condition indicated that they planned to smoke within 3 hours of leaving the experiment.

As a secondary analysis to provide more information about mechanisms of the effect of the mindfulness condition on increased planned latency to smoke, a mediational analysis was conducted. Specifically, this analysis tested whether increases in self-reported state mindfulness account for group differences in when participants planned their next cigarette. Baron and Kenny (1986) suggested the following steps for testing mediation: 1) Show that the initial variable (experimental mindfulness condition) predicts the outcome variable (planned latency to smoke); 2) Show that the initial variable (experimental mindfulness condition) predicts the mediator (state mindfulness); 3) Show that the mediator variable (state mindfulness) predicts the outcome variable (planned latency to smoke); and 4) Show that the relationship between mindfulness condition and planned latency to smoke is reduced when the mediator (state mindfulness) is statistically controlled.

In all of the following analyses, only participants who tried on the bathing suit were included, and BMI, minority status, smoking frequency and trait FFMQ were entered as

covariates. First, mindfulness condition predicted greater planned latency to smoke, $B = 1.10$, $t(25) = 3.10$, $p = .005$, $sr^2 = .13$. Second, mindfulness condition predicted TMS Decentering scores, $t(25) = 2.38$, $p = .03$, $sr^2 = .16$. However, mindfulness condition did not predict TMS Curiosity scores, $p = .86$. Third, TMS Decentering scores predicted greater planned latency to smoke, $t(25) = 2.18$, $p = .04$, $sr^2 = .08$. Fourth, when controlling for TMS Decentering scores, the relationship between mindfulness condition and planned latency to smoke was reduced, $B = .91$, $t(24) = 2.33$, $p = .03$, $sr^2 = .07$. The Sobel test (Sobel, 1982) was marginally significant ($z = 1.62$, $SE = .22$, $p = .10$), suggesting that TMS Decentering scores partially mediated the relationship between mindfulness and planned latency to smoke.

Effects of Experimental Conditions on Smoking Behavior

To determine effects of the body image challenge and mindfulness instructions on smoking behavior (*Hypothesis 3*; whether or not participants accept the experimenter's offer to smoke immediately), a binary logistic regression analysis was conducted. On the first step, relevant covariates (BMI, smoking rate, minority status) were entered as predictors, with smoking behavior as the dependent variable. On the second step, body image condition (dummy-coded) and mindfulness condition (dummy-coded) were entered. On the third step, the interaction term (the product of body image and mindfulness) was entered. The dependent variable was dichotomous (either the participants did or did not smoke immediately). There were no significant main effects or interaction effects, ps > .11.

Assessing Negative Affect as a Mediator between Mindfulness and Smoking Urges

To examine whether negative affect mediates the relationship between mindfulness and smoking urges (*Hypothesis 4*), I had planned to conduct a series of multiple regression analyses following Baron and Kenny's (1986) recommendations for testing mediation. However,

mindfulness did not reduce negative affect. Rather, as described above, mindfulness prevented the body image challenge from influencing affective experience. As one of Baron and Kenny's (1986) requirements for mediation is that the initial variable (mindfulness condition) predicts the mediator (reduced negative affect), this mediational analysis was not performed as planned.

Assessing Mindfulness as Moderator of Relationship between Negative Affect and Urges

To examine whether mindfulness moderates the relationship between negative affect and urges, I examined the correlations between PANAS negative affect and smoking urges (QSU-Negative Affect) in all conditions. These correlations are shown in Table 4. It was expected that for participants who received mindfulness, the relationship between negative affect and smoking urges would be lower. Indeed, the results supported this hypothesis. For participants in the control (non-mindfulness; $n = 31$) conditions, the correlation between negative affect and smoking urges for negative affect reduction was .70 ($p < .001$). However, for participants who received mindfulness instructions ($n = 33$), the correlation was .27 ($p = .13$). In order to statistically compare these two correlations, Fisher's z transformation was used (Winterbottom, 1979). Fisher's z' was calculated as: ½ [ln (1 + r) – ln (1 - r)], and the standard error of z' was calculated as: $1/\sqrt{(n-3)}$. Next, a z-statistic representing the difference between the two correlations was calculated as:

$$z = \frac{z_1' - z_2'}{\sqrt{[1/(n_1-3) + 1/(n_2-3)]}}$$

If the z-statistic is greater than 1.96, it is significant at the .05 level. Using this test, the correlations among the non-mindfulness ($r = .70$; $z' = .87$, $SE_{z'} = .19$) and mindfulness groups ($r = .27$; $z' = .28$, $SE_{z'} = .18$) were significantly different from one another, $z = 12.04$, $p < .05$).

These analyses were again performed comparing the correlations between negative affect and smoking urges only among participants who tried on the bathing suit. Among this subgroup, the correlation between negative affect and smoking urges among participants who received mindfulness instructions (n = 18) was .24 (p = .33). Among those who did not receive mindfulness instructions (n = 15), the correlation was .66 (p = .007). Using Fisher's z-transformation only among participants who tried on the bathing suit, the difference between the correlations in the mindfulness groups (r = .24; z' = .25, $SE_{z'}$ = .26) and non-mindfulness groups (r = .66; z' = .79, $SE_{z'}$ = .29) approached significance, z = 1.42.

Table 4. Pearson product-moment correlations between PANAS negative affect and smoking urges (QSU-Negative Affect) by conditions.

	PC (n = 16)	BC (n = 15)	PM (n = 15)	BM (n = 18)
r	.73**	.66**	$.43^{ns}$	$.24^{ns}$

PC = Purse + Control; BC = Body Image + Control; PM = Purse + Mindfulness; BM = Body Image + Mindfulness.
** p < .01

DISCUSSION

The results of the present study suggest that brief mindfulness instructions can change the way that female smokers respond to a body image challenge. Specifically, mindfulness prevented increases in body weight dissatisfaction and negative affect associated with trying on a bathing suit. Mindfulness did not affect participants' self-reported urges to smoke or likelihood of accepting the experimenter's offer to smoke directly after the experimental session. However, among participants who tried on a bathing suit, those who received mindfulness instructions reported that they planned to wait longer to smoke. Furthermore, mindfulness moderated the relationship between negative affect and smoking urges. Among participants who did not receive mindfulness instructions, self-reported level of negative affect was strongly associated with increased urges to smoke in order to relieve negative affect. However, among participants who were encouraged to respond mindfully, negative affect was not related to smoking urges. The results will be discussed in relation to each of the initial hypotheses.

• **Hypothesis 1**. It was expected that mindfulness would moderate the relationship between the body image challenge and negative affect. This hypothesis was supported. Mindfulness prevented increases in body dissatisfaction and negative affect associated with trying on a bathing suit. Mindfulness did not lead to lessened negative affect, but it did prevent the body image challenge from increasing negative affect. This is consistent with past research suggesting that mindfulness reduces the extent to which exposure to negatively-valenced stimuli affects emotional experience (Arch & Craske, 2006; Ortner et al., 2007). One explanation for this finding is that mindfulness prevents biased information processing related to body-image stimuli, thus reducing the likelihood that exposure to body image stimuli will increase negative affect (Stewart, 2004). However, because the present study did not employ a measure of information

processing, it is not possible to test this explanation. Future research should test participants' extent of biased information processing (e.g., using an implicit attitudes test) as well as affective experience before and after mindfulness interventions in order to test whether mindfulness prevents biased information processing and if so, whether reductions in biased information processing explain why mindfulness decreases the extent to which body image stimuli affect emotional experience.

• **Hypothesis 2**. It was expected that mindfulness would moderate the relationship between the body image challenge and smoking urges. This hypothesis was not supported using self-report measures of urges to smoke. However, this hypothesis was supported in relation to when participants planned to have their next cigarette. Among participants who tried on the bathing suit, mindfulness instructions were associated with increased planned latency to smoke. In fact, participants who tried on the bathing suit with mindfulness instructions reported the greatest latency to smoke after the experiment. Furthermore, this effect was partially mediated by self-reported state mindfulness. Thus, the effect of mindfulness condition on planned latency to smoke appears at least partially explained by increases in state mindfulness, rather than an alternative explanation (e.g., that the effects of the mindfulness condition are due to distraction rather than actual increases in mindfulness).

Furthermore, among participants who tried on the bathing suit, hearing mindfulness instructions was particularly related to higher Decentering scores (rather than Curiosity scores) on the TMS, and it was these Decentering scores that partially mediated the relationship between mindfulness condition and planned latency to smoke. It is possible that the Decentering aspect of mindfulness (i.e., observing thoughts and feelings without over-identifying with them) is particularly potent in explaining why participants who tried on a bathing suit while listening to

mindfulness instructions reported that they planned to wait longer to smoke. An example Decentering item is "I experienced myself as separate from my changing thoughts and feelings;" an example Curiosity item is "I was curious to see what my mind was up to from moment to moment." More research is needed on the functions of different aspects of mindfulness. However, it is possible that Decentering is a principle aspect of mindfulness that helps people to cope with negative emotions. Decentering is similar to the Acceptance and Commitment Therapy (ACT) concept of *cognitive defusion*, which is a way of observing thoughts as separate from oneself and not necessarily reflecting reality. According to Hayes et al. (2006), when individuals experience cognitive defusion, they tend to be less attached to their thoughts and less likely to attempt to alter their thoughts or emotions. Thus, mindfulness techniques might help people to observe their internal experiences without becoming overwhelmed by them so that they are less likely to attempt to rid themselves of negative thoughts and emotions through behaviors such as smoking.

• **Hypothesis 3**. It was expected that mindfulness would moderate the relationship between the body image challenge and smoking behavior. This was not supported; there were no effects of experimental conditions on whether or not participants accepted the experimenter's offer to smoke. This could be due to the measure of smoking behavior used in this study. Future research should investigate the effects of mindfulness on smoking behavior using more sensitive measures (e.g., smoking topography) as well as more externally valid assessments (e.g., smoking frequency during specified time periods after the mindfulness intervention). Notably, the present results regarding self-reported time to next cigarette are inconsistent with results regarding actual smoking behavior (whether or not participants accepted the experimenter's offer to smoke directly after the experiment). Reasons for this discrepancy are unclear. It could be that although

some participants planned to wait longer until smoking, they changed their plans when offered an immediately available, free-of-cost cigarette.

• **Hypothesis 4.** It was expected that negative affect would mediate the relationship between mindfulness and smoking urges. However, mindfulness did not predict lower negative affect. Rather, as described above, mindfulness prevented the body image challenge from influencing affective experience. Thus, this mediational analysis was not performed as planned.

• **Hypothesis 5**. It was expected that mindfulness would moderate the relationship between negative affect and urges, and this hypothesis was supported. Among participants who received mindfulness, the association between negative affect and smoking urges was much lower. This is consistent with Bowen and Marlatt's (2009) findings that brief mindfulness instructions reduced the association between affect and urges among college student smokers.

Implications and Future Directions

The current study is the first to experimentally investigate the effect of mindfulness on negative affect, smoking urges, and smoking behavior in response to a body image challenge. This study suggests that brief (20-minute) mindfulness instructions are potent in increasing participants' self-reported state level of mindfulness and preventing the body image challenge from increasing body dissatisfaction and negative affect. In addition, mindfulness led to increased planned latency to smoke as well as reduced association between negative affect and smoking urges. This is consistent with other studies (e.g., Arch & Craske, 2006; Bowen & Marlatt, 2009) that have shown significant effects of brief mindfulness instructions.

The present study adds to the literature on specific ways in which mindfulness affects emotional experience. These results suggest that among female smokers confronted with a body image challenge, mindfulness does not necessarily reduce negative affective experience.

However, mindfulness does lessen the extent to which body image stimuli affect emotions. It is likely that when women respond mindfully to the experience of trying on a bathing suit (i.e., focusing on their present-moment experience with an attitude of nonjudgment and acceptance), this experience is less likely to have a detrimental impact on their mood. This finding is striking given past literature suggesting that body image stimuli reliably increase negative affect among women (e.g., Lopez Khoury et al., 2009; Pinhas et al., 1999). The present study showed that brief mindfulness instructions prevented a body image challenge from increasing negative affect.

Furthermore, the present results suggest that mindfulness reduces the relationship between negative affect and smoking urges. This is particularly important given that research clearly suggests that negative affect is a common trigger for smoking urges (e.g., Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Brandon, 1994; Brandon, Wetter, & Baker, 1996; Payne, Schare, Levis, & Colletti, 1991). Mindfulness prevented this well-documented relationship between negative affect and smoking urges. By showing that mindfulness reduced the association between affect and urges, the results of the present study are consistent with Bowen and Marlatt's (2009) results.

Limitations of the present study include a relatively small sample size, homogeneous sample (i.e., primarily Caucasian college students), and a sample of light smokers. The present study should be replicated with larger sample sizes and more diverse populations (i.e., greater age ranges, varying ethnicities, non-student populations, heavier smokers). Furthermore, because the present study excluded individuals who reported extreme levels of body dissatisfaction and/or eating disorder symptoms, research should investigate the effects of mindfulness for smokers who have clinical levels of body dissatisfaction or eating disorders. The present study cannot speak to the effects of mindfulness on body image or smoking among female smokers

who have clinical levels of body dissatisfaction and other eating disorder symptoms. However, mindfulness might be helpful for these populations, given that research has shown positive effects of mindfulness-based interventions for body image dysfunction and eating disorders (e.g., Delinsky & Wilson, 2006; Kristeller et al., 2006; Wiser & Telch, 1999).

Although these results should be replicated and tested with more diverse samples, these preliminary findings lend support for the use of mindfulness strategies for helping female smokers to cope with body image stimuli. For example, mindfulness techniques might complement existing cognitive-behavioral techniques proposed by Levine et al. (2003) for working with weight-concerned smokers. Several lines of research could help to better understand and apply mindfulness strategies for female smokers. First, the mindfulness induction used in the present study should be compared with other treatments (e.g., CBT, relaxation) to compare its efficacy to other empirically supported strategies. Second, research could examine whether individual differences such as age, trait mindfulness, body image dissatisfaction, and eating disorder symptoms moderate the effects of mindfulness and cognitive-behavioral treatments for weight concerned smokers. Third, research will need to clarify the mechanisms by which mindfulness benefits weight-concerned smokers. For example, how does mindfulness affect information processing, cognitive distortions, or smoking expectancies for weight-concerned smokers? Fourth, mindfulness concepts should be integrated into existing treatments (e.g., Levine et al.'s (2003) cognitive behavioral treatment for weight concerned smokers), and long-term outcomes should be assessed.

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APPENDIX A

SCREENING SESSION QUESTIONNAIRES

Smoking Status Questionnaire (SSQ)

Smoking Stages of Change (SOC)

Body Shape Questionnaire (BSQ**)**

Eating Attitudes Test (EAT-26)

Bulimia Test – Revised (BULIT-R**)**

Multifactorial Assessment of Eating Disorders Symptoms (MAEDS**)**

Five-Factor Mindfulness Questionnaire (FFMQ**)**

Smoking Status Questionnaire

1. Age: _____
2. With which ethnic/racial group do you most identify yourself? (circle one)
   a. Caucasian
   b. African-American
   c. Asian
   d. Hispanic
   e. other

3. What is your preferred brand of cigarettes? _____
4. How concerned are you about gaining weight if you quit smoking? (circle one)

0	1	2	3	4	5
Not at all Concerned					Extremely Concerned

5. Do you smoke cigarettes every day? (circle one) YES NO
   (if YES, skip to question #8)
   (if NO, please answer only questions 6-7)

6. Did you ever smoke every day? (circle one) YES NO

   If YES: 6a. How many years did you smoke? _____
   6b. How long has it been since you stopped? _____
   6c. When you were smoking daily, how many cigarettes per day did you usually smoke? _____

7. Do you ever smoke now? (circle one) YES NO

   If YES: 7a. I smoke an average of _____ cigarettes per: (circle one)
   (enter number)
   a. week
   b. month
   c. year

8. How many years have you been smoking daily? _____

9. How many cigarettes per day do you smoke? _____

10. How soon after you wake up do you smoke your first cigarette? (circle one)
    a. Within 5 minutes
    b. 6-30 minutes
    c. 31-60 minutes
    d. After 60 minutes

11. Do you smoke more frequently during the first hours after waking than during the rest of the day? (circle one) YES NO

12. Which cigarette would you hate most to give up? (circle one)
    a. The first one in the morning
    b. All others

13. Do you find it difficult to refrain from smoking in places where it is forbidden (e.g., in church, at the library, in cinema, etc.)? (circle one) YES NO

14. Do you smoke if you are so ill that you are in bed most of the day? (circle one) YES NO

15. How many serious attempts (at least 24 hours) have you made to quit smoking? _____

SOC

Please answer the following questions regarding your smoking:

1. Are you seriously considering quitting smoking within the next 6 months?

(Circle one) YES NO

2. Are you planning to quit smoking in the next 30 days?

(Circle one) YES NO

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

(Circle one) 0 1 or more times

Clothing Sizes

Please circle the size that you typically wear in each type of clothing. Circle both the letter (XS-XXL) and number (0-18) that you currently wear most often.

1. **Shirts/Tops**:

	XS		S		M		L		XL	XXL
Women's Size	0	2	4	6	8	10	12	14	16	18

Other (e.g., petite or plus size): _____

2. **Shorts/Pants**:

	XS		S		M		L		XL	XXL
Women's Size	0	2	4	6	8	10	12	14	16	18

Other (e.g., petite or plus size): _____

3. **One-Piece Bathing Suit**:

	XS		S		M		L		XL	XXL
Women's Size	0	2	4	6	8	10	12	14	16	18

Other (e.g., petite or plus size): _____

BSQ

We would like to know how you have been feeling about your appearance over the ***PAST FOUR WEEKS***. Please read each question and circle the appropriate number to the right. Please answer all of the questions.

OVER THE PAST FOUR WEEKS:

	Never	Rarely	Sometimes	Often	Very Often	Always
1. Has feeling bored made you brood about your shape?	1	2	3	4	5	6
2. Have you been so worried about your shape that you have been feeling that you ought to diet?	1	2	3	4	5	6
3. Have you thought that your thighs, hips or bottom are too large for the rest of you?	1	2	3	4	5	6
4. Have you been afraid that you might become fat (or fatter)?	1	2	3	4	5	6
5. Have you worried about your flesh not being firm enough?	1	2	3	4	5	6

	Never	Rarely	Sometimes	Often	Very Often	Always
6. Has feeling full (e.g., after eating a large meal) made you feel fat?	1	2	3	4	5	6
7. Have you felt so bad about your shape that you have cried?	1	2	3	4	5	6
8. Have you avoided running because your flesh might wobble?	1	2	3	4	5	6
9. Has being with thin women made you feel self-conscious about your shape?	1	2	3	4	5	6
10. Have you worried about your thighs spreading out when sitting down?	1	2	3	4	5	6
11. Has eating even a small amount of food made you feel fat?	1	2	3	4	5	6

	Never	Rarely	Sometimes	Often	Very Often	Always
12. Have you noticed the shape of other women and felt that your own shape compared unfavorably?	1	2	3	4	5	6
13. Has thinking about your shape interfered with your ability to concentrate (e.g., while watching television, reading, listening to conversations)?	1	2	3	4	5	6
14. Has being naked, such as when taking a bath, made you feel fat?	1	2	3	4	5	6
15. Have you avoided wearing clothes which make you particularly aware of the shape of your body?	1	2	3	4	5	6
16. Have you imagined cutting off fleshy areas of your body?	1	2	3	4	5	6

	Never	Rarely	Sometimes	Often	Very Often	Always
17. Has eating sweets, cakes, or other high calorie food made you feel fat?	1	2	3	4	5	6
18. Have you not gone out to social occasions (e.g., parties) because you have felt bad about your shape?	1	2	3	4	5	6
19. Have you felt excessively large and rounded?	1	2	3	4	5	6
20. Have you felt ashamed of your body?	1	2	3	4	5	6
21. Has worry about your shape made you diet?	1	2	3	4	5	6
22. Have you felt happiest about your shape when your stomach has been empty (e.g., in the morning)?	1	2	3	4	5	6

	Never	Rarely	Sometimes	Often	Very Often	Always
23. Have you thought that you are the shape you are because you lack self-control?	1	2	3	4	5	6
24. Have you worried about other people seeing rolls of flesh around your waist or stomach?	1	2	3	4	5	6
25. Have you felt that it is not fair that other women are thinner than you?	1	2	3	4	5	6
26. Have you vomited in order to feel thinner?	1	2	3	4	5	6
27. Have you worried about your flesh being dimply?	1	2	3	4	5	6
28. Has seeing your reflection (e.g., in a mirror or shop window) made you feel bad about your shape?	1	2	3	4	5	6

	Never	Rarely	Sometimes	Often	Very Often	Always
29. Have you pinched areas of your body to see how much fat there is?	1	2	3	4	5	6
30. Have you avoided situations where people could see your body (e.g., communal changing rooms or swimming baths)?	1	2	3	4	5	6
31. Have you taken laxatives in order to feel thinner?	1	2	3	4	5	6
32. Have you been particularly self-conscious about your shape when in the company of other people?	1	2	3	4	5	6
33. Has worry about your shape made you feel you ought to exercise?	1	2	3	4	5	6

EAT-26

Instructions: **Please choose the response which best applies to each of the following statements.**		**Always**	**Usually**	**Often**	**Sometimes**	**Rarely**	**Never**
1.	Am terrified about being overweight.	□	□	□	□	□	□
2.	Avoid eating when I am hungry.	□	□	□	□	□	□
3.	Find myself preoccupied with food.	□	□	□	□	□	□
4.	Have gone on eating binges where I feel that I may not be able to stop.	□	□	□	□	□	□
5.	Cut my food into small pieces.	□	□	□	□	□	□
6.	Aware of the calorie content of foods that I eat.	□	□	□	□	□	□
7.	Particularly avoid foods with a high carbohydrate content (e.g., bread, rice, potatoes, etc.)	□	□	□	□	□	□
8.	Feel that others would prefer if I ate more.	□	□	□	□	□	□
9.	Vomit after I have eaten.	□	□	□	□	□	□
10.	Feel extremely guilty after eating.	□	□	□	□	□	□
11.	Am preoccupied with a desire to be thinner.	□	□	□	□	□	□
12.	Think about burning up calories when I exercise.	□	□	□	□	□	□
13.	Other people think that I am too thin.	□	□	□	□	□	□
14.	Am preoccupied with the thought of having fat on my body.	□	□	□	□	□	□
15.	Take longer than others to eat my meals.	□	□	□	□	□	□
16.	Avoid foods with sugar in them.	□	□	□	□	□	□
17.	Eat diet foods.	□	□	□	□	□	□
18.	Feel that food controls my life.	□	□	□	□	□	□

		Always	Usually	Often	Sometimes	Rarely	Never
19.	Display self-control around food.	□	□	□	□	□	□
20.	Feel that others pressure me to eat.	□	□	□	□	□	□
21.	Give too much time and thought to food.	□	□	□	□	□	□
22.	Feel uncomfortable after eating sweets.	□	□	□	□	□	□
23.	Engage in dieting behaviour.	□	□	□	□	□	□
24.	Like my stomach to be empty.	□	□	□	□	□	□
25.	Have the impulse to vomit after meals.	□	□	□	□	□	□
26.	Enjoy trying new rich foods.	□	□	□	□	□	□

BULIT-R

Answer each question by circling the appropriate number. Please respond to each item as honestly as possible; remember, all of the information you provided will be kept strictly confidential.

1. I am satisfied with my eating patterns.
    1. Agree
    2. Neutral
    3. Disagree a little
    4. Disagree
    5. Disagree strongly

2. Would you presently call yourself a "binge eater"?
    1. Yes, absolutely
    2. Yes
    3. Yes, probably
    4. Yes, possibly
    5. No, probably not

3. Do you feel you have control over the amount of food you consume?
    1. Most or all of the time
    2. A lot of the time
    3. Occasionally
    4. Rarely
    5. Never

4. I am satisfied with the shape and size of my body.
    1. Frequently or always
    2. Sometimes
    3. Occasionally
    4. Rarely
    5. Seldom or never

5. When I feel that my eating behaviour is out of control, I try to take rather extreme measures to get back on course (strict dieting, fasting, laxatives, diuretics, self-induced vomiting, or vigorous exercise).
    1. Always
    2. Almost always
    3. Frequently
    4. Sometimes
    5. Never or my eating behavior is never out of control

6. I use laxatives or suppositories to help control my weight.
    1. Once a day or more
    2. 3-6 times a week
    3. Once or twice a week
    4. 2-3 times a month
    5. Once a month or less (or never)

7. I am obsessed about the size and shape of my body.
    1. Always
    2. Almost always
    3. Frequently
    4. Sometimes
    5. Seldom or never

8. There are times when I rapidly eat a very large amount of food.
    1. More than twice a week
    2. Twice a week
    3. Once a week
    4. 2-3 times a month
    5. Once a month or less (or never)

9. How long have you been binge eating (eating uncontrollably to the point of stuffing yourself)?
    1. Not applicable; I don't binge eat
    2. Less than 3 months
    3. 3 months to 1 year
    4. 1-3 years
    5. 3 or more years

10. Most people I know would be amazed if they knew how much food I can consume at one sitting.
    1. Without a doubt
    2. Very probably
    3. Probably
    4. Possibly
    5. No

11. I exercise in order to burn calories.
    1. More than two hours per day
    2. About two hours per day
    3. More than 1 but less than 2 hours per day
    4. One hour or less per day
    5. I exercise but not to burn calories or I don't exercise

12. Compared with women your age, how preoccupied are you about your weight and body shape?
    1. A great deal more than average
    2. Much more than average
    3. More than average
    4. A little more than average
    5. Average or less than average

13. I am afraid to eat anything for fear that I won't be able to stop.
    1. Always
    2. Almost always
    3. Frequently
    4. Sometimes
    5. Seldom or never

14. I feel tormented by the idea that I am fat or might gain weight.
    1. Always
    2. Almost Always
    3. Frequently
    4. Sometimes
    5. Seldom or never

15. How often do you intentionally vomit after eating?
    1. 2 or more times a week
    2. Once a week
    3. 2-3 times a month
    4. Once a month
    5. Less than once a month or never

16. I eat a lot of food when I'm not even hungry.
    1. Very frequently
    2. Frequently
    3. Occasionally
    4. Sometimes
    5. Seldom or never

17. My eating patterns are different from the eating patterns of most people.
    1. Always
    2. Almost always
    3. Frequently
    4. Sometimes
    5. Seldom or never

18. After I binge eat I turn to one of several strict methods to try to keep from gaining weight (vigorous exercise, strict dieting, fasting, self-induced vomiting, laxatives, or diuretics).
    1. Never or I don't binge eat
    2. Rarely
    3. Occasionally
    4. A lot of the time
    5. Most or all of the time

19. I have tried to lose weight by fasting or going on strict diets.
    1. Not in the past year
    2. Once in the past year
    3. 2-3 times in the past year
    4. 4-5 times in the past year
    5. More than 5 times in the past year

20. I exercise vigorously and for long periods of time in order to burn calories.
    1. Average or less than average
    2. A little more than average
    3. More than average
    4. Much more than average
    5. A great deal more than average

21. When engaged in an eating binge, I tend to eat foods that are high in carbohydrates (sweets and starches).
    1. Always
    2. Almost always
    3. Frequently
    4. Sometimes
    5. Seldom or I don't binge

22. Compared to most people, my ability to control my eating behavior seems to be:
    1. Greater than others' ability
    2. About the same
    3. Less
    4. Much less
    5. I have absolutely no control

23. I would presently label myself a "compulsive eater" (one who engages in episodes of uncontrolled eating).
    1. Absolutely
    2. Yes
    3. Yes, probably
    4. Yes, possibly
    5. No, probably not

24. I hate the way my body looks after I eat too much.
    1. Seldom or never
    2. Sometimes
    3. Frequently
    4. Almost Always
    5. Always

25. When I am trying to keep from gaining weight, I feel that I have to resort to vigorous exercise, strict dieting, fasting, self-induced vomiting, laxatives, or diuretics.
    1. Never
    2. Rarely
    3. Occasionally
    4. A lot of the time
    5. Most or all of the time

26. Do you believe that it is easier for you to vomit than it is for most people?
    1. Yes, it's no problem at all for me
    2. Yes, it's easier
    3. Yes, it's a little easier
    4. About the same
    5. No, it's less easy

27. I use diuretics (water pills) to help control my weight.
    1. Never
    2. Seldom
    3. Sometimes
    4. Frequently
    5. Very frequently

28. I feel that food controls my life.
    1. Always
    2. Almost always
    3. Frequently
    4. Sometimes
    5. Seldom or never

29. I try to control my weight by eating little or no food for a day or longer.
    1. Never
    2. Seldom
    3. Sometimes
    4. Frequently
    5. Very frequently

30. When consuming a large quantity of food, at what rate of speed do you usually eat?
    1. More rapidly than most people have ever eaten in their lives
    2. A lot more rapidly than most people
    3. A little more rapidly than most people
    4. About the same rate as most people
    5. More slowly than most people (or not applicable)

31. I use laxatives or suppositories to help control my weight.
    1. Never
    2. Seldom
    3. Sometimes
    4. Frequently
    5. Very frequently

32. Right after I binge eat I feel:
    1. So fat and bloated I can't stand it
    2. Extremely fat
    3. Fat
    4. A little fat
    5. OK about how my body looks or I never binge eat

33. Compared to other people of my sex, my ability to always feel in control of how much I eat is:
    1. About the same or greater
    2. A little less
    3. Less
    4. Much less
    5. A great deal less

34. In the last 3 months, on the average how often did you binge eat (eat uncontrollably to the point of stuffing yourself)?
    1. Once a month or less (or never)
    2. 2-3 times a month
    3. Once a week
    4. Twice a week
    5. More than twice a week

35. Most people I know would be surprised at how fat I look after I eat a lot of food.
    1. Yes, definitely
    2. Yes
    3. Yes, probably
    4. Yes, possibly
    5. No, probably not or I never eat a lot of food

36. I use diuretics (water pills) to help control my weight.
    1. 3 times a week or more
    2. Once or twice a week
    3. 2-3 times a month
    4. Once a month
    5. Never

MAEDS

Name: _____ Date: _____

Instructions: Using the scale below, please rate the following items on a scale from 1 to 7. Please answer as truthfully as possible.

1 = Never
2 = Very Rarely
3 = Rarely
4 = Sometimes
5 = Often
6 = Very Often
7 = Always

1----------2----------3----------4----------5----------6----------7

NEVER	VERY RARELY	RARELY	SOMETIMES	OFTEN	VERY OFTEN	ALWAYS

1. Fasting is a good way to lose weight.
   1 2 3 4 5 6 7

2. My sleep isn't as good as it used to be.
   1 2 3 4 5 6 7

3. I avoid eating for as long as I can.
   1 2 3 4 5 6 7

4. Certain foods are "forbidden" for me to eat.
   1 2 3 4 5 6 7

5. I can't keep certain foods in my house because I will binge on them.
   1 2 3 4 5 6 7

6. I can easily make myself vomit.
   1 2 3 4 5 6 7

7. I feel that being fat is terrible.
   1 2 3 4 5 6 7

8. I avoid greasy foods.
   1 2 3 4 5 6 7

9. It's okay to binge and purge once in a while.
   1 2 3 4 5 6 7

10. I don't eat certain foods.
    1 2 3 4 5 6 7

11. I think I am a good person.
    1 2 3 4 5 6 7

12. My eating is normal.
    1 2 3 4 5 6 7

13. I can't seen to concentrate lately.
    1 2 3 4 5 6 7

14. I try to diet by fasting.
    1 2 3 4 5 6 7

1----------2----------3----------4----------5----------6----------7
NEVER VERY RARELY RARELY SOMETIMES OFTEN VERY OFTEN ALWAYS

15. I vomit to control my weight.
1 2 3 4 5 6 7

16. Lately nothing seems enjoyable anymore.
1 2 3 4 5 6 7

17. Laxatives help keep you slim.
1 2 3 4 5 6 7

18. I don't eat red meat.
1 2 3 4 5 6 7

19. I eat so rapidly I can't even taste my food.
1 2 3 4 5 6 7

20. I do everything I can to avoid being overweight.
1 2 3 4 5 6 7

21. When I feel bloated, I must do something to rid myself of that feeling.
1 2 3 4 5 6 7

22. I overeat too frequently.
1 2 3 4 5 6 7

23. It's okay to be overweight.
1 2 3 4 5 6 7

24. Recently I have felt that I am a worthless person.
1 2 3 4 5 6 7

25. I would be very upset if I gained 2 pounds.
1 2 3 4 5 6 7

26. I crave sweets and carbohydrates.
1 2 3 4 5 6 7

27. I lose control when I eat.
1 2 3 4 5 6 7

28. Being fat would be terrible
1 2 3 4 5 6 7

1----------2----------3----------4----------5----------6----------7
NEVER VERY RARELY SOMETIMES OFTEN VERY ALWAYS
RARELY OFTEN

29. I have thought seriously about suicide lately.
1 2 3 4 5 6 7

30. I don't have any energy anymore.
1 2 3 4 5 6 7

31. I eat small portions to control my weight.
1 2 3 4 5 6 7

32. I eat 3 meals a day.
1 2 3 4 5 6 7

33. Lately I have been easily irritated.
1 2 3 4 5 6 7

34. Some foods should be totally avoided.
1 2 3 4 5 6 7

35. I use laxatives to control my weight.
1 2 3 4 5 6 7

36. I am terrified by the thought of being overweight.
1 2 3 4 5 6 7

37. Purging is a good way to lose weight.
1 2 3 4 5 6 7

38. I avoid fatty foods.
1 2 3 4 5 6 7

39. Recently I have felt pretty blue.
1 2 3 4 5 6 7

40. I am obsessed with becoming overweight.
1 2 3 4 5 6 7

41. I don't eat fried foods.
1 2 3 4 5 6 7

42. I skip meals.
1 2 3 4 5 6 7

1----------2----------3----------4----------5----------6----------7
NEVER VERY RARELY SOMETIMES OFTEN VERY ALWAYS
RARELY OFTEN

43. Fat people are unhappy.
1 2 3 4 5 6 7

44. People are too concerned with the way I eat.
1 2 3 4 5 6 7

45. I feel good when I skip meals.
1 2 3 4 5 6 7

46. I avoid foods with sugar.
1 2 3 4 5 6 7

47. I hate it when I feel fat.
1 2 3 4 5 6 7

48. I am too fat.
1 2 3 4 5 6 7

49. I eat until I am completely stuffed.
1 2 3 4 5 6 7

50. I hate to eat.
1 2 3 4 5 6 7

51. I feel guilty about a lot of things these days.
1 2 3 4 5 6 7

52. I'm very careful of what I eat.
1 2 3 4 5 6 7

53. I can "hold off" and not eat even if I am hungry.
1 2 3 4 5 6 7

54. I eat even when I am not hungry.
1 2 3 4 5 6 7

55. Fat people are disgusting.
1 2 3 4 5 6 7

56. I wouldn't mind gaining a few pounds.
1 2 3 4 5 6 7

FFMQ

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
never or very rarely true	rarely true	sometimes true	often true	very often or always true

_____ 1. When I'm walking, I deliberately notice the sensations of my body moving.

_____ 2. I'm good at finding words to describe my feelings.

_____ 3. I criticize myself for having irrational or inappropriate emotions.

_____ 4. I perceive my feelings and emotions without having to react to them.

_____ 5. When I do things, my mind wanders off and I'm easily distracted.

_____ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.

_____ 7. I can easily put my beliefs, opinions, and expectations into words.

_____ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.

_____ 9. I watch my feelings without getting lost in them.

_____ 10. I tell myself I shouldn't be feeling the way I'm feeling.

_____ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.

_____ 12. It's hard for me to find the words to describe what I'm thinking.

_____ 13. I am easily distracted.

_____ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

_____ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.

_____ 16. I have trouble thinking of the right words to express how I feel about things

_____ 17. I make judgments about whether my thoughts are good or bad.

_____ 18. I find it difficult to stay focused on what's happening in the present.

_____ 19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.

1	2	3	4	5
never or very rarely true	rarely true	sometimes true	often true	very often or always true

_____ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.

_____ 21. In difficult situations, I can pause without immediately reacting.

_____ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

_____ 23. It seems I am "running on automatic" without much awareness of what I'm doing.

_____24. When I have distressing thoughts or images, I feel calm soon after.

_____ 25. I tell myself that I shouldn't be thinking the way I'm thinking.

_____ 26. I notice the smells and aromas of things.

_____ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.

_____ 28. I rush through activities without being really attentive to them.

_____ 29. When I have distressing thoughts or images I am able just to notice them without reacting.

_____ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.

_____ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

_____ 32. My natural tendency is to put my experiences into words.

_____ 33. When I have distressing thoughts or images, I just notice them and let them go.

_____ 34. I do jobs or tasks automatically without being aware of what I'm doing.

_____ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

_____ 36. I pay attention to how my emotions affect my thoughts and behavior.

_____ 37. I can usually describe how I feel at the moment in considerable detail.

_____ 38. I find myself doing things without paying attention.

_____ 39. I disapprove of myself when I have irrational ideas.

APPENDIX B

PRE-MANIPULATION QUESTIONNAIRES

Questionnaire of Smoking Urges – Brief (QSU-brief**)**

Visual Analogue Scales (VAS)

Positive and Negative Affect Schedule (PANAS**)**

Toronto Mindfulness Scale (TMS**)**

QSU-Brief

Please respond to each statement using a lOO-point scale, ranging from strongly disagree to strongly agree. Write your response (a number between 0 and 100) in each blank using the scale below:

0 100
Strongly Disagree Strongly Agree

_____ 1.1 have a desire for a cigarette right now.

_____ 2. Nothing would be better than smoking a cigarette right now.

_____ 3. if it were possible, I probably would smoke now.

_____ 4. I could control things better right now if I could smoke.

_____ 5. All I want right now is a cigarette.

_____ 6. I have an urge for a cigarette.

_____ 7. A cigarette would taste good now.

_____ 8. I would do almost anything for a cigarette now.

_____ 9. Smoking would make me less depressed.

_____ 10. I am going to smoke as soon as possible.

Visual Analogue Scales

Please place a mark on each line to show how you feel at this exact moment.

Level of Excitement

_____

Not Excited Very Excited

Affect

_____

Very Sad Very Happy

Feelings about Your Body Weight

_____

Very Good/Satisfied With Body Weight Very Bad/Dissatisfied With Body Weight

Interest Level

_____

Very Low Interest Very High Interest

Urge to Smoke

_____

Very Low Urge Very High Urge

Feelings about Your Overall Physical Appearance

_____

Very Good/ Satisfied With Appearance Very Bad/ Dissatisfied With Appearance

Boredom

_____

Not at All Bored Very Bored

PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way *right now*, that is, *at the present moment*. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested	_____ irritable
_____ distressed	_____ alert
_____ excited	_____ ashamed
_____ upset	_____ inspired
_____ strong	_____ nervous
_____ guilty	_____ determined
_____ scared	_____ attentive
_____ hostile	_____ jittery
_____ enthusiastic	_____ active
_____ proud	_____ afraid

TMS

Instructions: We are interested in what you just experienced. Below is a list of things that people sometimes experience. Please read each statement and indicate the extent to which you agree with each statement using the following scale. In other words, how well does the statement describe what you just experienced, just now? Write your response (0, 1, 2, 3, or 4) in the blank provided by each item.

0	1	2	3	4
Not at all	**A little**	**Moderately**	**Quite a bit**	**Very much**

_____ 1. I experienced myself as separate from my changing thoughts and feelings.

_____ 2. I was more concerned with being open to my experiences than controlling or changing them.

_____ 3. I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings or sensations.

_____ 4. I experienced my thoughts more as events in my mind than as a necessarily accurate reflection of the way things 'really' are.

_____ 5. I was curious to see what my mind was up to from moment to moment.

_____ 6. I was curious about each of the thoughts and feelings that I was having.

_____ 7. I was receptive to observing unpleasant thoughts and feelings without interfering with them.

_____ 8. I was more invested in just watching my experiences as they arose, than in figuring out what they could mean.

_____ 9. I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant.

_____ 10. I remained curious about the nature of each experience as it arose.

_____ 11. I was aware of my thoughts and feelings without overidentifying with them.

_____ 12. I was curious about my reactions to things.

_____ 13. I was curious about what I might learn about myself by just taking notice of what my attention gets drawn to.

APPENDIX C

MINDFULNESS INSTRUCTIONS

Adapted from Delinsky and Wilson (2006), Kabat-Zinn (1994, 2002), Baer et al. (2006), and Lau et al. (2006).

<u>Tape 1</u> (Before trying on bathing suit or observing purse)

While sitting down in your chair, place your feet flat on the floor. Sit up straight. Relax your shoulders, relax your neck, and place your hands in your lap or on your knees. As you settle into a comfortable position, commit yourself to simply being fully awake, fully present for these next few moments. If you feel comfortable with it, gently close your eyes. Otherwise, just look toward the floor.

Focus on tuning into the feeling of the breath moving in and out of your body. Focus on the sensation of the breath moving through your nose on each inbreath and each outbreath. Allow yourself to just be here in this moment, following the breath as it comes in and as it goes out. Just breathe and let go. Breathe and let be.

Naturally your mind may wander off into thoughts of one kind or another. Take note of any thoughts as they come up. Note what's on your mind and how your body is feeling. Acknowledge these thoughts, whatever they are, without judging or evaluating them. And then just gently let them go. Bring your attention back to the breath, focusing on the feeling of the breath coming in and out of your nostrils.

And each time you notice that your mind has gone off somewhere else, wherever that may be, just bring your attention back to the feeling of the breath. And if the mind wanders off a thousand times, you simply bring it back a thousand times, intentionally cultivating an attitude of patience and gentleness towards yourself. This means choosing as best you can not to react to or judge any of your thoughts or feelings, impulses or perceptions, reminding yourself instead that absolutely anything that comes into the field of awareness is ok. We simply sit with it and breathe with it and observe it, staying open and awake in the present moment, right here, right now, a continual process of seeing and letting be, seeing and letting go, rejecting nothing, pursuing nothing, dwelling in stillness and in calmness as the breath moves in and out.

If you'd like, commit yourself to bringing this attitude of attention and acceptance with you throughout your day, being fully aware in the present moment, noticing any thoughts or feelings that may arise, without judging them – just being right here and right now, accepting the present moment, and accepting yourself, no matter what happens. Remember that you can always bring your focus back to your breath, back to the sensations of the present moment, to cultivate this sense of attention and acceptance.

<u>Tape 2</u> (While Trying on Bathing Suit)

Now, as you start to look at yourself in the mirror, first pay attention to your breathing, to your body, whether you muscles are tensed or relaxed. Keep your eyes open, noticing all the sensations you feel right now, remaining fully awake in this present moment. Notice what you see, what you hear, and what you feel. Notice all of these sensations, becoming fully aware of them, observing them and accepting them. No need to judge them or try to change them, just accept that they are there. Abandon all ideas of getting somewhere or having anything happen. Just let yourself be right here, right now, observing and accepting this present moment.

Observe your body in the mirror. Rather than focusing on particular parts, focus on what you see as a whole. As you observe your body in the mirror, mentally describe to yourself what you see, from your head down to your toes. Make your goal be to not to use any evaluative, critical or judging words. Just observe and describe what you see with descriptive adjectives that do not represent "good" or "bad" labels, just noticing what is there. Notice the colors that you see. You may also notice proportions and shapes. Observe all of this and describe it to yourself in the most factual/objective way possible, without evaluating, labeling, or judging. Try not to dwell on any particular parts of features; rather, give equal attention to everything you see to the best of your ability.

Focus again on tuning into the feeling of the breath moving in and out of your nose. Allow yourself to just be here in this moment, following the breath as it comes in and as it goes out. Just breathe and let go. Breathe and let be. Notice any thoughts that may come up, and simply observe them. Whether they are thoughts of the past or of the future, whether they have strong feelings associated with them or not, observe them without either pushing them away or pursuing them. Bring your focus back to your present experience, noting your breath as it comes through your nose, noticing what you see in the mirror, and noting any physical sensations you may feel. Try to do this with an attitude of acceptance, without judging your thoughts or feelings or anything about your experience - just being fully aware of what is happening and letting it be. Notice that thoughts are just thoughts that come and go. They are not reality, so no need to react to them or judge them. Just observe them and let them pass.

Now, mentally describe to yourself what you see in the mirror again, this time from your toes up to your head. Again, make sure not to use any evaluative, critical or judging words. Just observe and describe what you see in the most factual way possible, accepting your present experience for what it is. Bring your focus back to your breath, to the feeling of air entering and leaving your nostrils.

Watch your thoughts and feelings, acknowledging them without becoming overwhelmed by them. Notice them and let them go. There's no need to judge them or to react. Just let them go, coming back to focus on your breath. As you dwell here in stillness and calmness, giving full care and attention to each moment, simply here, riding the waves of your own breathing, moment by moment, breath by breath.

Now try to commit yourself to bringing this attitude of attention and acceptance with you throughout your day, being fully aware in the present moment, noticing any thoughts or feelings that may arise, without judging them – just being right here and right now, accepting the present moment, and accepting yourself, no matter what happens. Remember that you can always bring your focus back to your breath, back to the sensations of the present moment, to cultivate this sense of attention and acceptance.

<u>Tape 2</u> (While Observing Purse)

Now, as you start to look at the purse, first pay attention to your breathing, to your body, whether you muscles are tensed or relaxed. Keep your eyes open, noticing all the sensations you feel right now, remaining fully awake in this present moment. Notice what you see, what you hear, and what you feel. Notice all of these sensations, becoming fully aware of them, observing them and accepting them. No need to judge them or try to change them, just accept that they are there. Abandon all ideas of getting somewhere or having anything happen. Just let yourself be right here, right now, observing and accepting this present moment.

Observe the purse. Rather than focusing on particular parts, focus on what you see as a whole. Mentally describe to yourself what you see, from the top of the handles down to the bottom of the purse. Make your goal be to not to use any evaluative, critical or judging words. Just observe and describe what you see with descriptive adjectives that do not represent "good" or "bad" labels, just noticing what is there. Notice the colors that you see. You may also notice proportions and shapes. Observe all of this and describe it to yourself in the most factual/objective way possible, without evaluating, labeling, or judging. Try not to dwell on any particular parts of features; rather, give equal attention to everything you see to the best of your ability.

Focus again on tuning into the feeling of the breath moving in and out of your nose. Allow yourself to just be here in this moment, following the breath as it comes in and as it goes out. Just breathe and let go. Breathe and let be. Notice any thoughts that may come up, and simply observe them. Whether they are thoughts of the past or of the future, whether they have strong feelings associated with them or not, observe them without either pushing them away or pursuing them. Bring your focus back to your present experience, noting your breath as it comes through your nose, noticing the purse that you're observing, and noting any physical sensations you may feel. Try to do this with an attitude of acceptance, without judging your thoughts or feelings or anything about your experience - just being fully aware of what is happening and letting it be. Notice that thoughts are just thoughts that come and go. They are not reality, so no need to react to them or judge them. Just observe them and let them pass.

Now, mentally describe the purse to yourself again, this time from the bottom of the purse to the top of the handles. Again, make sure not to use any evaluative, critical or judging words. Just observe and describe what you see in the most factual way possible, accepting your present experience for what it is. Bring your focus back to your breath, to the feeling of air entering and leaving your nostrils.

Watch your thoughts and feelings, acknowledging them without becoming overwhelmed by them. Notice them and let them go. There's no need to judge them or to react. Just let them go, coming back to focus on your breath. As you dwell here in stillness and calmness, giving full care and attention to each moment, simply here, riding the waves of your own breathing, moment by moment, breath by breath.

Now try to commit yourself to bringing this attitude of attention and acceptance with you throughout your day, being fully aware in the present moment, noticing any thoughts or feelings that may arise, without judging them – just being right here and right now, accepting the present moment, and accepting yourself, no matter what happens. Remember that you can always bring your focus back to your breath, back to the sensations of the present moment, to cultivate this sense of attention and acceptance.

APPENDIX D

POST-MANIPULATION QUESTIONNAIRES

Product Ratings

Experimenter-Administered Interview

Product Ratings

We would like to know your opinions about the product you just evaluated.
What type of product did you evaluate? _____
What color was it? _____

Please respond to each statement using a lOO-point scale, ranging from strongly dislike to strongly like, to rate different aspects of the product. Write your response (a number between 0 and 100) in each blank using the scale below:

0 100
Strongly Dislike Strongly Like

_____ 1. Quality

_____ 2. Color

_____ 3. Material/Fabric

_____ 4. Size

_____ 5. Shape

_____ 6. Overall rating

How likely would you be to buy this product? (Circle one)

Not at all Likely	Somewhat Likely	Very Likely	Extremely Likely

How much would you be willing to pay for this product? (Circle one)

Less than $5 $5-15 $15-30 $30-45 $35-45 $45-60 $60-75 Over $75

Please write any other comments you have about the product below:

Experimenter-Administered Interview

"Overall, what did you think of the product?" (record participant's response verbatim)

"When do you plan to have your next cigarette?" (record participant's response verbatim)

*For this question, also code response from 1 to 5 (ask participant if unsure). Circle one:

1= within 15 minutes of leaving the experiment

2= between 15 minutes and 1 hour after leaving the experiment

3= between 1 and 3 hours after leaving the experiment

4= later today, 3 + hours after leaving the experiment

5= tomorrow or later

VITA

Claire Elizabeth Adams was born in Atlanta, Georgia. She earned her Bachelor of Science degree in psychology and French from Furman University in 2004. She later earned a Master of Arts degree in psychology from Wake Forest University in 2006 under the supervision of Mark R. Leary, Ph.D. She completed an APA accredited internship in clinical psychology, with specialization in behavioral medicine, in June 2011 at the University of Mississippi Medical Center and G.V. (Sonny) Montgomery Veterans Affairs Medical Center in Jackson, Mississippi. She will begin a postdoctoral fellowship at the University of Texas M.D. Anderson Cancer Center in August 2011. Her primary clinical and research interests include health psychology, tobacco use and cessation, weight management, and mindfulness-based treatments.