

**BODY IMAGE CONCERNS AND URGE TO SMOKE AMONG PHYSICALLY ACTIVE
AND SEDENTARY COLLEGE-AGE FEMALES**

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ABSTRACT

Body Image Concerns and Urge to Smoke among Physically Active and Sedentary

College-Age Females

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Introduction: Smoking is often used as a maladaptive weight control strategy among college-age females who have increased weight concerns. Many perceived benefits accrued from smoking including enhanced mood, reduced anxiety, and weight control can also be achieved through physical activity. The purpose of this study was to examine the effects of a novel behavioral task (body-image exposure task) that was designed to elicit weight concerns on urge to smoke among college-age female smokers who vary in levels of physical activity. **Methods:** Using a cue-reactivity paradigm, 16 sedentary and 21 physically active college-age female smokers were exposed to a pilot tested body-image exposure session. Self-reported urge and smoking topography variables were obtained before and after the exposure session along with measures of body dissatisfaction, positive and negative affect, and physical-appearance related anxiety at the two time-points. **Results:** Paired sample t-test showed significant increases in self-reported urge ($p < .01$) and quicker latency to first puff ($p < .01$) at post test for the entire sample. Significant differences were not seen in the other topography variables of puff duration, puff number, and inter-puff interval. Results of partial

correlation indicated lower self-reported urge at post-test was associated with increased time engaging vigorous intensity physical activity ($r = -0.44$; $p = .01$). However, association between latency to first puff and physical activity was not significant ($r = -.10$; $p = .62$). The body-image exposure session also significantly increased body dissatisfaction ($p < .01$), and anxiety related to physical appearance ($p < .01$) while lowering positive affect at post-test ($p < .01$). Baseline measures of depressive symptoms were significantly associated with increased self-reported urge at post-test ($r = .59$, $p = .03$) urge though this relationship was not significant after controlling for vigorous intensity of physical activity ($r = .33$; $p = .07$) showing the potential protective effects of physical activity on smoking urges.

Conclusion: These results suggest that physical activity can be protective of smoking urges in a situation that increases weight concerns among young women and emphasizes the need to incorporate physical activity components along with cognitive behavioral therapy in tailoring smoking cessation interventions in this population. Future research should continue to explore effects of physical activity on reactivity to body-cues and explore variability in cue-reactivity as a result of physical activity.

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CHAPTER 1

INTRODUCTION

Population rates of cigarette smoking have declined in many industrialized nations over the past 20 years (USDHHS, 2004) but this trend is not seen in all groups of smokers. Smoking prevalence has stabilized in young women and even increased among teenage girls (Becher et al., 2001). This trend is concerning because cigarette smoking is the leading preventable cause of death worldwide (Fiore et al., 2000). As women suffer a greater proportion of mortality and morbidity rate of tobacco-related illnesses as compared to men (Bertone-Johnson, Hankinson, Johnson, & Manson, 2008; Downs et al., 2005; Haskins et al., 2008; C. F. Robinson, Sullivan, Li, & Walker, 2010), improving interventions for smoking cessation among girls and women could help in reducing the overall health burden of smoking in society.

One reason for the increased smoking rates among young women is a greater concern about body shape and weight in this population and the widely held belief that smoking can be used as an effective although maladaptive weight control strategy (Alberg, Carter, & Carpenter, 2007; Cavallo et al., 2010; White, McKee, & O'Malley S, 2007). Women are more likely to attribute smoking behavior to reasons of weight control, weight loss, and fear of weight-gain (Levine, Perkins, & Marcus, 2001; Meyers et al., 1997). Weight and body concerns have been implicated in smoking initiation (Stice & Shaw, 2003), maintenance of smoking behavior (Levine et al., 2001; Ward, Klesges, Zbikowski, Bliss, & Garvey, 1997), lower abstinence rates (Clark et al., 2006; Pisinger & Jorgensen, 2007), and high attrition in treatment programs (Copeland, Martin,

Geiselman, Rash, & Kendzor, 2006) among women. Furthermore, among other reasons for relapse such as dependence, negative affect, or stress, young women may be less likely to give up smoking once they have started due to fear of weight gain upon cessation (Pomerleau, Zucker, & Stewart, 2001; Twardella et al., 2006). These findings coupled with a recent increase in smoking rates among women between 18-25 years (CDC, 2002), and greater body image and weight concerns in this population (Vohs, Heatherton, & Hernin, 2001) fuel the need to further understand the relationships between weight concerns and body dissatisfaction and smoking behavior in this age group.

Theories of Nicotine Addiction

Nicotine addiction has often been explained through learning and conditioning theories with the primary objective being to understand mechanisms responsible for the acquisition of addictive behavior. The Expectancy Theory, developed by cognitive learning theorists, posits that experience of Pavlovian contingencies between stimuli and reinforcers gives rise to the knowledge of the predictive relationships between these events (Bolles, 1972; Brandon, Herzog, Irvin, & Gwaltney, 2004; G. A. Marlatt, 1985). This enables the stimuli to elicit an expectancy of the associated reinforcer. For instance, studies that have induced negative affect among smokers show an increase in both self-reported cravings as well as quickened latency to smoke (Conklin & Perkins, 2005) primarily because smokers expect relief from negative affect as a function of smoking (Brandon, 1994; Copeland, Brandon, & Quinn, 1995). Thus the Expectancy

Theory proposes that the expectancy of a reinforcer elicited by the stimulus leads to learning of behavior that produces that reinforcer (Holland, 2004).

A behavior that has shown to have similar reinforcing properties as smoking is physical activity. In the framework of the Expectancy Theory, regular exercisers may engage in physical activity because they believe in its positive consequences (Conn, Burks, Pomeroy, Ulbrich, & Cochran, 2003; Smith & Biddle, 1999; Symons-Downs & Hausenblas, 2004) and could expect gaining its desired effects. The perceived effects of smoking as a mood enhancer, weight control tool, and as a stress reduction technique are benefits can also achieved by participating in physical activity (Audrain-McGovern, Rodriguez, & Moss, 2003; Byrne & Byrne, 1993; Grilo, Brownell, & Stunkard, 1993).

Research shows that sedentary smokers who engaged in moderate intensity exercise (in short bouts of 5 to 10 minutes) report a reduction in desire to smoke, stress, tension, and improved concentration (Daniel, Cropley, Ussher, & West, 2004; Ussher, Nunziata, Cropley, & West, 2001). Exercise also plays a protective role in smoking cessation by reducing intensity of nicotine withdrawal symptoms (Daniel et al., 2004), preventing weight-gain, combating feelings of anxiety associated with weight gain (Bock, Marcus, King, Borrelli, & Roberts, 1999). Exercise also helps alleviating symptoms of anxiety (Broman-Fulks & Storey, 2008; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991), which has consistently been shown to be associated with continued cigarette use (Juliano & Brandon, 2002).

Significance of Study

Using the Expectancy Theory as a framework to understand smoking behaviors among weight concerned smokers, the associative learning between weight concerns and smoking is a result of one's experience that smoking can alleviate these concerns. However, it remains to be seen how more physically active weight-concerned smokers who have experienced the effects of exercise (i.e., enhanced mood, reduced anxiety) react to situations where their body image concerns are augmented as compared to those who are not physically active. Studies have yet to assess the effects of physical activity status (regular exercisers vs. being sedentary) on the urge to smoke among daily smokers. There is also a distinct absence of studies that examine how situational changes to body and weight concerns through exposure to one's own mirror image can influence affective reactions (such as anxiety and negative affect) among females who already have high weight concerns and the influence of these reactions on the urge to smoke.

This study was designed to address the gaps in literature mentioned above using a novel experimental behavioral task to better examine hypothesized causal relationships between weight concerns and maintenance of smoking behavior. The study examined, for the first time, the effect of eliciting situational changes to body and weight concerns on the urge to smoke (as measured via smoking topography and self-report) among college-age female smokers who are sedentary as compared to those who are physically active all of whom have high smoking-related weight concerns. The rationale was that heightened exposure to one's own body may induce cognitive

changes and negative feelings associated with the body (Hilbert, Tuschen-Caffier, & Vogele, 2002). By eliciting affective reactions related to body image concerns and using smoking topography as a measure of urge to smoke, this research paradigm provides strong internal validity for examining potential relationships between body image concerns and smoking behaviors among weight concerned smokers. This study also attempted to delineate the protective effects of physical activity and provide pilot data for future studies that intend to further examine how physical activity moderates both the urge to smoke and smoking behavior among weight concerned female smokers.

Problem Statement

The study assessed the effects of affective reactions induced from a body image challenging stimulus using a mirror-exposure task on the urge to smoke among weight concerned females who vary in levels of physical activity. The study had two aims. The first aim was to assess how college age-female smokers with high weight concerns respond to a novel experimental behavioral task that elicits body image concerns. The second aim was to observe if physical activity plays a protective role in the relationship between body image concerns and urge to smoke. A secondary aim of the study was to observe changes in body image anxiety and negative affect and examine their influence on smoking urges.

Hypotheses

The following hypotheses were proposed for the study:

Specific Aim 1. To assess the effects of an experimental behavioral task that elicits body image concerns on urge to smoke among weight concerned college-age female smokers.

Hypothesis 1. Exposure to the body-image exposure session will lead to a greater urge to smoke as measured by self-report and smoking topography-derived latency to first puff, number of puffs, puff duration, and inter-puff interval.

Specific Aim 2. To assess if physical activity influences the relationship between body image concerns and urge to smoke.

Hypothesis 2. Weight concerned female smokers who are physically active will have fewer urges to smoke than those who are sedentary as measured by self-report and smoking topography-derived latency to first puff, number of puffs, puff duration, and inter-puff interval.

Secondary Aims. To examine changes in body dissatisfaction, affect, and anxiety related to body image before and after body-image exposure session and examine associations between baseline anxiety and depressive symptoms and urge to smoke after the exposure session.

Hypothesis 3. Completing the body-image exposure session will lead to increases in body dissatisfaction, positive and negative affect and physical appearance related anxiety as measured by the BISS (Body Image State Scale), PANAS (Positive and Negative Affect Schedule) and PASTAS (Physical Appearance State and Trait Anxiety-State scale) respectively.

Hypothesis 4. Anxiety and depression as measured by the HADS (Hospital Anxiety and Depression Scale) will have significant associations with urge to smoke at post-test measured by self-report and topography derived measures (latency to first puff, number of puffs, puff duration, and inter-puff interval) in the post body image exposure session.

Delimitations

The study was delimited as follows:

- 1) Both objective and subjective measures were used to assess participant's urge to smoke a cigarette.
- 2) The results of the study can be generalized to college-age female students with high weight concerns (18-25 years of age) in the Philadelphia, PA area.
- 3) Participants were limited to the definition of being sedentary and physically active.
- 4) The study occurred in a controlled-lab environment.

Limitations

The study was limited as follows:

- 1) The accuracy of physical activity was self-reported and based on the truthfulness of the participants.
- 2) The results of the study may not be generalized to men or adolescent females and women older than 25 years of age or to individuals outside the Philadelphia, PA area.

3) The researcher was responsible for designing and modifying the body-image concern eliciting stimulus.

4) Participants were categorized on their physical activity status depending on the definition of being sedentary and physically active.

5) The study was conducted in a lab-based environment and results may not be generalizable in an external setting.

Definition of Terms

Body-image exposure session. This refers to a mirror-exposure task that is aimed at increasing participants' concerns regarding their body shape and weight using their mirror images. The present study uses a combination of mirror exposure techniques along with a script development session as a means to elicit body image concerns.

Mirror exposures have been used in body image treatment studies (Hilbert et al., 2002; Jansen et al., 2008). Script developments have often been used in post-traumatic stress disorder (PTSD) research and have been effective in eliciting negative affect and stress.(Beckham et al., 2007; McClernon et al., 2005).

Physical activity. Refers to number of days participants self-report engaging in purposeful and planned exercise (e.g., going to the gym, walking, running, etc). In this study, participants were categorized as being physically active if they reported greater than 60 minutes of vigorous physical activity or greater than 90 minutes of moderate physical activity in a week. Participants who reported not engaging in any purposeful physical activity during the past month or those reporting less than or equal to 30

minutes of moderate intensity in a week were categorized as being sedentary.

Participants who reported being physically active between 30 and 60 minutes in a week were excluded from the study.

Self-reported smoking urge. This is a subjective measure of self-reported craving to smoke a cigarette measured using the Questionnaire for Smoking Urges- Brief (Tiffany & Drobes, 1991).

Smoking topography. Measured using the CReSS Pocket (Clinical Research Support System), smoking topography was an objective measure of urge to smoke. The topography device calculates various dimensions of smoking behavior such as latency to first puff, puff volume, inter-puff interval, and number of puffs.

Weight concerns. A construct that refers to the extent to which individuals have worries about smoking-related weight control and weight gain. This was measured by the Weight Control Smoking Scale (Pomerleau & Snedecor, 2008).

CHAPTER 2

REVIEW OF LITERATURE

The study aimed at assess the effects of a novel behavioral task (body-image exposure session) on the urge to smoke (as measured via smoking topography and self-report) in a sample of physically active and sedentary college-age females and examine the effects of physical activity on smoking urge. A secondary aim of the study was to assess if exposure to the body-image exposure session produced changes in body dissatisfaction, physical appearance related anxiety, and affect and explore the effects of baseline depression and anxiety on smoking urge. The review of the literature is presented below.

Health Consequences of Smoking on Women

Tobacco smoking is responsible for nearly 1 million deaths per year among women worldwide (Ezzati & Lopez, 2004) and is expected to produce about 3 million deaths per year among women by the year 2020 (Peto et al., 1996). In the US alone, smoking is responsible for 178,000 deaths among women annually (CDC, 2005). The health consequences of smoking are well-known and include increased risk of cardiovascular diseases such as coronary diseases, heart arteriosclerosis, peripheral vascular diseases, and cerebral vascular disease (stroke) (USDHHS, 2004). Nearly 90% of all lung cancers are caused by smoking (Costa, Marques, Figueiredo, & Barata, 2006) and it can also cause irreversible respiratory ailments such as COPD and emphysema (CDC, 2008).

Women tend to suffer a greater proportion of morbidity and mortality related diseases from smoking, although the gender differences in risk are unclear, partly due to the lack of studies that have reported risk by gender. In one of the seminal studies that studied gender differences and cardiovascular risks Prescott and colleagues (Prescott, Hippe, Schnohr, Hein, & Vestbo, 1998) found an increased risk of myocardial infarction (MI) due to smoking among women compared to men. However, while some recent studies have supported these results (Downs et al., 2005), others researchers feel that it may be too soon to draw these conclusions (e.g.,(Ferrie et al., 2009; Marang-van de Mheen, Smith, Hart, & Hole, 2001). Women smokers also tend to have an increased risk of lung cancer and other lung diseases compared to men (CDC, 2004; Zang & Wynder, 1996). As smoking influences estrogen metabolism and the risk for multiple estrogen sensitive outcomes (Tansavatdi, McClain, & Herrington, 2004), estrogen has been implicated in these findings (Siegfried, Davis, & Gupta, 2000). Apart from these health hazards, women also encounter other risks that are not experienced by men. Smoking is associated with greater menstrual bleeding, duration of dysmenorrhoea, as well as greater variability in menstrual cycle length (Bertone-Johnson et al., 2008; Hornsby, Wilcox, & Weinberg, 1998; Mishra, Dobson, & Schofield, 2000; Windham, Elkin, Swan, Waller, & Fenster, 1999). Women who smoke have increased difficulty becoming pregnant and reach menopause sooner (by 1 or 2 years) than women who do not smoke (USDHHS, 2001). Smoking can also cause complications during pregnancies and women smokers face a twofold increased risk of placental abruptions (USDHHS, 2006) and impaired fetal growth (Bada et al., 2005). Women who smoke when pregnant are at an

increased risk of ectopic pregnancies, spontaneous miscarriages, neonatal mortality, and preterm labor (Kyrklund-Blomberg, Granath, & Cnattingius, 2005; Stroud et al., 2009). Post-partum smoking also has severe implications to women and their children. According to the Surgeon General's Report (USDHHS, 2006), children who are exposed to second hand smoke are at an increased risk of sudden infant death syndrome (SIDS), developing weaker lungs, asthma, ear infections, bronchitis, and pneumonia.

In summary, health risks due to smoking may be greater in women than men. This coupled with the health risks that exclusively women who smoke face such as complications during pregnancies, menstrual dysfunctions, and its effects on fetal health makes it imperative to study reasons for maintenance of smoking behaviors in this population. Thus, a better understanding of factors that influence smoking behavior in women will help in development of more effective cessation interventions for women smokers which can improve their quality of life and greatly reduce the overall health burden of smoking on society.

Smoking Cessation Outcomes in Women

Women differ from men with respect to several smoking-related variables: they are less dependent on tobacco (Gritz et al., 1998; Royce, Corbett, Sorensen, & Ockene, 1997) and they have lower concentrations of cotinine, a metabolite of nicotine (Etter, Vu Duc, & Perneger, 2000; Fu et al., 2009) even after adjustment for the number of cigarettes smoked per day (Etter & Perneger, 2000). Biologically, smoking in women is less reinforced by the effect of nicotine than in men (Perkins, Donny, & Caggiula, 1999). In spite of a reduced pharmacological dependence on nicotine, women have poorer

cessation outcomes than men. Few studies have examined these gender disparities but clinical studies that do look at these differences show poorer outcomes in women compared to men. Women are less likely to quit than men (McKee, Maciejewski, Falba, & Mazure, 2003; Osler, Prescott, Godtfredsen, Hein, & Schnohr, 1999) and are more likely to relapse after a quit attempt (Killen, Fortmann, Schatzberg, Hayward, & Varady, 2003; Razavi et al., 1999). Women have less successful quit attempts in interventions involving formal counseling (Carlson, Goodey, Bennett, Taenzer, & Koopmans, 2002; Swan, Ward, Carmelli, & Jack, 1993), self-quitting without assistance (Ward et al., 1997), or varying levels of counseling with nicotine replacement therapy (Perkins & Scott, 2008; Senore et al., 1998; Wetter et al., 1999) with a recent meta-analysis showing greater effectiveness of NRT for men than women (Cepeda-Benito, Reynoso, & Erath, 2004).

Researchers have focused on non-pharmacological factors to explain continued use of nicotine among women. Women are less likely to express a readiness to quit and are also less confident in their ability to quit smoking and cope with smoking-related situations (Etter, Prokhorov, & Perneger, 2002). The higher prevalence of depression and anxiety among women may also play a role (Frackiewicz, Sramek, & Cutler, 2000; Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Pigott, 1999). Women are more likely to use tobacco to cope with depression and anxiety (Cepeda-Benito & Reig-Ferrer., 2000; Husky, Mazure, Paliwal, & McKee, 2008) and also tend to relapse more in situations involving negative and stressful feelings (Berlin et al., 2003; Gritz et al., 1998). Another primary reason that has contributed to continued smoking and poor cessation

outcomes among women is attributed to the widely held belief that nicotine can attenuate weight gain (Gritz et al., 1998; Jeffery, Henrikus, Lando, Murray, & Liu, 2000; Perkins, 2001), especially among young women who have concerns about weight and body image. These relationships between weight concerns and smoking among young women will be further explored in the following sections.

Smoking and Weight and Body Concerns

Although overall rates of cigarette smoking among populations in industrialized countries have declined over the past 20 years (USDHHS, 2001), this trend is not evident among all groups of smokers. Smoking prevalence has increased among teenage females and young women (Becher et al., 2001). A primary reason for this may be that young women have concerns about their body shape and weight and are more likely to use cigarettes to combat these concerns (Pinto et al., 1999; Sánchez-Johnsen, Carpentier, & King, 2010). The belief that smoking helps with weight control is not unfounded, especially since research shows that smokers in general weigh less than non-smokers (Perkins, 1993; Rasky, Stronegger, & Freidl, 1996). Moreover, they also tend to put on weight during abstinence attempts (Pomerleau, Pomerleau, Namenek, & Mehringer, 2000). Epidemiological studies show that on an average, smokers who quit gain approximately 10 pounds after quitting (Blitzer, Rimm, & Giefer, 1977; Klesges et al., 1997; Swan & Carmelli, 1995). The increase in weight gain continues until the weight of a former smoker is not significantly different from that of a non-smoker. Thus, it appears that smokers maintain a constant weight that is below that of non-smokers, go through a period of processes that leads to an increase in weight upon cessation of

smoking, until once again, a weight plateau is attained that is no different from that of a non-smoker. The reduced weight among smokers is attributed to reduced food/caloric intake and increased metabolic rate among smokers (Perkins, 1992 a, 1992 b). These are explained in the following sections.

Smoking and Food/Caloric Intake

Nicotine has been commonly called an anorectic, an agent that suppresses eating. However, there is no evidence of reduced eating among smokers versus non-or-ex-smokers (Perkins, 1992 b; Troisi, Heinold, Vokonas, & Weiss, 1991). These findings seem incompatible with the postulation that nicotine can be an anorectic. However, prospective studies have found a sharp increase in eating during the first weeks after cessation and a gradual decline to baseline levels in eating (Gritz, Carr, & Marcus, 1991; J. R. Hughes, 1992) and decrease in eating and caloric intake with resumption of smoking (Perkins, Epstein, & Pastor, 1990) (which could explain the increase in body weight of smokers who quit). This suggests that though caloric intake is not significantly affected by smoking or nicotine, eating behaviors increase or decrease when smoking status changes (i.e., following cessation, relapse).

The increase in weight gain during periods of nicotine withdrawal has been attributed to the specific preference of certain kinds of food during periods of withdrawal. Grunberg (1982) reported that chronic exposure to nicotine selectively suppresses the intake of sweet foods and withdrawal from nicotine selectively enhances the intake of sweet foods, in both humans and rats. This hypothesis has been tested using animal models that show animals undergoing nicotine withdrawal increased their

consumption of sweet foods that contributed to their change in body weight (Grunberg, 1982; Grunberg, Bowen, & Morse, 1984). This has been attributed to a shift in the palatability of sweet-tasting foods. In a study that tested the effects of nicotine on taste reactivity, (Parker & Doucet, 1995) showed that rats who were chronically exposed to nicotine showed enhanced hedonic evaluation of sucrose 24 hours after nicotine was withdrawn showing that withdrawal from nicotine enhances the palatability of sweet-tasting foods. Human self-reports also reveal that nicotine deprivation results in an increased hedonic evaluation of sweet foods (Perkins et al., 1992; Rodin, 1987). However, only a handful of studies have evaluated the effects of nicotine on reward value of food on humans. Perkins et al. (1995) observed increases in reward value of foods only among nicotine-deprived female smokers who were high in dietary restraint. In a more recent study that evaluated reward value of carbohydrate snacks for female smokers, Spring, Pagato, McChargue, Hedekar, & Werth (Spring, Pagato, McChargue, Hedekar, & Werth, 2003) showed that nicotine deprivation increases the reward value of appealing carbohydrate snacks among female smokers. Such an increase in the reward value of foods has been attributed to brain serotonergic neurotransmission that could be triggered by nicotine administration and withdrawal. Discontinuing nicotine diminishes serotonin turnover (Koob & Le Moal, 2001; Watkins, Koob, & Markou, 2002) which triggers a withdrawal state that is characterized by carbohydrate craving (Spring, Chiodo, & Bowen, 1987). Increased carbohydrate consumption may result in the form of substance self-administration that is reinforced by positive mood changes (Spring et al., 1987). Consistent with this interpretation are findings that indicate that dysphoric

mood and carbohydrate consumption during nicotine withdrawal are reduced by agents that enhance serotonergic neurotransmission (Covey, Glassman, Stetner, Rivelli, & Stage, 2002; Killen et al., 2001).

Smoking and Metabolic Rate

As smokers have the same caloric intake but weigh less than non smokers (Perkins, 1993; Rasky et al., 1996), researchers have speculated that smoking could alter body weight due to its influence on metabolic rates. Increased metabolic rates (usually measured by indirect calorimetry) have been observed following nicotine intake (Perkins, Epstein, Stiller, Marks, & Jacob, 1989) mirroring earlier animal research (Ilebekk, Miller, & Mjos, 1975), while other human studies have failed to find increases in metabolic rates (Marks et al., 1991; Warwick, Chapple, & Thomson, 1987). Improved understanding of these metabolic effects may lead to better prediction and control of weight gain after smoking cessation. However, very little to no research in this area over the past few decades has made it difficult to better comprehend the relationship between nicotine and metabolic rates.

Thus, physiologically, either through the mechanisms of increased caloric intake and/or influences on metabolism, nicotine can reduce body weight and promote weight loss and smoking cessations can cause increased, albeit modest, weight gain. This can make smoking cigarettes an effective although maladaptive smoking strategy, especially for young women, who already may have increased weight concerns. Hence, both concerns about weight gain and actual weight gain post-cessation can affect cessation outcomes and abstinence rates among women who attempt to quit smoking.

Smoking-Related Weight Concerns among Women

Smoking-related weight concerns are more common among women than men (Clark et al., 2005; Meyers et al., 1997; Pisinger & Jorgensen, 2007). Women are more likely to attribute smoking behavior to reasons of weight control, weight loss, and fear of weight-gain (Copeland & Carney, 2003; Levine et al., 2001; Perkins, 2001; Pomerleau et al., 2001; Ward et al., 1997) and some women refrain from attempting quitting because of excessive weight gain (Berg, Park, Chang, & Rigotti, 2008; Perkins, 2001; Pomerleau & Kurth, 1996). Initiation of smoking among women is often associated with thoughts about weight, eating disorder symptoms, and general weight concerns (French, Perry, Leon, & Fulkerson, 1994; Stice & Shaw, 2003). Smoking becomes a very effective weight control tool such that weight concerned smokers refrain from quitting smoking for fear of post-cessation weight gain (Perkins, Levine, Marcus, & Shiffman, 1997; Pomerleau et al., 2001). Women with greater concerns about post-cessation weight gain are also significantly less ready to quit (Pomerleau et al., 2001; Weekley, Klesges, & Reylea, 1992), and are willing to tolerate very minimal weight gain after quitting (Levine et al., 2001). Weight concerns also influence abstinence rates in cessation programs. Meyers et al., (1997) examined smokers who were trying to quit smoking and found that those with a high level of weight concerns were less likely to be abstinent at one, six, and twelve months' follow-up than those with no weight concerns. Weight concerned smokers also have increased attrition rates from treatment programs with women with higher weight concerns having a greater likelihood of dropping out of treatment programs (Copeland et al., 2006; Mizes et al., 1998).

Factors Influencing Weight Concerns among Women

As weight concerns appear to be common among women smokers, it is important to identify characteristics of women who endorse these concerns. Specific demographic factors or smoking rate characteristics have been identified among female smokers, but not among male weight concerned smokers (Clark et al., 2004; Clark et al., 2006), suggesting that factors associated with weight concerns may be gender-specific or less studied in men. A better understanding of these factors may help in developing more targeted smoking cessation interventions.

BMI. BMI has been associated with overall body esteem and weight concerns (Kornblau, Pearson, & Breitkopf, 2007), although the direction of BMI influence is unclear in smokers. Some researchers found that weight concerns are related to body image issues (Clark et al., 2005; King, Matacin, White, & Marcus, 2005), predicting that smokers with lower BMI would have greater weight concerns. One smoking cessation trial showed evidence that females with weight concerns were more likely to have a lower BMI, be of a younger age and have a Caucasian background (Clark et al, 2006); while other studies have shown that weight concerned women weighed more than their counterparts (Collins, Nair, Hovell, & Audrain-McGovern, 2009; Davis, Durnin, Gurevich, Le Maire, & Dionne, 1993). It can be speculated that perhaps a BMI-weight concern relationship among smokers could be represented as a “U” shaped distribution, where women with relatively low or high BMI express weight concerns.

Smoking-related factors. Weight concerned female smokers report smoking more cigarettes per day than non-weight concerned females (Klesges, Meyers, Klesges,

& La Vasque, 1989; Loken, 1982), although the evidence of nicotine dependence seems equivocal. Some studies have shown weight concerned women to have greater levels of nicotine dependence (Pinto et al., 1999; Pomerleau et al., 2001), while other studies have failed to find such an association (Clark et al., 2006; Levine et al., 2001). This inconsistency may suggest that the increased number of cigarettes could be a way to assuage weight concerns rather than an indication of nicotine dependence. Smoking status is also implicated in women smokers who have weight concerns. Regular smokers (smoking more than one cigarette weekly) are more likely than experimental smokers (smoking less than one cigarette per week) to believe that smoking is a weight control strategy (Camp, Klesges, & Relyea, 1993; L. A. Robinson, Klesges, Zbikowski, & Glaser, 1997) suggesting that smokers may learn the weight control properties of cigarette overtime and this may reinforce smoking behavior.

Dietary restraint and body-image issues. Dietary restraint and body-image issues have also been implicated as being associated with weight concerns. In a study that examined weight concerned smokers, Pomerleau et al. (1993) found that compared to women who did not smoke to control their weight, weight-control smokers scored significantly higher measures of dietary restraint. Similar results have been reported in other studies examining weight concerns (e.g., Pinto et al., 1999; Pomerleau & Saules, 2007; Weekley et al., 1992). Women with strong concerns about post-cessation weight gain are also more likely to report dissatisfaction with their weight and body shape (Pomerleau et al., 2001). Weight gain during smoking cessation may adversely impact

body image concerns and dissatisfaction leading to an increased risk for relapse (King, Matacin, Marcus, Bock, & Tripolone, 2000; King et al., 2005).

Demographic factors. Greater weight concern among female smokers is associated with higher levels of education and income (French & Jeffrey, 1995; Wardle & Griffith, 2001). Women's age also relates to weight concerns in smokers. Women under the age of 30 are more likely to smoke to control their weight (Wee, Rigotti, Davis, & Phillips, 2001) and are also more likely to cite weight gain as a reason for relapse (Swan et al., 1993) .

Race. Race is another important factor that has been implicated in weight concerns and smoking behaviors in women. Most of the studies exploring race have consistently depicted greater weight concerns in Caucasian and Hispanic populations (Clark et al., 2006; McBride, French, Pirie, & Jeffery, 1996; Weiss, Merrill, & Gritz, 2007). These associations have less clear among African American women. This may be because although African American women meet the criteria for obesity (BMI >27) (CDC, 1997), they are known to show greater body satisfaction than European American women and less likely to believe that being overweight makes them unattractive (Kumanyika, 1998). This has led to assumptions that African American women place lesser emphasis on being thin and have fewer concerns about body image (Flynn & Fitzgibbon, 1998). However recent research points to the contrary. In two independent samples of African American (AA) and Caucasian women smokers, Pomerleau and colleagues (Pomerleau et al., 2001) concluded that not only were AA smokers as likely as Caucasian smokers to be motivated by weight concerns but that they were more likely

than Caucasian smokers to not be willing to gain any post cessation weight gain. In another study, Collins and colleagues (2009) found that factors such as BMI, intention to quit smoking, and social support, that are associated with weight concerns among white smokers are also predictive of weight concerns in a sample of low-income black smokers. Researchers suggest that AA women tend to conceptualize weight concerns differently and have a greater 'preferred' body weight and a deviation from this weight can be a persistent source of concern in this population (Pomerleau et al., 2001). Thus, weight concerns do exist in this population and there is a need for future studies to further understand this relationship.

Depressive symptoms. Depression may represent a problem among women concerned about post-cessation weight gain. Women are almost twice as likely to experience mood disorders compared to men (Kessler et al., 2005; Kessler et al., 1994) and women are at a greater risk of depressive problems while quitting than men (al'Absi, Hatsukami, Davis, & Wittmers, 2004; B. Borrelli, Bock, King, Pinto, & Marcus, 1996; Morrell & Cohen, 2006; Xu et al., 2008). Depression has been associated with changes in body weight (Jasienska, Ziolkiewicz, Gorkiewicz, & Pajak, 2005; Kendler et al., 1996) and a history of depression has been associated with greater weight-gain post-cessation among women (S. L. Frederick, Hall, Humfleet, & Munoz, 1996). In a study that examined smoking cessation outcomes among women with weight concerns (Levine, Marcus, & Perkins, 2003), found that depressive symptoms were associated with poor cessation outcomes suggesting that depressive symptoms may contribute to weight-concerned women's difficulties when attempting to quit smoking.

Interventions for Weight Concerns among Women

As weight concerns influence smoking initiation and maintenance and thwart successful smoking cessation efforts (e.g., Copeland et al., 2006; French & Jeffrey, 1995; King et al., 2000; Perkins et al., 1997), studies that look at smoking cessation among female smokers have attempted to study interventions that could address weight concerns by preventing weight gain. These have included both cognitive behavioral therapies (CBT) to combat weight concerns and use of behavioral interventions such as physical activity. The next sections delve into these interventions in greater detail.

CBT strategies with a focus on weight-related attitudes to attenuate weight concerns are based on observations that weight concerns tend to be more related to body image or weight perceptions than to actual weight itself. Preoccupation with weight and a fear of weight gain among smokers could be a result of body dissatisfaction and poorer body image in general (Cavallo, Duhig, McKee, & Krishnan-Sarin, 2006). King et al. (2005) reported that negative body-image ratings predicted greater difficulty in quitting smoking among women in a 12 week randomized clinical trial for smoking cessation. Similar results have been seen in other studies (Pomerleau & Saules, 2007) suggesting the use of cognitive behavioral therapy to directly address and attenuate the heightened concerns and weight-related attitudes. In a randomized clinical trial of 219 women who wanted to quit smoking, Perkins and colleagues (Perkins et al., 2001) found that women who received cognitive behavioral therapy to reduce weight concerns had higher abstinence rates at 6 and 12 months follow-up and also gained significantly less weight over the one year period than those who received

behavioral weight control (e.g., reducing between meals snacking, giving calorie goals, self-monitoring of weight) to prevent weight gain. This indicated that crucial cognition influencing smoking abstinence and relapse may be the concern about weight gain rather than the experience of weight gain itself. Thus, CBT treatments to address weight concerns during smoking cessation programs have yielded efficacious results.

The effectiveness of adding physical activity to smoking cessation interventions in general and the influence of PA on weight concerns in particular will be discussed in the next sections.

Physical Activity (PA) and Smoking

Smoking and lack of physical activity (PA) rank among the top three modifiable risk factors for chronic diseases and premature death (WHO, 2005). Most of the studies that look at the relationship between physical activity and smoking show an inverse relationship with smokers reporting lower levels of PA (Kaczynski, Manske, Mannell, & Grewal, 2008). Not only are smokers less physically active than non-smokers (Paavola, Vartiainen, & Haukkala, 2004), they are also less ready to adopt positive changes to their exercise patterns (Emmons, Marcus, Linnan, Rossi, & Abrams, 1994). This section provides an overview of the reasons for an inverse relationship between PA and smoking and the efficacy of interventions involving PA in smoking intervention programs.

Physical Activity and Smoking: Potential Reasons for the Negative Relationship

A systematic review of associations between smoking and PA (Kaczynski et al., 2008) found 60% of studies showed an inverse relationship between the two behaviors.

A common explanation that has been offered to better understand this relationship is that positive and negative health behaviors cluster together. For example, smokers are more likely than non smokers to engage in other health-risk behaviors (Dallongeville, Marecaux, Fruchart, & Amouyel, 1998; Strine et al., 2005). It is important to further understand how these behaviors cluster because changing one's harmful behavior may serve as an ideal opportunity for changing other behaviors by way of resultant increases in self-efficacy, motivation, or self-confidence (King, Marcus, Pinto, Emmons, & Abrams, 1996; Sherwood, Hennrikus, Jeffery, Lando, & Murray, 2000).

Other authors have explained the inverse relationship based on factors (such as income, education) that moderate the relationship between PA and smoking. For example, educational level and PA have a strong positive relationship whereas educational level and smoking are inversely related (Choiniere, Lafontaine, & Edwards, 2000). Lower education may be related to high risk behaviors either directly by imparting knowledge of negative consequences or indirectly through being associated with factors leading to elevated stress levels (e.g., depression, financial stressors) that could lead to increased smoking (Emmons et al., 1994; Steptoe, Wardle, Pollard, Canaan, & Davies, 1996). However, other studies have found contrary evidence of the moderating effects of education (Schuit, van Loon, Tijhuis, & Ocke, 2002; Tammelin, Nayha, Laitinen, Rintamaki, & Jarvelin, 2003; van Oort, van Lenthe, & Mackenbach, 2004), so such connections need to be explored further.

Physiological and psychological explanations have been offered for the negative relationship between PA and smoking. Physiologically, the ability to be physically active

may be reduced due to the impairment of lung function caused by smoking (Gold et al., 1996; Louie, 2001), making it difficult for a smoker to engage in exercise. Physical activity has been shown to improve pulmonary function (Courteix, Obert, Lecoq, Guenon, & Koch, 1997; Doherty & Dimitriou, 1997) and smoking can increase respiratory problems (Gold et al., 1996). Thus, physical activity and smoking can have opposite effects on lung function. Interestingly, a recent study showed that though exercise can have significant effects on the lung function among adolescent non smokers, daily smokers who exercised had lung functions similar to that of inactive participants who did not smoke (Holmen, Barrett-Connor, Clausen, Holmen, & Bjermer, 2002). This indicates that the negative effects of smoking can be overcome, to some extent, by engaging in higher levels of exercise. Psychologically, PA and smoking may be negatively associated through negative mood states such as depression. PA and depression are negatively associated (Field, Diego, & Sanders, 2001; Norris, Carroll, & Cochrane, 1992) potentially through the release of norepinephrine (Cronan & Howley, 1984) and smoking is positively related to depression (Convey & Tam, 1990; Fergusson, Lynskey, & Horwood, 1996). Lower levels of physical activity may lead to increased levels of depression and consequently smoking (Audrain-McGovern et al., 2003).

Thus, there seem to be different explanations for reasons of physical inactivity among smokers. While some researchers use clustering of health behaviors, other researchers explain the negative associations between exercise and smoking through physiological and psychological mechanisms. This may lead to beliefs that these two behaviors occur at opposite ends of a spectrum and are more different than they are

alike. The next section examines how exercise and smoking can be very similar to each other as they often provide similar rewards and may serve redundant purposes.

Similarities between PA and Smoking

Physical activity and smoking can both be considered forms of rewards and reinforcement. Alternative reinforcers do not have to be physically similar but can have shared characteristics that may not be physically apparent (Green & Fisher, 2000) and physical activity can serve as an appropriate alternative reinforcer to smoking. The perceived effects of smoking as a mood enhancer and as a stress and anxiety reduction technique are the benefits that can be achieved by participating in physical activity (Audrain-McGovern et al., 2003; Byrne & Byrne, 1993; Mead et al., 2009; Saxena, Ommeren, Tang, & Armstrong, 2005). Studies have consistently shown that both acute and chronic exercise is related to a significant reduction in depression (Brosse, Sheets, Lett, & Blumenthal, 2002; Calfas & Taylor, 1994; Craft & Perna, 2004; Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005). These effects are generally “moderate” in magnitude (i.e., larger than the anxiety-reducing effects noted earlier) and occur for subjects who were classified as non-depressed, clinically depressed, or mentally ill. The findings indicate that the antidepressant effect of exercise begins as early as the first session of exercise and persists beyond the end of the exercise program (North, McCullagh, & Tran, 1990). These effects are also consistent across age, gender, exercise group size, and type of depression inventory. Similarly, studies have shown that PA can be an effective stress and anxiety reduction technique. Numerous meta-analyses on the effects of exercise and anxiety have consistently shown lower anxiety levels in healthy

exercisers (Guszkowska, 2004; Petruzzello et al., 1991) and even among those with anxiety disorders (Strohle, 2009; Strohle et al., 2009) indicating the anxiolytic effects of exercise.

Thus, both smoking and physical activity can be considered forms of reward as they serve similar purposes; they alleviate mood, both are negatively reinforced by a reduction in anxiety, and are effective weight loss strategies. Regular physical exercise can increase energy expenditure and help in weight loss, thereby mimicking the effects of nicotine. Moreover, many of cognitive mechanisms associated with smoking behavior change (such as self-efficacy, motivation) are also associated with changes in exercise behavior (King et al., 1996). Thus, some smoking cessation programs use exercise as a effective treatment component.

Physical Activity in Smoking Cessation Interventions

Participation in regular physical activity among female smokers may aid in cessation efforts by serving both as an alternative to smoking and by reducing weight gain which is associated with cessation. Exercise may have the potential to moderate some of the negative consequences associated with nicotine withdrawal and cessation.

Smoking cessation is typically followed by withdrawal symptoms and a strong desire to smoke (West & Schneider, 1987) and these are likely to contribute to a failure to quit smoking (Piasecki et al., 2000). Exercise has been proposed as a possible strategy for reducing tobacco withdrawal symptoms and cravings (Ussher, Taylor, & Faulkner, 2008). Exercise has been shown to have acute moderating effect on a wide range of psychological variables such as mood disturbance (Ekkekakis & Petruzzello,

1999), hunger (King et al., 1997), stress (Taylor, 2000), and tension (DeVries, 1987); all of which are reported as withdrawal symptoms (J.R. Hughes & Hatsukami, 1986). Such acute and short-term effects of a single bout of exercise have been investigated using lab-based studies.

Acute and short-term effects of exercise on smoking behavior. In one of the first studies to show the effects of exercise on desire to smoke, Pomerleau et al. (1987) found a non-significant trend toward decreased desire for cigarettes, but due to the small sample size, there were no significant differences in the two intensity conditions. Bock et al. (1999) investigated the effects of exercise over a 12-week period and found that abstinent women smokers in a vigorous intensity condition reported significant reductions in negative affect, nicotine withdrawal, and cigarette craving. The role of exercise intensity has been investigated in studies since to observe the role of varying levels of intensity on urges and desires to smoke. Ussher et al. (2001) found that a single bout of 10 minutes of moderate intensity exercise reduced desire to smoke and withdrawal during smoking cessation as compared to a control group and the effects were maintained 10 minutes following exercise. Daniel et al. (2001) further investigated the role of exercise as a potential distraction (to withdrawal effects) by adding a light intensity condition. They found that moderate intensity exercise yielded significant reductions in restlessness, stress, tension, and poor concentration and had a greater sustained effect than low intensity and a passive control group. Besides, effects of exercise were sustained longer in the 10 minute exercise bout session (Ussher et al., 2001). However, similar results have not been seen among adolescents (Everson et al.,

2006) suggesting that a 10 minute bout of moderate intensity may not be sufficient to impact strength of craving to smoke among a younger population raising doubts if level of nicotine dependence moderates effects of exercise.

Using self-paced low intensity exercise session, Taylor et al. (2005) found that a self-paced walk at a preferred/chosen level can have rapid and measureable positive effects on single and multiple measures of urges to smoke, lasting at least 20 minutes. Non aerobic exercises were also effective in providing relief from desire to smoke with isometric contractions (5min) providing greater immediate relief from desire to smoke than passive control (Ussher et al., 2006). However, moderate intensity seemed to have more pronounced and sustained effects on desire to smoke than reported for isometric contractions suggesting that mechanism underlying the observed effect on desire to smoke may be partly related to distraction. Similarly, there has been less evidence of effectiveness of low-intensity (or self-paced) exercise on smoking behavior.

While there seems to be consensus on the effectiveness of physical activity to control smoking urges, there seems to be insufficient evidence to clearly support the effects of a particular level of intensity on urge to smoke. Some data points to moderate intensity being more effective than low or high intensities. However, there is a distinct need to have more studies to understand why and how exercise is effective.

Effectiveness of interventions combining PA and CBT. Smoking cessation intervention studies have also examined the combined effects of exercise and cognitive behavioral smoking cessation program (CBT). In their seminal paper, Marcus et al. (1999) randomized 281 sedentary female smokers to either a 12-week CBT + vigorous

exercise or to CBT+ staff contact. Results showed that compared with the control group, the exercise group achieved significantly higher levels of continuous abstinence and gained significantly less weight at end of treatment, 3, and 12 months post-treatment. However, similar results were not found in an identical protocol that incorporated moderate levels of exercise intensity (Marcus et al., 2005). Differences in abstinence and weight loss were seen at 3 month but not at 12-months follow up.

While the CBT+ moderate exercise group were more likely to report smoking cessation as measured by 7-day point prevalence at the 3 month follow-up compared to the CBT group, no group differences were found at 12 months by either 7- day point prevalence or continuous abstinence. However, those who adhered to the exercise prescription (in the CBT+ moderate exercise group) were more likely to achieve cessation than those who with lower adherence. Studies examining the effects of exercise counseling sessions (not exercise) in smoking cessation programs have found less encouraging results with abstinence rates despite reported increases exercise levels (Ussher, West, McEwen, Taylor, & Steptoe, 2003). Prapavessis and others (2006) examined the individual effects of exercise combined with Nicotine Replacement Therapies (NRT) on cessation rates. It was seen that while exercise helped in improving functional exercise capacities and helped in weight loss, it did not influence abstinence rates. However, compared with exercise participants, those who received CBT reported having greater self-efficacy for quitting and a greater knowledge of coping resources. This may indicate that though exercise on its own can influence psychological and physiological processes, optimal results are seen when combined with a counseling component. This may help

participants increase their confidence, self-efficacy, and motivate them to quit and remain abstinent.

One of the concerns that researchers have when attempting smoking behavior change and lifestyle change (exercise or diet) simultaneously is that changing multiple behavioral may undermine efforts to change any single behavior (Joseph et al., 2004; Spring et al., 2004). However, a recent meta-analysis indicates that adding behavioral weight control (CBT and/or exercise) to smoking cessation intervention does not undermine tobacco abstinence (Spring et al., 2009). On the contrary, the findings indicated that combined smoking cessation and weight control treatment, compared to smoking cessation treatment alone, enhanced tobacco abstinence and also reduced post cessation weight gain significantly ,at least in the short run, indicating the efficacy of these interventions in attenuating weight gain and abstinence. The results were more murky in the long-run such that although combined smoking plus weight treatment did not adversely affect abstinence, the advantageous effect on weight control was no longer significant in the long-run (at the end of 6 months) suggesting the need for increased duration of these treatments. Thus, combating weight gain and weight concerns continue to be a problem when women quit smoking and with the surmounting evidence of influence on weight gain on relapse rates, more research is needed to enhance long-term weight loss efforts, especially in the field of smoking cessation intervention.

Summary

The relationship between weight concerns and smoking among women influences every aspect of smoking behavior: initiation, maintenance, poor cessation outcomes, and increased relapse rates. Weight concerns is associated with a number of factors such as BMI, nicotine dependence, negative affective states, race, and body image and weight issues. Interventions aimed at optimizing cessation outcomes have components aimed specifically to address weight concerns through by incorporating physical activity in smoking cessation interventions. Physical activity can be protective of smoking as both these behaviors can serve as forms of rewards and reinforcements. It can also be an effective reward as it attenuates feelings of withdrawal, depression, cravings, and more importantly, is an efficient behavioral strategy for weight loss. These strategies have yielded modest results, but there is a need to increase efforts to assuage weight concerns and increase smoking cessation efforts among young female smokers.

Theories of Conditioning and Nicotine Addiction

An important objective of addiction research is to specify the exact nature of the learning mechanism responsible for the acquisition of addictive behavior in humans. The ultimate purpose of this research is to better understand these mechanisms so as to provide an effective treatment of the addictive behavior. Theories that aim to understand tobacco dependence can be broadly classified into negative reinforcement theories, positive reinforcement theories, and cognitive and social learning theories. The theoretical rationale for this study was based on the Expectancy Theory (derived from the social cognitive theory). Hence while negative reinforcement (see Eissenberg,

2004) and positive reinforcement theories (see Glautier, 2004) are important in understanding nicotine addiction, this section will elaborate only elaborate on the Expectancy Theory.

Cognitive and Social Learning Theories

The social learning and cognitive theories of addiction represent a loose collection of models, constructs, and conceptualizations influenced by social learning theory (Bandura, 1977) and cognitive-behavioral principles of learning. While there are many models derived from cognitive and social learning theories such Marlatt's model of relapse process (G. A. Marlatt, 1985) and Tiffany's (Tiffany, 1990) cognitive processing theory of drug use and craving, this literature review focuses on the Expectancy Theory and nicotine addiction.

Expectancy theory. Expectancy theory was developed by cognitive learning theorists to describe the forms of associative knowledge that underlie conditioned behavior (Bolles, 1972; Brandon et al., 2004). Expectancy beliefs regarding drug effects and likelihood of drug use or avoidance can have a great influence on continued drug use and dependence development. According to this model, experience of Pavlovian contingencies between stimuli and reinforcers gives rise to knowledge of the predictive relationships between these events, enabling the stimulus to elicit an expectancy of their associated reinforcer (Hogarth & Duka, 2006). Individuals also learn that the behavior produces the intended reinforcers. These two sets of information can be synthesized such that the expectancy of a reinforcer (reduced stress) elicited by a stimulus (stressful situation) leads to a behavior (smoking) that is expected to produce

that reinforcer (reduced stress). Hence, expectancy beliefs, and not the actual outcomes, drive drug-seeking behavior. For example, a smoker's expectancies regarding tobacco's ability to reduce stress and negative affect and control weight gain may motivate smoking behavior regardless of whether or not these expectancies hold true for the given smoker. Using this theory as a framework for this study, the associative learning between weight concerns and smoking is because the weight concerned smoker expects the desired results from smoking (weight loss, relief from negative affect).

Drug-related expectancies are traditionally described as risk-factors for the use and abuse of drugs, rather than dependence on the drug per se. For example, expectancies regarding a drug may develop even before an individual's initial experience with the drug. Holding positive expectancies related to drug use may increase the probability of actual drug use (Christiansen, Goldman, & Inn, 1982; Christiansen, Smith, Roehling, & Goldman, 1989) and may also lead to poor cessation outcomes (Brown, 1993). These relationships hold true for tobacco use as well (Brandon, Juliano, & Copeland, 1999) and are reciprocal. Expectancies enhance engaging in a particular behavior (drug use) which in turn strengthen expectancies (continued drug use) (Bauman & Chenoweth, 1984). Within the context of exercise, individuals who are physically have outcome expectancies of exercise and are more likely to participate in exercise if they expect its positive outcomes such as weight loss, enhanced mood, reduced anxiety (C. M. Frederick & Morrison, 1996; Petosa, Suminski, & Hartz, 2003; Winters, Petosa, & Charlton, 2003).

Expectancy theories were initially used by alcohol researchers, who used balanced placebo designs to infer expectancies by differentiating the influences of pharmacology (alcohol or placebo administration) and instructional set (subjects were informed that they were receiving alcohol or placebo) on observed drinking behavior (G. A. Marlatt & Rohsenow, 1980). Tobacco researchers have also adopted these research approaches (Brandon et al., 1999; Juliano & Brandon, 2002). Juliano and Brandon (2002) examined whether the type of cigarette people expected and the type of cigarette they actually received influenced their levels of state anxiety, urge to smoke, and withdrawal symptoms. Participants abstained from smoking for 3 hours before the study, and upon arrival they were placed in an anxiety-provoking situation. Cigarettes with nicotine reduced anxiety more than nicotine-free cigarettes and merely expecting to receive cigarettes with nicotine also reduced anxiety significantly in smokers who believed nicotine would do so. Thus, response expectancy for anxiety seemed to moderate stimulus expectancy effects.

Significance of Proposed Study to Expectancy Theory

Using the Expectancy Theory to understand smoking behaviors among weight concerned smokers, the associative learning between weight concerns and smoking is a result of the expectancy that smoking can alleviate these concerns and the experience that smoking can be an effective weight control strategy. Similarly, individuals who are physically active experience and expect its positive outcomes such as weight loss, enhanced mood, and reduced anxiety. The proposed study examines how weight concerned females smokers who vary in levels of physical activity also vary in their urge

to smoke following a body concern-eliciting stimulus. It remains to be seen how physically active weight-concerned smokers who have experienced the effects of exercise (i.e., enhanced mood, reduced anxiety) and expect exercise to relieve the body concerns react to situations where their body image concerns are augmented as compared to those who are not physically active. This study thereby attempts to view how exercise modifies urge response to a weight concern stimulus among young women who have high weight concerns and rely on cigarettes to allay these concerns.

Cue-Reactivity Research

One hypothesis that is common across learning-based models of addictive behaviors is that the presence of antecedent stimuli associated with drug use or administration can elicit addiction-specific responses (i.e., psychological, psychophysiological, behavioral, and self-report). The intensity of these responses (i.e., cue-reactivity) is considered a reflection of the responses underlying craving or urge to smoke (Overduin, Jansen, & Eilkes, 1997). Since its origin, interpretations of cue-reactivity have been explained using classical or Pavlovian conditioning. During a history of drug-use, certain stimuli (e.g., cigarette use paraphernalia, drug-use environment) get associated with using the drug. Due to continuous pairing between these stimuli (conditioned stimulus; CR) and the actual drug (unconditioned stimulus; UCS), the CS comes to elicit a conditioned response (CR) that can produce craving in the absence of the drug. Human laboratory based studies have demonstrated that neutral stimuli when repeated paired with drug use can act as CSs and elicit CRs which get manifested as increased cravings and increases in physiological responses (Foltin & Haney, 2000;

Lazev, Herzog, & Brandon, 1999). CRs are known to play a role in both drug use maintenance (Rohsenow et al., 1994) and relapse (Niaura et al., 1999).

Two general classes of antecedent stimuli or cues have received considerable attention. The first class is comprised of environmental cues directly associated with smoking behavior (e.g., cigarettes, matches, ashtrays, smell of smoke, sight of another person smoking). In a typical cue reactivity study, such cues are presented to participants in a controlled laboratory setting. Cue-reactivity is measured across various domains such as self-report which assess craving or desire to smoke and physiological responses which include autonomic nervous system responses such as heart rate, skin conductance, and skin temperature (Carter & Tiffany, 1999). Generally, drug-dependent individuals report greater craving in response to cues associated with their drug of choice as compared to neutral cues (Drobes & Tiffany, 1997; Drummond, Tiffany, Glautier, & Remington, 1995).

The second class are affective states comprise that have an influential role in smoking behavior. Smokers show increased reactivity (as measured via different domains such as heart rate and blood pressure reactivity or report greater urges to smoke, report lower self-efficacy to not smoke) in responses to a wide range of affective cues such as cognitive stress (Niaura, Shadel, Britt, & Abrams, 2002) using standardized positive and negative scripts to evoke affective processes (Payne, Schare, Levis, & Colletti, 1991), exposure to stressors such as public speaking (Dobbs, Strickler, & Maxwell, 1981), and high anxiety situations (Parrott, 1995b; Pomerleau & Pomerleau, 1987).

Thus, the presence of stimuli that cause aversive reaction could play a role in influencing smoking behavior and influence reactivity to these stimuli. Using the existing research on the impact of affect on cue-reactivity measure, it would follow that among a sample of highly weight concerned individuals who smoke for reasons of weight control, a situation that creates dissatisfaction regarding their body could produce negative affective cues. Studies have shown that women, immediately following exposure to images of thin models, reported increased shame, body, and weight dissatisfaction, and weight concern (Birkeland et al., 2005; Cattarin, Thompson, Thomas, & Williams, 2000; Lopez, Drobles, Thompson, & Brandon, 2008). Such negative states may produce a potential change in psychophysiological, behavioral, and self-report responses (changes in cue-reactivity) related to smoking. In a recent study, Lopez, et al., (2008) used a cue-reactivity paradigm to test if an experimental manipulation designed to challenge women's weight concern, influenced their motivation to smoke. They found that women with greater weight concerns produced greater urge to smoke in response to images of thin models, even when smoking cues were not present. These suggest that situational challenges to body image, and not the mere presence of smoking cues, may be related to smoking motivation.

Measures of Cue-Reactivity

Cue-reactivity is measured across several domains. The most common measures are self-reports which assess cravings or desires for a particular substance. Studies examining self-reported urge to smoke either use questionnaires of smoking urges or have participants subjectively rate their urge to smoke on a visual scale (Tiffany &

Drobes, 1990). Other measures include physiological responses such as heart rate, skin conductance, or skin temperature. A meta-analysis of cue-reactivity studies by Carter & Tiffany (1999) showed that studies that have used psychophysiological responses have consistently indicated increases in heart rate, sweat gland activity, and skin temperature when participants were exposed to drug-related versus drug-neutral stimuli. However, Carter and Tiffany (1999) noted that there was a larger effect size for self-reported craving (0.92) as compared to physiological responding (ranging between -.24 to .40). This could suggest that self-report measures exhibit strong cue-specificity and physiological responses are less influenced by drug-cue manipulations. It has also been speculated that physiological indices of cue-reactivity are derived from general measures of physiological responses, of which only a small part could be attributed to the cue-manipulations. Hence, physiological processes may be engaged in functions unrelated to manipulations of drug-cues and as a measure of reactivity may contain a great deal of noise (Carter & Tiffany, 1999). So, studies using psychophysiological measures do so in combination of self-reported cravings of urge (e.g., (Hutchison, Niaura, & Swift, 2000; Lopez et al., 2008; Tong, Bovbjerg, & Erblich, 2007).

A third measure of cue-reactivity is smoking topography. Smoking topography focuses on rate or frequency of cigarettes smoked as the primary dependent variable. It is a component of smoking behavior and can be objectively measured by puff volume (Ahijevych, Gillespie, Demirci, & Jagadeesh, 1996), puff duration (Burling, Stitzer, Bigelow, & Mead, 1985), interpuff interval (D. K. Hatsukami, Morgan, Pickens, & Champagne, 1990), latency to first cigarette (Payne et al., 1991), or butt length (Jenks &

Higgs, 2007b). Smoking topography has shown to differ as a function of gender (Eissenberg, Adams, Riggins, & Likness, 1999), personality and stress level (Lombardo & Carreno, 1987) and differences in smoking behavior (Ahijevych & Gillespie, 1997). In spite of these differences, smoking topography provides a valid and reliable index of conventional smoking (Lee, Malson, Waters, Moolchan, & Pickworth, 2003).

Smoking topography methodology has been a valuable tool for assessing the effects of context (Eissenberg, Adams, Riggins, & Likness, 1999) and experimental manipulations (Cohen, Britt, Collins, Stott, & Carter, 1999) on cigarette smoke self-administration. Studies where stress/negative affect have been induced have observed changes in smoking behavior and urges consistent with increased nicotine administration. Using a learned helplessness paradigm, Payne et al. (1991) observed greater urge to smoke and increases in topographical components (latency to first puff, number of puffs) following negative affect induction. Similar results have been seen among individuals with Post Traumatic Stress Disorder (PTSD) who reported increased desire to smoke and increased puff volumes following recall of their traumatic experiences (McClernon et al., 2005).

Summary

Cue-reactivity research is a valuable research paradigm. It can produce reliable physiological effects and robust cravings in users of the drug when exposed to drug-related stimuli and thus is ideally suited for basic investigations of the addictive process. It can be used to investigate the impact of pharmacological treatments of medications on cue-specific cravings and even evaluate the effectiveness of psychological

interventions. There have been very few studies examining the effects of physical activity in cue-exposure paradigms. As physical activity is shown to decrease withdrawal symptoms and decrease rates of depression, it would also be interesting to view the effects of exercise on cue-reactivity, especially among smokers.

Summary of Literature

Smoking rates in industrialized countries have declined, but this decline is not seen in all groups of smokers. Smoking rates have increased among young women (18-25 year old) and there is an imminent need to develop effective intervention strategies for this population. One of the reasons for increased smoking rates in this age-range is concern about weight and body issues and the use of cigarettes as a weight control strategy. Another behavior than tends to have similar reinforcers as smoking is physical activity. Unlike smoking, physical activity can be a healthy way to deal with weight loss, weight control, and relieve feelings of anxiety, and depression. Based on the rationale of the Expectancy Theory, it remains to be seen how high weight concerned women who are physically active (and expect exercise to alleviate their weight concerns), react to situations where their weight and body concerns is augmented as compared to women who are sedentary (and expect only cigarettes to alleviate weight concerns). Thus, the study examined the influence of body-image cues on smoking urge and the influence of physical activity on urge among female smokers who had high smoking related weight concerns.

CHAPTER 3

METHODS

The purpose of the study was to examine the effects of a novel behavioral task intended to increase weight concerns on the urge to smoke in a sample of college-age females who varied in levels of physical activity. The study had two primary aims; the first aim was to observe the effects of a body-image exposure task that increased weight and body concerns on the urge to smoke in a sample of high weight concerned college-age female smokers. The second aim of the study was to study the protective role of physical activity on the urge to smoke.

The study was conducted in two phases. The first phase involved pilot testing of the body image concern eliciting stimulus (i.e., the body-image exposure session). The second phase involved testing the effect of this stimulus on the urge to smoke on college-age females. The methodology for the two phases is presented in the following sections.

Phase One

The primary purpose of the pilot testing was to ensure the integrity of the affective manipulation through observation of changes in body image concerns (this procedure is mentioned in greater detail below) in a cross section of the population and refining it for Phase 2 of the study. Phase 1 took approximately 30-45 minutes and was conducted in the research labs at the Health Behavior Research Clinic located at Weiss Hall on Temple University's main campus. Participant meetings, debriefing sessions, and

administering of baseline assessments occurred in an interview room adjacent to the research lab.

Participants

Nine female participants between 18-25 years of age were recruited for the pilot testing phase of the study. Temple University students who by self-report smoked for weight control reasons (scoring ≥ 4 on the Weight Control Smoking Scale) were eligible for the study (Pomerleau & Snedecor, 2008). To be eligible for the study, they were required to be self-reported regular daily smokers (minimum of 10 cigarettes per day over the past 6 months). Participants were excluded if they reported a current diagnosis for Axis I psychiatric disorders (e.g., depressive or anxiety disorders, schizophrenia, eating disorders), took psychotropic medication (e.g., haloperidol, alprazolam, SSRIs etc) , or were in therapy for Axis I disorders. Prior to participation, informed consent was obtained. All participants received a \$10 gift certificate for participation in the study.

Recruitment

Participants were recruited through flyers posted across Temple University's main campus. This included postings across various buildings on the campus, the student health center, and advertisements in Temple's print media (Temple Today) and electronic announcements of the study on undergraduate student list-serves (see Appendix A). Active recruitment also took place by way of approaching female smokers who were smoking on Temple's campus and by word of mouth.

Procedure

Interested participants were telephone screened (for the above mentioned eligibility criteria) and eligible participants were scheduled for the session. All participants attended a 30-45 minute visit where they were exposed to the body-image exposure session. At the end of this session they were asked to rate: 1) how they felt during the session, 2) how they felt about their weight and body perception before and after the session, 3) any recommendations for changing the session. All participants completed questionnaires that assessed concerns on weight and body image before and after the session. Responses to these questions along with the evaluations based on the questionnaires were used to refine the body image exposure session for Phase 2.

Body- image exposure session. The body-image exposure session was a combination of an exposure session (participants viewing their image in a mirror) and script-driven imagery. Exposure sessions often use a mirror where participants are encouraged to describe their body in great detail and are often used among patients with eating disorders. However, such mirror-exposure sessions are known to induce cognitive changes and negative feelings associated with the body even among non-clinical populations (Segal & Ingram, 1994) and thereby can elicit increased weight and body concerns. Adapted from Hilbert et al. (2002), the mirror-exposure session for this phase was aimed at eliciting body image and weight concerns and involved participants viewing their images in a full-length mirror. The second feature of the body-image exposure session was script-driven imagery that has been previously used in Post-Traumatic Stress Disorder (PTSD) populations and is a well validated and reliable

procedure that elicits strong mood responses (Beckham et al., 2007). In PTSD studies, this process involved participants describing their trauma-related experiences along with an emotion attached to each experience while the researcher prepared a 30-second script and read it back to the participant. This procedure has been shown to elicit strong physiological and negative mood responses (Pitman et al., 1987) and increased urge to smoke (Beckham et al., 2007). However, this is the first time that script-driven imagery has been used as a way to elicit increased body and weight concerns.

At the time of the telephone screening, the researcher provided the eligible participants with a choice of apparel they would prefer to bring with them during the exposure session. They were asked to either bring a swimsuit or a sports-bra (a regular bra if they did not own a sports bra) and pair of shorts. A full-length mirror with wings opening at a 45 degree angle was placed in the lab. Upon entering the lab, participants changed into their choice of apparel after which they were instructed to stand at a 2-foot distance facing the mirror such that a full view of the front of the body and the sides would be visible to the participant. The body-image exposure session took place with the female researcher in the same room. Participants were instructed to describe their image as precisely as they could see in the mirror while the researcher wrote down these descriptions. They were asked to describe their mirror image in a systematic manner starting with the face and neck, shoulders, chest, abdomen, waist, thighs, calves, and ankles and asked to provide a reaction/emotion to each of these parts. On a scale from 1 (most satisfied) to 10 (most dissatisfied), they were also asked to rate their

level of dissatisfaction with each of the body parts. At the end of this procedure, the researcher composed and read back a 30-second script that portrayed the descriptions in the second person, present tense using the reaction/emotion, and level of dissatisfaction that was used while describing the body parts. All participants were fully debriefed after the session and all participants were provided with counseling resources (see Appendix B).

Measures

The following measures were obtained **only at baseline.**

Body mass index. At the end of the body-image exposure session, the participants were weighed in order to calculate their body mass index using weight (kg)/height (squared in meters).

Nicotine Dependence. Nicotine dependence was measured by the Fagerström Test for Nicotine Dependence (FTND), a self-report measure derived from the Fagerström Tolerance Questionnaire (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) (see Appendix C). The FTND is a 6-item questionnaire measuring: time to first cigarette, difficulty in refraining from smoking in places where it is forbidden, number of cigarettes smoked per day, smoking frequency in the morning compared to the rest of the day, smoking whilst ill in bed. It has adequate internal consistency ($\alpha = .64$) and high test-retest reliability ($r = .88$) (Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994).

The following measures were obtained at **baseline and after the body-image exposure session.**

Weight concerns. Weight concerns was assessed before and after the body image exposure session using the 10-point Likert scale (0 = not at all, to 10 = very much) developed by Borrelli and Mermelstein (1998) (see Appendix D). Questions on this scale include, “How much do cigarettes help you control your weight?” “How likely is it that you would go back to smoking after quitting if you gained too much weight?” “How important is losing weight or maintaining your current weight compared with other personal health concerns?” This scale has shown to be internally consistent ($r = .87$) and demonstrated convergent validity with a moderate correlation with a measure of general weight concern ($r = .49, p < .01$) (B Borrelli & Mermelstein, 1998).

Body image measures. Body Image States Scale (BISS) (Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002) is a multi-item measure of momentary evaluative and affective experiences of one’s physical appearance (see Appendix E). The BISS consisted of six items related to domains of current body experience such as dissatisfaction-satisfaction with overall physical appearance, dissatisfaction-satisfaction with one’s body size and shape, dissatisfaction-satisfaction with current weight, feelings of physical attractiveness-unattractiveness, current feelings about one’s looks relative to how one usually feels, and evaluation of one’s appearance relative to how the average person looks. The BISS is internally consistent ($r = .77$) and has adequate test-retest reliability among women ($r = .68, p < .001$) (Cash et al., 2002).

Anxiety related to body image was measured using the Physical Appearance State and Trait Anxiety Scale- State Version (PASTAS, Reed et al., 1991) (see Appendix F). The PASTAS is a 16-item questionnaire anchored on a 5-point scale (0= not at all, 4=

exceptionally so) and participants rated how anxious or nervous they feel about specific parts of the body (e.g., thighs, buttocks, stomach, hips) at that moment. The scale has high internal consistency ($r = .88-.82$; $p < .01$) and test-retest reliability ($r = .87$) (Reed et al., 1991).

Affect. Changes in affect were assessed using the Positive and Negative Affect Schedule (PANAS) (see Appendix G). The PANAS was administered before and after the body image concern session to examine changes in positive affect (10 items, such as enthusiastic, strong) and negative affect (10 items, such as distressed, upset) at the two time-points. The items were scored on a 5-point Likert scale (1= very slightly or not at all, 5= extremely). Both PA and NA scales are highly internally consistent and demonstrate good convergent and discriminant validity (Watson, Clark, & Carey, 1988).

Data Analysis

Analyses were conducted to assure the integrity of the affective manipulation of the body image exposure session. This was accomplished both qualitatively and quantitatively. As described above, participants were asked 3 questions:

- a) What do you feel the session was intended to do?
- b) How do you perceive your body and weight before and after the session?
- c) Are there any recommendations to change the session in any way?

Responses to these questions were used to modify the body-image exposure session for Phase 2 of the study.

The results of the change weight concern scale, BISS, PASTAS, and PANAS were quantitatively assessed to evaluate if the body image exposure session had the intended

changes in affect and weight and body concerns. Descriptives were calculated for the weight concerns scale, BISS, PASTAS, and PANAS at baseline and after the body image exposure session. Keeping in consideration the small sample size (N=9), a non-parametric test (Wilcoxon test) was used to analyze changes in weight concern, body image, and affect measures before and after the body image exposure session.

Phase Two

The aim of Phase 2 was to assess the effect of the body image exposure session on the urge to smoke among physically active and sedentary 18-25 year old females. This was a within subjects research design in which participants from both the groups (sedentary vs. physically active) attended one 70- 90 minute session. The study was conducted in the research labs at the Health Behavior Research Clinic located at Weiss Hall on Temple University's main campus. Approximately a 165 sq. foot area, the lab was also equipped with two air purifiers (Airpura T600) specially designed to absorb chemicals in tobacco smoke to eliminate tobacco exposure to other offices in the suite. Participant meetings, signing of informed consents, and debriefing sessions took place in the researcher's office. Assessments (both baseline and post-test) were completed in the research lab.

Participants

Thirty-seven female participants between 18-25 years of age who by self-report smoked for weight control reasons were (scoring ≥ 4 on the Weight Control Smoking Scale) (Pomerleau & Snedecor, 2008) were eligible for the study. To be eligible for the study, they were required to be self-reported regular daily smokers (minimum of 5

cigarettes per day over the past 6 months). Participants were excluded if they reported a current diagnosis, took medication, or were in treatment for Axis I psychiatric disorders (including eating disorders). Prior to participation, informed consent was obtained. Participants received a \$ 15 gift certificate for taking part in the study.

Level of Physical Activity. At the time of screening, participants were asked to report their level of physical activity and were divided into two groups of physical activity: Physically Active (PA) or Sedentary (SE) groups based on the modified version of Godin's leisure-time physical activity questionnaire (Godin & Shepherd, 1985).

Participants were categorized as being physically active if they reported greater than 60 minutes of vigorous physical activity or greater than 90 minutes of moderate physical activity in a week. Participants who reported not engaging in any purposeful physical activity during the past month or those reporting less than or equal to 30 minutes of moderate intensity in a week were categorized as being sedentary. Participants who reported being physically active between 30 and 60 minutes in a week were excluded from the study.

Recruitment

Participants were recruited via flyers posted on Temple University's campus, student dorms, student health center, and student list-serves. The researcher also made recruitment announcements in various undergraduate classrooms across different departments within Temple such as Kinesiology, Philosophy, Chemistry, Public Health, Educational Psychology, Psychology, and Communication Sciences and Disorders (Appendix A). Active recruitment also took place by way of approaching female smokers

who were smoking on Temple's campus. Participants in the study were also encouraged to spread the word of the study to roommates or friends who were female smokers.

Procedure

Participants were required to abstain from cigarettes for approximately two hours before the session. The sessions occurred in a well-lit ventilated room approved for smoking research. To verify abstinence, a measure of expired carbon monoxide (CO) was taken on arrival with a CO > 11ppm (parts per million) used to exclude participants who were non-deprived. If CO was less than 11ppm, they were asked to wait until CO reached the desired level before proceeding with the session. To ensure standardization of time since last cigarette and also to acquaint participants with the topography device, participants were instructed to smoke their own brand of cigarette through the device. They were then provided with baseline questionnaires which took approximately 20-25 minutes to complete. After this interval, participants were introduced to body-image exposure session. At the end of this session, participants were administered post-test questionnaires after which, they were left alone in the room with their choice of cigarettes. This inter-cigarette interval has been considered adequate time to avoid aversive symptoms such as nausea and dizziness due to nicotine overdose (Ashton, 1991). Participants were instructed that they would be given 10 minutes in the room during which they could smoke their cigarette (through the topography device). If they reported feelings of nausea or dizziness, they were given the opportunity to decline to smoke the second cigarette and only complete post-test questionnaires (no one reported these aversive symptoms). All participants were

debriefed after the session and all were provided with mood management, weight control, and anxiety management referrals.

Body image exposure session. Participants were exposed to the refined body image concern eliciting session based on information from Phase 1.

Baseline Measures

The following questionnaires were administered **only at baseline**

Nicotine dependence. Nicotine dependence was measured by the Fagerström Test for Nicotine Dependence (FTND), a self-report measure derived from the Fagerström Tolerance Questionnaire (Heatherton et al., 1991). The FTND is a 6-item questionnaire measuring: time to first cigarette, difficulty in refraining from smoking in places where it is forbidden, number of cigarettes smoked per day, smoking frequency in the morning compared to the rest of the day, smoking whilst ill in bed. It has adequate internal consistency ($\alpha = .64$) and high test-retest reliability ($r = .88$) (Pomerleau et al., 1994).

Smoking motivation. Motivation to smoke was assessed using the Smoking Motivation Questionnaire (SMQ) (Tate, Pomerleau, & Pomerleau, 1994) (Appendix I). The SMQ describes the reasons for smoking and items are scored on a four point Likert scale ranging from 0= not at all to 4= very much so. It has seven subscales: dependent (When I run out of cigarettes, I find it unbearable until I can get them”), automatic (e.g., “I light up a cigarette without realizing I still have one burning in the ashtray”), indulgent (e.g., “I want to smoke most when I am comfortable and relaxed”), sedative (e.g., “I smoke more when I am worried about something”), stimulation (e.g., I get a definite lift

and feel more alert when smoking”), social (e.g., it is easier to talk and get on with other people when smoking”), and sensory (e.g., “I smoke for the pleasure for having something in my mouth”). The subscales have been shown to have high internal consistency ($\alpha = 0.77$) (Tate et al., 1994).

The Body Shape Questionnaire (BSQ) (Cooper, Taylor, Cooper, & Fairbum, 1987) (see Appendix J) was used to assess body image concerns and administered before and after exposure to the body image exposure session. The BSQ is comprised of 34 items and is a practical measure of body image symptoms for persons with excessive concerns about weight and shape. The BSQ uses a 6-point Likert Scale (1= rarely, 6= always) and consists of questions such as, “Has feeling bored made you brood about your shape?,” “Have you been afraid that you might become fat (or fatter?),” “Have you avoided wearing clothes that might make you particularly aware of the shape of your body?” The BSQ has demonstrated high reliability for all 34 items ($r = 0.88$, $p < .001$) and has been shown to have high concurrent validity with other measures of body image (Rosen, Jones, Ramirez, & Waxman, 1996).

Depression and anxiety. Symptoms of depression and anxiety were assessed using the Hospital Anxiety and Depression scale (HADS, Zigmond & Snaith, 1983) that was only administered at baseline (see Appendix K). The HADS is a convenient self-rating instrument for anxiety and depression (Herrmann, 1997) and consists of 7 items measuring anxiety and 7 measuring depression. Participants are asked to rate their symptoms (e.g., tense, afraid, feelings of being slowed down) on a four-point Likert scale. Internal consistency has been shown to be high for both the anxiety ($\alpha = .78-.93$)

and depressive ($\alpha = .82-.90$) scales of the HADS (Hammerlid *et al*, 1999; Stordal *et al*, 2001).

Body mass index. Prior to the body-image exposure session, the participant's body mass index was calculated using weight (kg)/ square of height (in meters). Participants self-reported their height and they were weighed before the start of the body-image exposure session.

Physical activity measures. Physical activity was measured using the modified version of Godin's Leisure Time Physical Activity Questionnaire (Godin & Shepherd, 1985) (Appendix H).

Measures for Primary Outcomes of Interest

Smoking urge and assessments for weight and body image concerns at baseline and after the body image exposure sessions were the primary outcomes of interest and were assessed at the **two-time points (before and after the body-image exposure session)** using the following measures.

Smoking urge. Urge to smoke was measured using both, the smoking topography measures and self-reported urge. Smoking topography was measured through the *CRess pocket* (Clinical Research Support System; Plowshare Technologies, Baltimore, MD) topography device. The *CRess Pocket* is a self-contained battery operated device that measures ambulatory smoking behavior. Topography measures included puff duration, inter-puff interval, number of puffs, and latency to first puff (measured on *CRess pocket*). The device was attached to a workstation which allowed in retrieving and downloading recorded data.

Self-reported urge to smoke a cigarette was measured using the brief version of the Questionnaire for Smoking Urges (QSU-B) (Cox, Tiffany, & Christen, 2001) (Appendix L). This is a 10-item version of the Questionnaire for Smoking Urges (Tiffany & Drobes, 1991) and measures smoking craving and urges. Each statement is rated on a scale of 1 (strongly disagree) to 7 (strongly agree). Two sub-scales have been identified. Factor 1 reflects desire to smoke and includes items such as, "I have a desire to smoke a cigarette right now," "I have an urge for a cigarette." Factor 2 reflects anticipation of relief from withdrawal or negative affect and urgent desire to smoke and consists of items such as, "I could control things better right now if I could smoke," "smoking would make me less depressed." The QSU-B is more psychometrically sound than the longer version of the QSU (Toll, McKee, Krishnan-Sarin, & O'Malley S, 2004). The QSU-B has been used in laboratory studies to assess smoking urges in continuing smokers (Burton & Tiffany, 1997; Drobes & Tiffany, 1997) and has high reliability ($\alpha = 0.97$) (Cox et al., 2001).

Weight concerns and body image. Similar to Phase 1, weight concerns was assessed before and after the body image exposure session using the 10-point Likert scale (0 = not at all, to 10 = very much) developed by Borrelli and Mermelstein (1998). (see Appendix D) Questions on this scale include, "How much do cigarettes help you control your weight?" "How likely is it that you would go back to smoking after quitting if you gained too much weight?" "How important is losing weight or maintaining your current weight compared with other personal health concerns?" This scale has shown to be internally consistent ($r = .87$) and demonstrated convergent validity with a moderate

correlation with a measure of general weight concern ($r = .49, p < .0001$) (B Borrelli & Mermelstein, 1998)

Body-appearance related anxiety. The state form of the PASTAS (Reed et al., 1991) (used in Phase 1) was used to assess changes in anxiety related to specific body parts at the two time points (see Appendix F). The PASTAS is a 16-item questionnaire anchored on a 5-point scale (0= not at all, 4= exceptionally so) and participants rated how anxious or nervous they feel about specific parts of the body (e.g., thighs, buttocks, stomach, hips) at that moment. The scale has high internal consistency ($r = .88- .82$) and test-retest reliability ($r = .87$) (Reed et al., 1991).

Withdrawal symptoms. As withdrawal from nicotine may also influence urge to smoke, an assessment of the participant's withdrawal symptoms was examined using the Withdrawal Symptoms Check List (WSCL) ((J.R. Hughes & Hatsukami, 1986) (see Appnedix M) . The WSCL is a self-report questionnaire that assesses the degree of severity of a variety of symptoms of nicotine withdrawal (craving, irritability/frustration/anger, anxiety, difficulty concentrating, restlessness, increased appetite, depressed mood, impatience, insomnia, drowsiness, and headaches). Each item (symptom) score ranges from 0 (none) to 4 (severe), with a total withdrawal symptom score ranging from 0 to 39.

Measures for Secondary Outcomes of Interest

A secondary aim of the study was to assess changes in anxiety and depressive symptoms at baseline and after the body image exposure session and examine predictors of urge to smoke after the body-image exposure session.

Affect. Similar to Phase 1, the PANAS was used to assess changes in positive affect (10 items, such as enthusiastic, strong) and negative affect (10 items, such as distressed, upset) at baseline and post body-image exposure session (see Appendix G). The items were scored on a 5-point Likert scale (1= very slightly or not at all, 5= extremely). Both PA and NA scales are highly internally consistent and demonstrate good convergent and discriminant validity (Watson, Clark, & Carey, 1988).

Power Analysis

The power analysis for Phase 2 of the study accomplished using PASS (Power analysis and Sample Size) software. Due to similarities in the research design and objectives, descriptives from Jenks and Higgs (Jenks & Higgs, 2007a) were used as a basis for the power analysis, and included information on the topography variables puff volume, number of puffs, butt length, and inter-puff interval. Due to unique variables proposed in this study (novel stimulus, influence of physical activity), a more conservative effect size (10%) was assumed. A MANOVA design based on 1 factor representing dichotomous levels of physical activity (PA) and 5 responses variables resulted in two groups of 22 subjects each. This design achieves 75% power to evaluate effects of PA using a Wilks' Lambda approximate F test with a 5% significance level (Power = 0.80; Beta = 0.20).

Data Analysis

This phase had two primary objectives. The first objective was to assess the influence of the body-image exposure task on urge to smoke among college-age female smokers with high weight concerns. The second primary objective was to evaluate the

impact of physical activity on urge to smoke. The phase also had two secondary aims: to assess changes in body dissatisfaction, physical appearance related anxiety, and affect following the body image exposure session and examine associations between depression and anxiety on urge to smoke. Data were entered and analyzed using SPSS 18.0.

Primary Aims

Specific aim 1. To assess the effects of the body-image exposure task on urge to smoke among weight concerned college-age female smokers.

Baseline participant characteristics (age, daily smoking rate, age of smoking initiation, WCSS scores, FTND, and HADS, physical activity measures) for the entire sample as well as for the two groups of physical activity were generated. Independent sample t-test was used to compare variables (baseline smoking, body image, and demographic variables) by physical activity group to observe if there were differences in these variables in the two groups. Additionally, descriptive statistics (means and standard deviations) were calculated for all measures of smoking urge was calculated at the two time points (pre-exposure and post-exposure) and included QSU, latency to first puff, number of puffs, puff duration, and inter-puff interval.

Dependent variables in this analysis included smoking urge by QSU, latency to first puff, number of puffs, puff duration, and inter-puff interval. Mean values for the five dependent variables were compared pre-exposure to post-exposure using paired sample t-tests. Because this analysis involved multiple comparisons, alpha level was

adjusted for multiplicity using the Bonferroni coefficient. Significance was set at the 0.01 level (.05/5; 5 dependent variables).

Specific Aim 2. To assess if physical activity influences the relationship between body image concerns and urge to smoke.

Descriptive estimates (means and standard deviations) of all measures of smoking urge (QSU, latency to first puff, number of puffs, puff duration, and inter puff interval) were generated for the two groups of physical activity defined by sedentary (SE) and physically active (PA) groups before and after exposure to the body-image exposure session (pre-test and post-test). Paired sample t-test was used to compare means of pre-test and post-test urge scores by SE and PA groups.

To address this aim, a 2X2 (urge x physical activity) repeated measures ANOVA with repeated on the first factor (pre and post urge) was computed comparing the mean scores of urge for the PA and SE groups controlling for WSCL, FTND, and WCSS scores. Withdrawal was computed as a change score (post-test withdrawal minus pre-test withdrawal) to control for pre-test withdrawal. To examine if there were changes in urge scores within the SE and PA groups, a one-way repeated measures ANOVA for the urge variables (QSU and latency to first puff) was computed. Finally, partial correlation analyses were conducted between measures of smoking urge and physical activity. Partial correlation analysis is aimed at finding correlation between two variables after removing the effects of other variables. Controlling variables included in the analysis were WCSS, FTND, and WSCL. Other variables that were significantly associated with urge identified via bivariate correlations were entered as controlling variables.

Secondary Aims

The secondary aims of the study were to examine changes in body dissatisfaction, affect, and physical appearance related anxiety pre and post examine. Descriptive estimates (mean and standard deviations) for the BISS, PASTAS, and PANAS for the entire sample were generated pre and post exposure session. Paired sample t-test were used to compare mean scores of these measures at pre and post-test for the entire sample. As this was a secondary aim so the study, no adjustment was made for multiplicity and significance will be taken at 0.05 level.

Another secondary aim was to examine associations between anxiety and depressive symptoms and urge to smoke at post-test. Two partial correlation analyses were performed to observe associations between HADS-depression subscale and HADS-anxiety subscale with measures of smoking urge with potential controlling variables of pre-test urge, BMI, WSCL, WCSS, and FTND. As in the previous analysis, no adjustment was made for multiplicity ($p = .05$).

CHAPTER 4

RESULTS AND DISCUSSION FOR PHASE 1

This study aimed to assess the effects of a novel behavioral task designed to increase body image and weight concerns on urge to smoke among 18-25 year old weight-concerned female smokers. The study had two aims: 1) to examine the effects of the body-image exposure task on increasing urge to smoke; 2) to explore the protective effects of physical activity on urge to smoke. As described in the Methods, the study was conducted in two phases. Phase 1 involved pilot testing of the body image exposure task and Phase 2 examined the effects of the exposure task on urge to smoke. Results from Phase 1 of the study are presented below.

The primary purpose of this phase was to pilot test the body image exposure session and examine its efficacy in increasing body and weight concerns among 18-25 year old weight-concerned female smokers.

Recruitment for Phase 1 occurred from June through November of 2009 during which a total of 19 participants were telephone screened for eligibility. The mean number of daily cigarettes ($N=19$) reported was 7.0 ($SD = 2.88$). The mean weight concern score was 5.7 ($SD = 1.71$). Overall, this sample of college female smokers had moderate-to- high weight concern scores on the WCSS (total score of 9). Of the 19 participants, nine were eligible for the study (10 were ineligible).

Sample Characteristics

A predominate percent (77%) were Caucasian/White. Three out of the 9 participants reported smoking 8-10 cigarettes per day. Hence, an average of 9 was taken for their daily consumption of cigarettes. No one reported smoking more than 10 cigarettes per day. Of the sample, 88.9% had at least 3 straight days of not smoking any cigarettes and reported approximately 2 quit attempts ($M= 2.2$; $SD = 1.69$). Sample characteristics are presented in Table 1.

Table 1

Sample Characteristics for Entire Sample (N=9) for Phase 1

Variable Name	M	SD
Age	20.30	0.97
Body Mass Index	24.86	4.31
Weight Control Smoking Scale	6.00	2.06
Cigs Smoked Per Day	9.44	0.53
Nicotine Dependence	8.11	1.33
Age of smoking initiation	17.77	0.97

Qualitative Data

Three open-ended questions were asked of participants at the end of the body-image exposure session to obtain feedback on the validity of the task and to improve this session for the next phase.

Question 1: What do you think the session was intended to do?

While some of the participants were not sure of the session purpose ($n=3$), others ($n=5$) mentioned that the session was intended to “pick or draw attention on parts of the

body.” One participant felt that the session attempted to better understand smoking behavior with body image.

Question 2: How do you perceive your body before and after the session?

A majority of the participants (n=7) reported experiencing increased dissatisfaction regarding their body. One participant answered, “I feel worse about my body now than before. It was as if I were picking on things and drawing attention to my body in a different way”. Another participant felt that the increased awareness of her body made her want to do something about it. She said, “I feel like going home and heading to the gym. This makes me want to work out more.” Another participant mentioned that she felt a greater urge to smoke at the end of the session. Only one participant mentioned that she did differ in her perception of her body before and after the session.

Question 3: Are there any recommendations to change the session in any way?

Five participants provided recommendations to change the session so as to increase body and weight concerns for Phase 2. These included weighing the person before the start of the session, asking the person to visualize their body before they see themselves in the mirror, and asking how other people viewed their body rather than just themselves thinking about their body. One participant felt that the session could be more effective if the researcher could draw more attention to a single problem area that the person mentioned. For example, “asking questions like why you feel that way about your body would give better answers.” Finally, one participant recommended asking

about the most dissatisfied body part before talking about the other parts as a way to better the session for the next phase.

Body and Weight Concern Measures

Table 2 illustrates pre and post-test measures for the weight concern scale (WCS), body image states scale (BISS), physical appearance state and trait anxiety scale (PASTAS), and positive and negative affect scale (PANAS), and self-reported urge to smoke. Overall, there were changes in the measures of weight and body image concern, affect, and smoking urge from baseline to follow-up. Specifically, at post-test, 55.6% scored higher on the WCS and the entire sample (100%) reported an increase in the PASTAS. Additionally, 88.9% reported a reduced score on the BISS (body image state scale) and reduced positive affect (PA). Self-reported urge to smoke also increased from pre-test with 66.6% reporting an increased urge at post-test.

Results of Primary Aims

Considering the small sample size, Wilcoxon signed rank test (a non-parametric test) was used to examine differences in the mean scores of the WCS, PASTAS, BISS, PANAS, and urge to smoke scores at pre and post test. The results of the Wilcoxon signed rank test along with the mean pre and post test scores on WCS, BISS, PASTAS, PANAS, and urge to smoke are presented in Table 2. While there was no significant difference in the mean scores of the WCS, there was a significant difference in the BISS ($Z = -2.49, p = 0.01$), PA ($Z = -2.50, p = .01$), and PASTAS ($Z = -2.67, p < .01$). There was a trend ($p = 0.057$) for a difference in self-reported smoking urge. However, mean differences in negative affect (NA) were not significant ($p = .49$).

Table 2

Wilcoxon Signed Rank Test Comparing Variables Pre and Post Body-Image Exposure Session

Variable Name	M	SD	Z	Sig
Body Image States Scale				
Pre-test	30.89	8.08		
Post-test	23.11	5.64	-2.49	0.01*
Positive Affect				
Pre-test	26.88	5.01		
Post-test	23.44	5.70	-2.50	0.01*
Physical Appearance Anxiety				
Pre-test	15.00	7.87		
Post-test	21.44	9.38	-2.67	<.01**
Smoking Urge				
Pre-test	4.55	2.00		
Post-test	6.33	2.64	-1.90	0.057
Negative Affect				
Pre-test	19.00	6.04		
Post-test	18.44	5.43	-0.69	0.49
Weight Concern Scale				
Pre-test	4.85	2.40		
Post-test	5.31	2.38	-1.01	0.31

** p < .01; * p < .05

Discussion and Recommendations for Phase 2

The purpose of Phase 1 of the study was to pilot test the effectiveness of a novel behavioral task (a body image exposure session) on increasing body and weight concerns in a population of 18-25 year old weight concerned female smokers. It was also proposed

that based on the results of this phase, changes to the body image exposure session, if needed, would be introduced for Phase 2.

The results supported the hypothesis that after exposure to the body image exposure session, participants reported increased body image related anxiety and body dissatisfaction. There was a non-significant increase in weight concern scores. In addition, there was also a reduction in positive affect, and a trend for an increase in urge to smoke. This is the one of the initial studies that has attempted to elicit body and weight concerns using a combination of body image exposure and script driven imagery in an attempt to observe its relationship to smoking urges.

Drawing attention to parts of the body through mirror exposure has been seen to increase feelings of anxiety and lower body image among women with body dysmorphic disorders, eating disorders, and restrained eaters (e.g., Clerkin & Teachman, 2009; Veale & Riley, 2001; Vocks, Legenbauer, Wachter, Wucherer, & Kosfelder, 2007). Participants in this sample were women with high weight concerns but were screened for any Axis-I disorders including diagnosis for eating disorders. Our results show that similar feelings (anxiety, lower body image) can also be experienced by women who have increased weight concerns but may not have a clinical diagnosis of eating disorder-related psychopathology.

Script-driven imagery (Pitman et al., 1987) has largely been used with PTSD individuals to provoke symptoms during psychophysiological assessments. These studies have shown that such imagery shows robust physiological responses like an increased startle response, skin conductance, and heart rate (McTeague et al., 2010; Orr, Pitman,

Lasko, & Herz, 1993) as well as increased feelings of anger (Pitman, Orr, Forgue, de Jong, & Claiborn, 1987), distress (McTeague et al., 2010), negative affect and anxiety among individuals with PTSD (Beckham et al., 2007). However, this is the first time descriptions of various body parts have been used in script driven imagery and used in a sample of weight concerned female smokers. Similar to other studies, participants in this study also reported increased anxiety specifically related to body image as well as reduced positive affect showing the efficacy of using this behavioral task as means to increase situational changes to body and weight concerns in a lab-setting.

There was a non-significant change in weight concern before and after the body-image exposure session that could be attributed to the small sample size. With an increase in sample size in phase 2, we expect to see the increase in weight concern at post-test reaching the desired level of significance. In the pilot, we also observed that there was an unexpected increase in negative affect, though this was not significant. As with weight concerns, this could be a result of the small sample size. However, the body image exposure session was very successful in decreasing positive affect significantly. Though positive and negative affect are related concepts, they are distinct constructs with different psychological (Watson, Clark, & Tellegen, 1988) and biological correlates (Davidson, 1992). It is possible that this body image exposure session influenced affective responses more so by reducing positive affect than increasing negative affect. While studies show a relationship between smoking urge and negative affect (e.g., Leventhal, 2010; Shiffman & Waters, 2004; Tiffany & Drobles, 1990), there is emerging evidence that low positive affect (Presson, Chassin, & Sherman, 2002) or a reduction in

positive affect (Rabois & Haaga, 2003; Zinser, Baker, Sherman, & Cannon, 1992) can also lead to an increased motivation to smoke. Thus, apart from increased negative affect, recent evidence that suggests that reduced positive affect is also associated with smoking behavior.

Preliminary findings also show a trend for a significant increase in self-reported urge to smoke at the end of the body-image exposure session, paving the way to explore the influence of the increased body and weight concerns on smoking urge. However, this finding may need to be interpreted with caution for two main reasons. Firstly, this phase did not control for pre-session hours of abstinence and there is a possibility that the increase in urge may be a result of withdrawal rather than the actual exposure session. Secondly, participants self-reported their urge to smoke on a scale from 0 (no urge at all) to 10 (strongest urge they have ever felt). While this can be a reliable measure of urge, there is a need to have more valid self-report measures of urge, such as, the Questionnaire for Smoking Urges (Tiffany & Drobes, 1991), and objective measures such as smoking topography. These limitations will be addressed in Phase 2 of the study. Nevertheless, the increase in urge to smoke at the end of a session that manipulates body and weight concerns is an interesting finding and will be explored in greater detail in Phase 2 of the study.

Implications of the Study

Results from this pilot can have implications for smoking cessation interventions. While mirror image exposure therapies have only been used in treatment programs among women with eating disorders, these results show that even women with greater

smoking related weight concerns may benefit if such exposure therapies are included as a treatment component in smoking cessation interventions. This, along with evidence-based cognitive behavioral therapy, will greatly help in improving cessation outcomes and reducing the likelihood of a relapse, especially among women with weight concerns.

Changes to Phase 2 Based on Findings from Phase 1

Changes to the Body Image Exposure Session

As the body image exposure session, by itself, produced the intended increases in body image and weight concern scores, only two main changes were made to refine this session for Phase 2 so as to minimize participant burden and assure that the study could be complete within a reasonable time frame. Both these changes were based on the qualitative data that the participants provided. First, after the participants changed into their choice of apparel (and before they started the session), they were asked to weigh themselves in the room while the researcher was present. Second, before the researcher prompted them to describe various parts of their body, participants were asked to discuss one part of their body they were dissatisfied with the most and elaborate on their reasons for being dissatisfied. After they had completed this description, the researcher continued with the same body-image exposure session protocol that was carried out in Phase 1.

Changes to the Eligibility Criteria

In keeping with the rationale that heavier smokers in this population were more likely to smoke for weight control reasons, a cut-off of a daily smoking rate of 10 cigarettes per day was originally chosen for both phases of the study. As the body image

exposure session is intended to increase urge to smoke, there is a greater likelihood that the increases in urge would be more pronounced among heavy smokers. However, preliminary data from Phase 1 and the subsequent review of available epidemiological data regarding smoking trends among college students has highlighted that what defines “heavy smokers” in this population of college students may be different compared to the general sample of adult smokers.

Characteristics of ineligible participants for Phase 1. Of these 19 screens completed for Phase 1, the average number of cigarettes for the eligible participants (N=9) was 6 (*SD* =2.06). Mean score on the WCSS for the ineligible group (N=19) was 5.6 (*SD* =1.22). An independent sample T-test revealed no significant differences in the weight concerns score between the eligible (those who smoked more than 10 cigarettes per day) and ineligible groups (those who smoked five cigarettes per day) ($t = -.49$; $p=.63$). Thus, weight concerns related to smoking may have less to do with number of cigarettes smoked per day and be more related to the weight control properties that the individual attributes to smoking. Although 10 participants were ineligible based on the original criteria of 10 cigarettes per day, the amount and rate students were smoking then prompted a re-review of the epidemiological literature.

General smoking trends among college smokers. Along with a steady decline in smoking rates among college students over the years, the average number of cigarettes smoked per day seems to be declining as well.

In one of the earlier studies to examine trends in smoking rates among college students between 1993-1997, (Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998) found that

though smoking rates among college students had increased, more than 40% of smokers averaged less than 1 cigarette per day with approximately 25% smoking less than 10 cigarettes/day. In a 1999 nationally representative sample of college students (n=14,314), smoking rates seemed to have stabilized. Although more than half of the sample reported ever smoking a cigarette (53.4%), 29% reported smoking in the past 30 days (current smoking). Of these, 32% reported smoking less than 1 cigarette per day, and almost half (43.6%) smoked between 1-9 cigarettes per day (Rigotti, Lee, & Wechsler, 2000). Although cigarette use among college students hit a peak in 1999, the rates have been steadily declining (Johnston, O'Malley, & Bachman, 2001). Moreover, these studies have found non-significant gender differences in smoking practices among college students with rates relatively the same among male and female college students (Johnston et al., 2001; Patterson, Lerman, Kaufmann, Neuner, & Audrain-McGovern, 2004). Daily smoking practices also have non-significant gender differences. For instance, Johnston et al. (2001) found that of the 27% of college females who smoke regularly, only 10% smoked more than 10 cigarettes per day (as compared to 11% of the 30% male smokers).

Smoking rates among female college smokers. In one of the more recent large scale studies examining characteristics of college age students regarding tobacco use, Thompson et al (2007) examined tobacco use in 30 colleges and universities. Fifty three percent of the women (N=9,409) had never smoked and 16.6% were current smokers and 29.9% was former smokers. On an average female students who identified themselves as current smokers (smoked at least one cigarette in the past 30 days)

reported smoking approximately 5 cigarettes per day ($M=4.34$, $SD = 5.4$) and former smokers reported an average of smoking 3 cigarettes per day in the past ($M=2.59$, $SD=7.16$). An examination of the smoking characteristics among male and female smokers showed that college students were, in general, light smokers who may not smoke everyday of the month (Thompson et al., 2007). A more recent study attempted to explore differences among college students to understand if there were distinct sub-groups among college student smokers. Sutfin and colleagues (2009) assessed patterns of smoking in a college-age population in the North Carolina area. Twenty eight percent of the daily smokers were classified as being heavy smokers (smoking 6-10 cigarettes/day). However, 41% smoked between 2-5 cigarettes per day. These included moderate smokers (smoking on most days of the month) social smokers (smoke on 3-5 days/month) and 26% were puffers (smoking 1 or 2 cigarettes/month). Female smokers comprised a majority of the moderate and social sub-group of smokers (Sutfin, Reboussin, McCoy, & Wolfson, 2009).

Changing eligibility criteria to 5 cigarettes per day. The available data suggests that along with the decline in smoking rates among college students, what may be considered as “heavy” smokers in the general population (greater than 10 cigarettes per day) may not apply to the female college student population. This population on the whole, smokes less than 10 cigarettes and the heavier smokers in this population smoke between 6-10 cigarettes per day. However, a smaller proportion of the population smokes this amount (28%). Considering the fact that a majority of college female smokers smoke between 2-5 cigarettes and as the dissertation was aimed to capture

smokers at the higher end of the continuum, it seemed reasonable to speculate that female smokers who smoked 5 or more cigarettes/day can be classified as relatively heavier smokers within this population. To screen out the social smokers, it was clarified that participants would need to have been smoking (5 or more cigarettes) everyday for the past 6 months. Moreover, the study was particularly aimed at capturing smokers who smoke for weight concerns (as captured by the Weight Concern Scale for Smoking asked during the screening protocol). By only including weight concerned female smokers who smoked 5 or more cigarettes per day every day for the past 6 months in phase 2, Phase 2 of the study was able to include smokers who rely on smoking to assuage their weight concerns.

Summary of Phase 1

The purpose of Phase 1 was to pilot test if the novel behavioral task (a combination of body-image exposure session and script-driven imagery) was effective in increasing body and weight concerns in a sample of 18-25 year old weight concerned female smokers. The results from this phase showed that at the end of the exposure session, participants reported reduced body image states and increased body-image related anxiety along with a reduced positive affect. There was also a trend for an increase in urge to smoke. As the session was successful in eliciting body and weight concerns, only two additional changes were made based on lessons from the pilot : 1) Based on the feedback from the participants, all participants for Phase2 were weighed and were asked to discuss one part of their body they were most dissatisfied along with reasons for being dissatisfied before the start of the body-image exposure session, (2)

due to the decreased prevalence of smoking rates in this population, the eligibility criterion was changed to include smokers smoking 5 or more cigarettes per day (for the past 6 months) for Phase 2.

CHAPTER 5

RESULTS FOR PHASE 2

The purpose of this phase was to observe the effects of the body-image exposure session on urge to smoke among physically active and sedentary college-age women. The second purpose of the study was to explore the effects of physical activity on smoking urge in this sample. Results from this phase are presented below.

Recruitment

After pilot testing and introducing the modifications discussed in the previous chapter, recruitment for this phase began in December 2009 and ended the last week of September 2010. In this period, a total of 79 phone screens were completed, of which 30 participants were ineligible. Twelve eligible participants did not keep their scheduled appointments and could not be further contacted to reschedule. The remaining eligible participants (N=37) were enrolled for Phase 2 of the study. Based on their self-reported physical activity, 21 were classified as being in the physically active (PA) group and 16 were in the sedentary (SE) group.

Sample Characteristics

A predominant percent 75.7% were Caucasian/White, 13.5% were African American, and 10.8% were Asian. Baseline characteristics for the entire sample are presented in Table 3. Within this sample, 81.1% reported having at least having 3 or more days of not smoking any cigarettes and had been smoking for approximately 3 years ($M= 3.39$; $SD = 2.06$).

Table 3

Sample Characteristics for Entire Sample (N=37) for Phase 2

Variable Name	M	SD
Age	20.27	1.50
Cigs smoked per day	8.81	3.97
Age of smoking initiation	16.50	1.70
Number of quit attempts	2.23	2.24
Weight Control Smoking Scale	4.97	1.38
Nicotine Dependence	4.54	1.64
Body Mass Index	23.73	5.69
Body Shape Questionnaire	93.05	28.73
Depression	8.59	3.12
Anxiety	11.35	3.71

There were no statistically significant differences between the PA and SE groups on age, BMI, FTND, number of cigarettes smoked per day, number of previous quit attempts, WCSS scores, and anxiety and depression scale of the HADS, and BSQ.

Baseline characteristics by PA and SE groups are presented in Table 4. The two groups were statistically different in the time spent engaging in physical activity with the PA group reporting statistically higher time engaging in vigorous ($p < .01$) and moderate intensity exercises in a week ($p = .03$). Only one person in the SE group reported engaging in vigorous physical activity (10-15 min on 1 day) and 95% in the PA group reported engaging in vigorous activity at least 1 day of the week. There were no differences between the two groups in time spent doing low intensity exercises.

Descriptive statistics for time and frequency of physical activity for the two groups are included in Table 4. Within the subscale for motives for smoking (SMQ), the PA group had higher scores on the automatic subscale, but there were no differences between

the groups on the sedative, indulgent, addictive, psychosocial, and stimulation subscales.

Table 4

Sample Characteristics by Sedentary (SA) and Physically Active (PA) Groups

Variable Name	SE (N =16)		PA (N=21)		p
	M	SD	M	SD	
Age	20.33	1.53	20.21	1.52	0.82
Weight Control Smoking Scale	5.00	1.30	4.93	1.52	0.89
Nicotine Dependence	4.54	1.64	4.66	1.82	0.60
Body Shape Questionnaire	97.31	28.92	89.8	28.86	0.56
Depression subscale	9.56	3.98	7.87	2.08	0.10
Anxiety subscale	11.93	4.34	10.90	3.19	0.41
Smotive Motives Questionnaire					
Automatic	1.06	1.52	1.43	1.711	0.02*
Sedative	7.00	1.96	7.62	1.75	0.30
Psychosocial	3.81	1.75	4.86	2.83	0.30
Indulgent	3.56	1.86	3.05	1.88	0.86
Addictive	4.81	2.40	4.71	2.81	0.90
Stimulation	2.75	1.77	3.00	2.00	0.87
Physical Activity (Days in a week)					
Vigorous intensity	0.63	0.25	2.85	1.42	0.01**
Moderate intensity	0.91	1.03	4.57	1.85	0.01**
Low intensity	3.30	2.60	3.71	3.01	0.15
Physical Activity (Mins in a week)					
Vigorous intensity	0.78	3.13	135.71	95.27	0.01**
Moderate intensity	11.80	12.84	214.76	150.31	0.03*
Low intensity	1.88	7.5	20.12	61.8	0.45

** p< .01, *p<.05

Primary Aims Analyses

Specific Aim 1

To assess the effects of the body-image exposure task on urge to smoke among weight concerned college-age female smokers.

Hypothesis 1. There will be significant increases in post-test urge in the entire sample as measured by the QSU, and topography measures of latency to first puff, number of puffs, puff duration, and inter puff interval.

Descriptive statistics calculated for all measures for QSU and topography measures including number of puffs, latency to first puff, interpuff interval, and puff duration at the two time points (pre-exposure and post-exposure) along with results for the paired sample T-tests for the entire sample are presented in Table 5.

Table 5

Paired Sample t-tests Comparing Pre and Post Measures of Smoking Urge (N=37)

Variable	Mean	SD	t
Questionnaire for Smoking Urges			
Pre	2.10	9.85	- 5.43**
Post	3.13	14.76	
Latency to first puff			
Pre	12.01	4.79	2.81**
Post	9.00	4.90	
Puff Number			
Pre	17.00	4.31	2.00
Post	15.54	4.61	
Puff Duration			
Pre	1.41	0.41	2.49
Post	1.33	0.42	
Interpuff interval			
Pre	15.47	4.17	- 0.26
Post	15.69	5.52	

* p value set at 0.01 (using Bonferroni coefficient; 0.05/5)

**p<.01

Using a Bonferroni adjustment, the alpha coefficient was set at 0.01 (0.05/5). Paired sample t-tests showed significant increases in post-test QSU scores ($t = -5.42, p < .00$) and quicker post-test latency to smoke at post test ($t = 2.81, p < .00$). There were no significant differences in the other smoking topography measures of number of puffs, interpuff interval, and puff duration. Bivariate correlations between the five measures of smoking urge pre and post test are presented in Appendix N.

Specific aim 2

To evaluate the impact of physical activity on the relationship between body-image concern and urge to smoke.

Paired sample t-tests were used to compare means of the five DVs (QSU, latency to first puff, number of puffs, puff duration, and inter puff interval) at both time points (pre and post) within PA and SE groups. Consistent with the proposed hypothesis, the SE group demonstrated a statistically significant quicker latency to puff at post test ($M = 7.96, sd = 3.20$) compared to pre-test ($M = 11.72, sd = 4.21$) ($t = 3.25; p < .01$). Similarly, in keeping with the proposed hypothesis, there was a significant increase in the QSU scores at post-test for the SE group ($t = -.46, p < .01$). There was also a significant increase in QSU scores from pre test ($M = 1.88, sd = .84$) to post-test ($M = 2.78, sd = 1.51$) in the PA group and this change was statistically significant ($t = -3.21, p < .01$). There were no significant differences in the other measures of smoking topography measures in the PA group. Table 6 provides descriptive statistics (means and standard deviations) along with the results of the t-test for pre and post test measures of smoking urge by PA and SE groups.

Table 6

Paired Sample T-test Comparing Pre and Post Means of Smoking Urge Variables by Groups

Variable	Pre-Test (M, SD)	Post-test (M, SD)	T	p*
Sedentary (N=16)				
Questionnaire for Smoking Urges	2.40 (1.10)	3.60 (1.33)	- 4.96	0.01**
Latency to first puff	11.72 (4.21)	7.97 (3.40)	3.26	0.01**
Number of puffs	17.31 (4.60)	16.54 (4.21)	2.02	0.06
Puff Duration	1.43 (0.49)	1.41 (0.51)	0.56	0.59
Inter puff interval	15.44 (2.46)	16.50 (4.18)	- 0.96	0.35
Physically active (N=21)				
Questionnaire for Smoking Urges	1.88 (0.84)	2.79 (1.51)	- 3.21	0.01**
Latency to first puff	12.23 (5.29)	9.79 (5.57)	1.45	0.16
Number of puffs	16.48 (4.13)	15.29 (4.82)	0.99	0.33
Puff Duration	1.39 (0.36)	1.31 (0.36)	2.17	0.04
Inter puff interval	15.49 (5.17)	15.07 (6.40)	0.39	0.70

* p value set at 0.01 (using Bonferroni coefficient; 0.05/5)

**p<.01

Hypothesis 2. Female smokers in the PA group will have lower urge to smoke as measured by the QSU and latency to first puff as compared to those in the SE group.

Rationale: For this hypothesis (and subsequent hypotheses, we have decided to only examine two measures of smoking urge (i.e., self-reported urge to smoke [measured by QSU scores] and latency to first puff [as measured by smoking topography]). This is for the following reasons: 1) measures of nicotine intake (e.g., puff number, puff volume, etc) is a less important factor of self-reported urge to smoke among women (D. Hatsukami, Skoog, Allen, & Bliss, 1995). 2) While topography variables are important in studying smoking behavior, when considering all variables of smoking topography, latency to first puff (or time to first puff) has known to be most

closely associated with self-reported craving (Henningfield & Griffiths, 1979; Sayette et al., 2000). Latency to first puff serves as an ideal proxy of the behavioral response to urge because subsequent use of the drug (e.g., puff volume, number of puffs) tends to be more associated with the pharmacological effects of the drug and less associated with actual craving (Tiffany, 1990). Accordingly, results for analysis described below were analyzed and interpreted using the adjusted Bonferroni alpha coefficient set at 0.025 (0.05/2).

QSU and physical activity. A two factor repeated measures ANOVA (QSU X physical activity) with repeated measures on the first factor (pre and post QSU) was computed comparing the mean scores of QSU for the PA and SE groups controlling for WSCL and FTND. The WCSS was added as the third covariate to control for baseline weight concerns related to smoking. The two measures of weight and body concerns used in the study (BSQ, WCSS) were highly correlated with each other ($p < .01$). However, while the BSQ only captures concerns about body shape and weight, it does not specifically look at smoking-specific weight concerns which are captured by the WCSS and hence was included as a controlling variable in all subsequent analysis.

Results for the repeated measures ANOVA showed that the interaction between the physical activity level and post-test measures of the QSU was not significant ($F(1, 32) = 0.99, p = .33$) (see Table 7).

Table 7

2X2 Repeated Measures (Questionnaire for Smoking Urges (QSU) x Physical Activity)
ANOVA

Variables	F	df	p
QSU	2.07	1	0.16
QSU x Physical Acitivity	0.98	1	0.33
QSU x Nicotine Dependence	9.14	1	0.00**
QSU x Withdrawal	0.26	1	0.61
QSU x Weight Control Scale	1.36	1	0.25

**p<.01

Mean scores from pre to post test scores of the QSU after controlling for WSCL, FTND, and WCSS are illustrated in Figure 1.

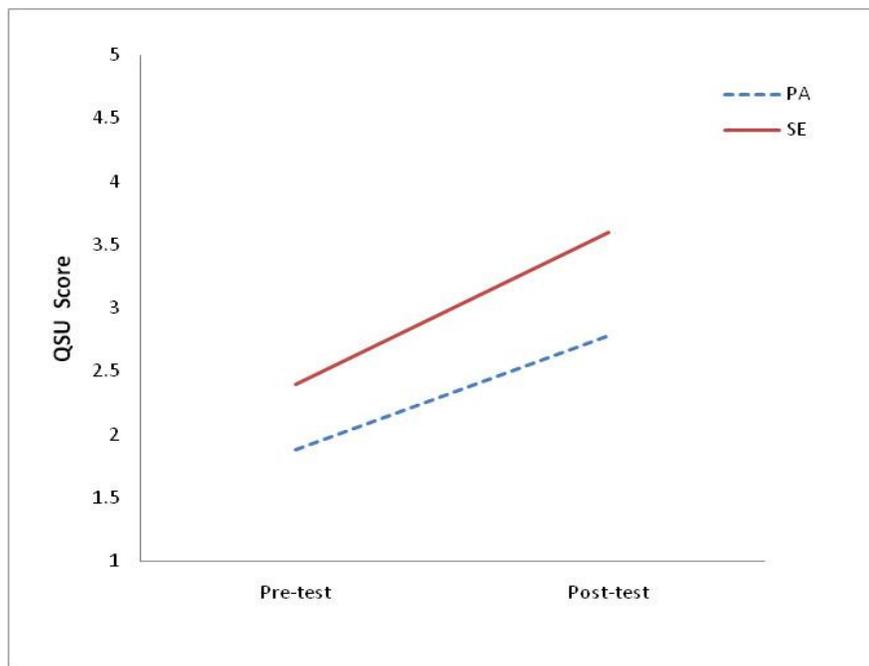


Figure 1

Repeated Measures ANOVA for Questionnaire for Smoking Urges (QSU) scores by
Physical Activity Groups

Considering the small sample size in each group, a final step was to explore the effects of physical activity as a continuous variable on QSU to observe if variability in time spent in physical activity would influence QSU scores. The association between physical activity and QSU was analyzed using partial correlations controlling for potential covariates. Multiple regression analyses could not be used due to concerns regarding the small sample size. Partial correlation analyses are aimed at finding correlations between two variables after removing the effects of other variables. The covariates for the partial correlation analysis apart from pre-test QSU included those used in the above analysis (WSCL, FTND, and WCSS).

Other controlling variables. Combining the PA and SE groups led to increase in sample size (from 16 and 21 in each group to a total sample size of 37) allowed for additional controlling variables to be added to the partial correlation analysis. Other covariates included HADS-Depression subscale, BMI, and SMQ-sedative subscale. These variables were included for the following reasons: 1) Both depression and anxiety were highly correlated with the QSU (depression =.50, $p < .01$; anxiety $r = .35$, $p = .04$) 2) SMQ-sedative subscale was added as an additional covariate as it is a non-nicotine related motive to smoke and is closely related to smoking urge in stressful situations (Hajek & Belcher, 1986). Time spent in vigorous physical activity in the week showed a trend to be associated with QSU ($r = -.30$; $p = .07$) and was examined in the partial correlation analysis, as it has the strongest relationship with cessation in the literature (e.g, Marcus et al., 1999; Taylor et al., 2007b). Bivariate associations between the covariates and physical activity variables with QSU scores are presented in Table 8.

Table 8

Bivariate Correlations between Baseline Variables and Post-test Questionnaire for Smoking Urges (QSU) and Latency to First Puff

Variable	QSU	Latency to first puff
Smoking Variables		
Nicotine Dependence	0.29 *	-0.18
Number of quit attempts	0.10	-0.25
Withdrawal Scale	0.25	0.09
Weight Concern Variables		
Body Shape Questionnaire	0.27	-0.04
Weight Control Smoking Scale	0.26 *	0.20
Weight Concern Scale	0.18	0.21
Body Mass Index	-0.08	-0.09
Depression	0.50 ***	-0.28
Anxiety	0.35 **	-0.29 *
Smotive Motives Scale		
Indulgent	-0.14	-0.50
Addictive	0.57 ***	-0.10
Stimulation	0.38	-0.21
Sedative	0.50 ***	-0.16
Psychosocial	0.10	0.01
Automatic	0.41 **	0.15
Physical Activity (mins/wk).		
Vigorous Intensity	-0.30 *	0.11
Moderate Intensity	-0.06	0.19
Low intensity	0.01	-0.09

***p<.01; **p<.05, *p<.10

Results from the partial correlation analysis showed a significant negative association between time spent in vigorous activity and post-test QSU ($r = -0.44$; $p = .01$). Controlling for potential covariates in the model, there was a significant association between physical activity and urge to smoke and this relationship had a small effect size

(0.20). Interestingly, the number of days spent doing vigorous physical activity was not significantly associated with QSU ($r = -.35$; $p = .06$) indicating that the duration rather than the frequency of physical activity is associated with lower self-reported urge at post-test.

Latency to first puff and physical activity. A two factor (Latency X physical activity) repeated measures (pre and post latency) ANOVA was conducted comparing the mean scores of latency to first puff for the PA and SE groups controlling for WSCL, FTND, and WCSS. The interaction between the physical activity level and post-test measures of the latency was not significant ($F(1, 32) = 0.86$, $p = .36$) (Table 9). Mean scores from pre to post test of the QSU after controlling for WSCL, WCSS, and FTND are illustrated in Figure 2. Though there seems to be a trend for decreased mean latency to first puff at post-test in the SE group ($M = 7.97$; $SD = 3.40$) than the PE group ($M = 9.79$; $SD = 5.58$) (Figure 2), this difference did not reach statistical significance ($t = -1.16$, $p = .26$).

Table 9

2X2 Repeated Measures (Latency to first puff x Physical Activity) ANOVA

Variables	F	df	p
Latency to first puff	0.12	1	0.73
Latency x Physical Acitivity	1.02	1	0.32
Latency x Nicotine Dependence	0.38	1	0.54
Latency x Withdrawal	3.25	1	0.08
Latency x Weight Control Scale	0.12	1	0.94

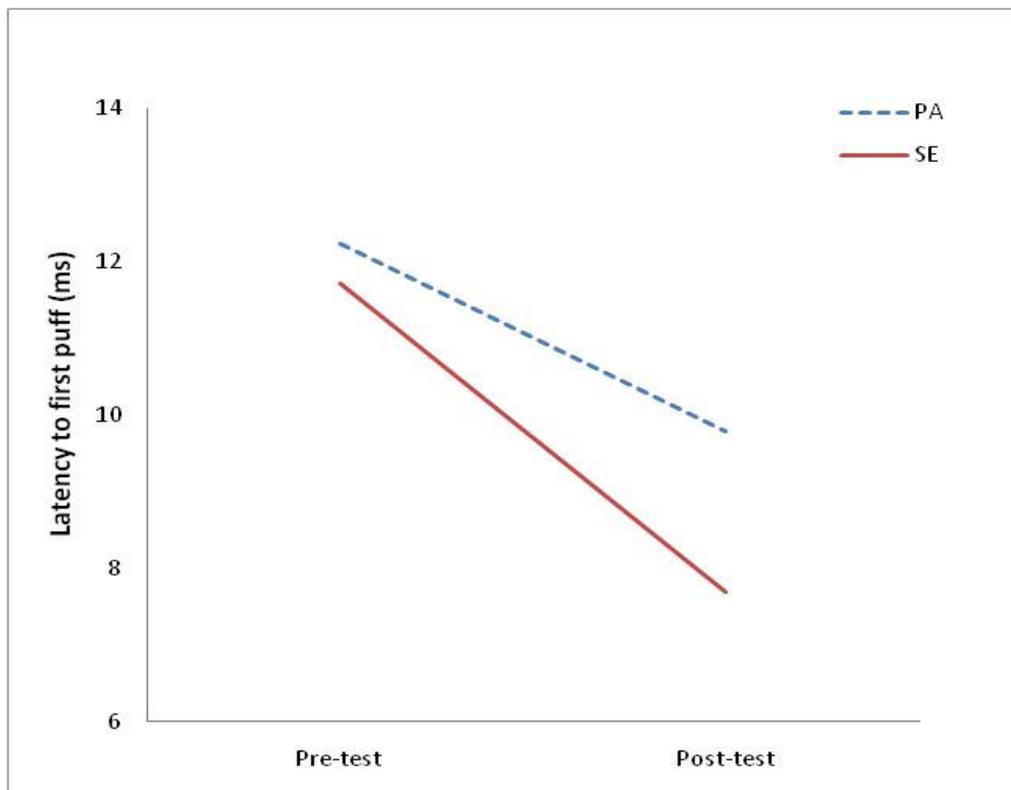


Figure 2

Repeated Measures ANOVA for Latency to First Puff (in milliseconds (ms)) by Physical Activity Groups

A final step (similar to the QSU analysis described above) was to explore the effects of vigorous physical activity as a continuous variable on latency to first puff. To be consistent with previous analysis, partial correlations were conducted controlling for HADS- depression and anxiety, BMI, and the SMQ-sedative subscale. Bivariate associations between the covariates and physical activity variables with latency scores are presented above in Table 8. Results from the partial correlation analysis failed to show a significant association between time spent in vigorous activity and post-test

latency after controlling for potential covariates in the model ($r = -.10$; $p = .62$). Number of days spent doing vigorous physical activity was also not significantly associated with latency ($r = -.18$; $p = .34$).

Secondary Aims of the Study

The secondary aims of the study were to examine changes in body image states, affect, and body-image related anxiety following the body-image exposure session and determine associations between baseline anxiety and depression on post-test urge to smoke. As these were secondary aims of the study, no adjustment was made for multiplicity and alpha coefficient was set at 0.05.

Hypothesis 3

There will be significant increase in BISS, NA, and PASTAS and a significant decrease in PA after exposure to the body-image exposure session for the entire sample.

Descriptive estimates (means and standard deviations) for the BISS, PA, NA, and PASTAS for the entire sample pre and post test are presented in Table 10. Consistent with the proposed hypothesis, results of the paired sample t-tests show a significant decrease in post-test scores of the BISS ($t = 5.23$, $p < .01$), indicating lower body image scores at post-test. There was a significant increase in the PASTAS score ($t = -4.60$, $p < .01$) and significantly decreased PA scores at post-test ($t = 3.52$, $p < .01$).

Table 10

Paired Sample T-test Comparing Means of Body Image Dissatisfaction, Affect, and Physical Appearance Anxiety Pre and Post Test

Variable	M	SD	t
Body Image States Scale			
Pre-test	29.65	6.90	5.23**
Post- test	25.03	9.60	
Positive Affect			
Pre-test	26.65	6.64	3.51**
Post- test	24.36	8.80	
Physical Appearance Anxiety			
Pre-test	16.83	8.52	-4.67**
Post- test	19.54	8.75	
Negative Affect			
Pre-test	19.80	6.31	0.98
Post- test	19.28	6.20	

**p<.01

Contrary to hypothesis, post-test increase in NA did not reach statistical significance (t=.989; p = .33). Figure 3 illustrates pre and post test mean scores for the BISS, PA, NA, and PASTAS by the two groups.

Hypothesis 4

Anxiety and depression as measured by the HADS will have significant associations with QSU and latency to first puff at post-test.

For this analysis, potential controlling variables included FTND, WSCL, BMI, pre-test QSU, and WCSS. Partial correlations were conducted to analyze associations between anxiety and depression and QSU as post-test.

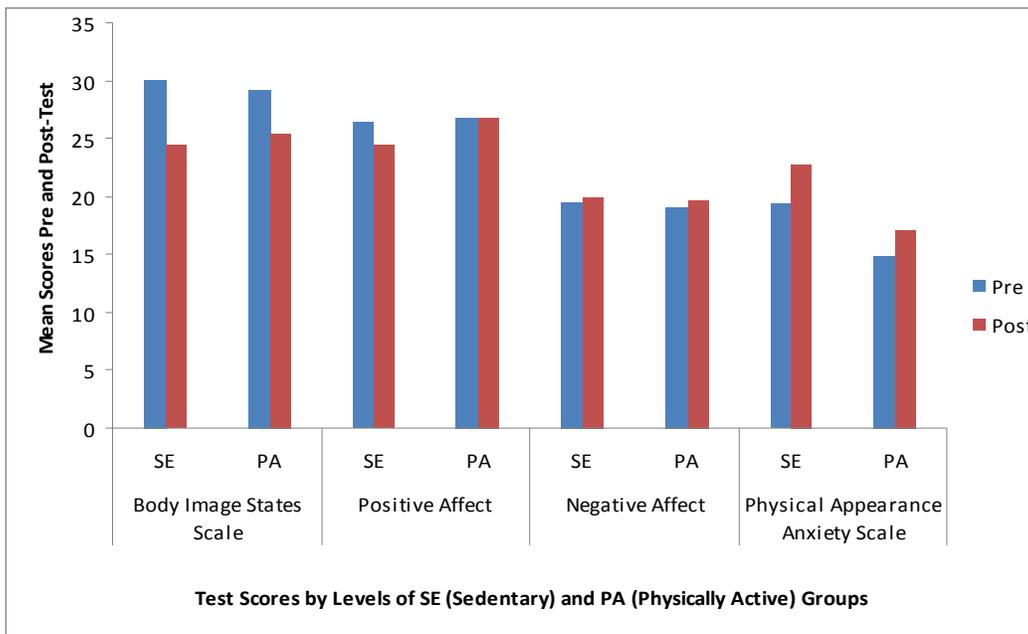


Figure 3

Pre and Post Test Scores on the BISS, PANAS, and PASTAS by SE (N=16) and PA (N=21) Groups

Results show significant association between post-test QSU scores and depression scale of the HADS ($r = 0.59$; $p = .03$) with a small effect size of 0.35. There was no association between anxiety and post-test QSU ($r = .24$; $p = .19$). Including average time spent in vigorous activity/week in the model with other controlling variables, the association between depression and post-test QSU became non significant ($r = .33$; $p = .07$) showing the potential mediating effect of physical activity on depression

and self-reported urge. The association between QSU and anxiety continued to be non-significant even after inclusion of physical activity in the model ($r = .37$; $p = .14$).

Partial correlations between latency to first puff at post-test and depression (after controlling for the above mentioned variables) showed a trend towards a negative association ($r = -.34$, $p = .06$) between the two variables indicating quicker latency to first puff among those with higher depression scores, though the relationship was nearing significance. Similarly, there was a non-significant trend towards quicker latency to first puff and increased scores on the anxiety subscale of the HADS ($r = -.34$, $p = .06$).

Association between latency to first puff and depression ($r = -.33$; $p = .07$) and anxiety ($r = -.34$; $p = .06$) scores on the HADS remained unchanged after adding physical activity to the model.

CHAPTER 6

DISCUSSION FOR PHASE 2

Summary of Findings

The purpose of this phase was to observe the effects of the pilot tested and modified body-image exposure session on urge to smoke among physically active and sedentary college-age female smokers. Results showed that there was a significant increase in self-report urge to smoke and a quicker latency to first puff at post-test for the entire sample. The other topography variables did not significantly change pre and post-test. Partial correlation analyses showed that increased amount of time spent in vigorous intensity physical activity was significantly associated with lower self-reported urge to smoke at post-test after controlling for withdrawal, nicotine dependence, smoking related weight concerns, BMI, and baseline depressive symptoms; however, significant associations were not seen between physical activity and latency to first puff. The entire sample had significant increases in body image dissatisfaction and physical appearance related anxiety and lower positive affect at post-test. Increased depressive symptoms at baseline was significantly associated with self-reported urge at post-test, though the association was not significant after controlling for time spent in vigorous intensity physical activity; indicating the potential mediating effects of physical activity. Increased depressive symptoms and anxiety at baseline showed a trend towards lower post-test latency to first puff but this association did not reach statistical significance. The following sections involve discussion of recruitment issues encountered during the study, interpretation of results, and limitations and implications of the study.

Recruitment

Recruitment for this phase neared the goals set for the study. There were a few challenges that affected the ability to reach recruitment goals: a) university summer breaks, and b) lack of response to undergraduate list-serves. First, recruitment was challenging during the university's summer breaks due to fewer students on campus. Second, undergraduate student list-serves that was widely used as a recruitment strategy in the initial part of the Phase 2 was not successful with no student contacting the researcher through this strategy. A recent study that compared traditional (flyers, postings on bulletin boards, etc) vs. internet methods to recruit smokers indicated that students who did not respond to the email recruitment efforts, but responded to a follow-up interview, were more likely to be smokers suggesting that a subset of student smokers may be unwilling to respond to email recruitment methods to participate in studies about smoking (Norton, Lazev, Schnoll, & Miller, 2009). Such unwillingness could explain the ineffectiveness of recruiting students through student list-serves in the current study, suggesting that the internet may not be an effective way to recruit young smokers in a college sample. Active recruitment for the current study took place by approaching females who were smoking on campus and providing them with study information, though none of these participants enrolled in the study. With the recent increase in the social taboos associated with smoking, young female smokers often report experiencing feelings of guilt and embarrassment when they are seen smoking (Paul et al., 2010). This coupled with the social pressures to quit, may have prevented them from contacting the researcher. Thus, while such forms of active recruitment can

be an effective way to spread word of the study, additional strategies may be needed in this sample of female smokers.

Recruitment was most successful with postings of flyers on bulletin boards across Temple University's Main Campus, specifically in female locker rooms at the university gym, female restrooms, and college dormitories with a majority of participants contacting the researcher through these strategies. Another successful strategy involved the researcher making announcements in undergraduate classrooms and circulating sign-up sheets to assure anonymity. This strategy was also successful with interested participants providing referrals to the study (e.g., friends, roommates). Future studies recruiting college age female smokers may benefit from having a combination of classroom announcements and postings of flyers in places across the campus area.

Results of Primary Aims

Hypothesis 1

The study results supported hypothesis 1, specifically that there was a significant increase in self-reported urge to smoke and quicker latency to first puff after exposure to the body-image exposure session in the entire sample. These results indicate that situational changes to body and weight concerns due to exposure to a body-image exposure session in a sample of high weight concerned female smokers are related to urge to smoke. Similar results were seen in recent studies (Lopez et al., 2008, 2009) in which female smokers who were introduced to cues that were aimed to decrease one's self-perceived body satisfaction (e.g., rating models in a swimsuit or having participants

try a swimsuit) experience greater self-reported urge to smoke. However, the current study differs from the above mentioned studies in two ways. Firstly, while previous studies use a combination of body image manipulation and smoking-cues (pictures of lit cigarettes) to observe effects of body image concerns on smoking urges, participants in the current study were only exposed to cues related to their body (body-image exposure session). The increase in urge (even in the absence of external smoking cues) further elucidates that the change in urge was a direct result of the body-image manipulation session rather than reaction to presence of external smoking cues in the environment. Secondly, the current study adds to the body weight concerns-smoking literature by observing the effect of body and weight concerns on latency to first puff. Previous smoking studies have examined latency to first puff by manipulating environmental and negative affect cues. This is the first time that latency has been explored in the context of body and weight concerns and smoking and the results indicated that not only do women with high weight concerns experience greater self-reported urge to smoke, but they also have a quicker latency to first puff when exposed to a body-image exposure stimulus, thus providing a valid measure of actual smoking behavior.

Though there were significant increases in self-report urge and quicker latency to first puff, there was no hypothesized increase in other smoking topography variables: puff number, puff duration, and inter puff interval. The reasons for these can be attributed to gender differences in nicotine administration and nicotine use that consistently show that relative to men, women smoke more for non-pharmacological

reasons (Perkins et al., 2005, 2004, 2001). Studies that have examined smoking behavior in women have found that measures of nicotine intake (e.g., puff number, puff volume, etc) are less important factors of self-reported urge to smoke among women (D. Hatsukami et al., 1995). This is because women are more likely to smoke for non-pharmacological reasons (e.g., conditioned responses to smoking stimuli, negative affect) and respond to the non-nicotine stimuli associated with smoking than nicotine intake per se (Perkins, 1996; Perkins et al., 1999), thereby explaining the increase urge to smoke post-exposure in this study without significant changes in other topography variables. Thus, for the reasons mentioned above, subsequent analyses for smoking urge examined only self-reported urge to smoke and latency to first puff.

Hypothesis 2

Consistent with the proposed hypothesis, results of the partial correlation analysis revealed a significant negative association between time spent in vigorous intensity physical activity and self-reported urge to smoke. This is the first study that has explored the relationship between physical activity and urge in the context of body and weight concerns in a controlled lab environment. The results that exercise is protective of smoking urge is consistent with other research findings that physical activity is an effective treatment component in smoking cessation programs (see Taylor et al., 2007; Ussher et al., 2008). Many of these intervention studies have examined acute (or short-term) and long-term effects of exercise intensity on smoking behavior and smoking outcomes.

While short acute bouts of moderate and vigorous exercise intensity are effective in managing withdrawal and reduction in urge (Taylor et al., 2007b), very little is known how long these acute effects last. It is possible that though both vigorous and moderate intensities are associated with reduced withdrawal and urge to smoke in the short-term, the effects of vigorous intensity on urge to smoke may last longer. In the only study that has examined the long-term effects of vigorous exercise on smoking outcomes, Marcus et al. (1999) found that female smokers who participated in smoking intervention using vigorous exercise condition not only had higher short-term quit (greater 7 day point prevalence) but this effect was also significant at 12-month follow up. Similar results were not seen while using moderate intensity of exercise (Marcus et al., 2005), indicating that vigorous intensity may play a greater role in influencing smoking behavior change in the long run. In the current study, though time since last exercise session was not collected, none of the participants reported engaging in exercise on the day of the study. Thus, it is possible that the lower urge in the PA groups may be less associated with the acute effects of exercise. The current study adds to the literature and shows the association between vigorous intensity and smoking urge among weight concerned female smokers. However, there is a distinct need for more studies examining behavioral and/or psychophysiological mechanisms of how engaging in vigorous intensity (as compared to moderate intensity) in the long-term influences smoking urge and behavior change.

Motives or reasons for smoking could also influence urge to smoke between the PA and SE groups. The two groups (PA and SE) in this study significantly differed on the

automatic subscale of the Smoking Motives Questionnaire (SMQ) with the PA group scoring higher than the SE group. The automatic subscale (along with the addictive, sedative, and stimulation) subscale represent smoking for pharmacological rewards of nicotine (Tate et al., 1994). It is possible that smokers who are physically active smoke more for the physiological rewards of nicotine and were less likely to experience increased urge in a situation that elicited decreased affect and anxiety as compared to the SE group. For example, considering the effect of exercise on affect, stress, and withdrawal, it may be possible that the smokers who are physically active tend to use smoking more for positive reinforcement (pharmacological effects of nicotine) than as a form of negative reinforcement (reduction from stress and negative affect). However, there were no significant differences in the other pharmacological subscales (addictive, sedative, and stimulation) or the non-pharmacological subscales of the SMQ (psychosocial and indulgent) in the two groups. Another reason for the difference in the motives for smoking could be that exercisers in general have better body image and have greater body satisfaction (De Young & Anderson, 2009; Lepage & Crowther, 2010). Hence, exercisers may be less likely to smoke for reasons of stress reduction and negative affect due to increased body dissatisfaction and weight concerns. Future studies need to look at the interaction between smoking motives and exercise to better understand this association which can help design more effective and tailored smoking cessation intervention strategies.

While vigorous intensity of exercise was associated with a reduced self-reported urge to smoke, the relationship was not significant for latency to first puff. However,

within groups, latency to first puff significantly decreased in the SE group and not in the PA group, indicating greater urge in the SE group after exposure to the body-image exposure session. The repeated measures ANOVA showed a trend towards quicker latency to first puff post test in the SE as compared to the PA groups, though this relationship did not reach statistical significance. The failure to see a significant relationship in the partial correlation analysis could be attributed to: a) the small sample size, and b) criteria used to differentiate between the PA and SE groups. Participants who exercised for a minimum of 60 minutes in a week of vigorous activity were classified in the PA group. This criterion, which was chosen because smokers have been shown to have lower levels of physical activity than non-smokers (Kaczynski, 2008), might have been too low to observe distinct differences between the PA and SE groups. While there is no known study that examines a criterion for level of exercise as being protective of smoking, findings from Marcus (2005) suggest that abstaining smokers may need to accumulate at least 110 minutes of activity per week to maintain abstinence, indicating that having a greater duration spent being physically active may have more enhanced effects on smoking urge and behavior. No study has identified an accurate cut-off to differentiate between levels of physical activity in a college-age sample; however, this current study and findings from Marcus et al. (2005) may suggest that the ideal amount of time spent in exercise to differentiate between PA and SE groups may be more than 60 minutes per week. Future studies may benefit from having a higher criterion cut-off and also investigate what an ideal cut-off for differentiating between the two groups might be.

Results of Secondary Aims

The secondary aim of the study was to observe the effects of the body-image exposure session on body image states, affect, and anxiety related to physical appearance. Results showed that, as hypothesized, at post-test, participants had significantly greater body dissatisfaction, experienced a decrease in positive affect, and increased physical appearance related anxiety.

These findings are similar to those in Phase 1 and continue to show that mirror exposure techniques can decrease positive affect and increase body dissatisfaction in a non-clinical population with high weight concerns. It is important to note that the body-image exposure session involved wearing an everyday apparel of clothing and viewing a mirror image. Previous studies examining body image dissatisfaction among smokers often have participants change into swimsuits or rate their pictures wearing swimsuits (e.g., Lopez et al, 2008; Pomerleau & Saules, 2007). This is the first study to combine mirror-exposure task and script-driven imagery while investigating weight concerns and smoking behavior and show the effects of these procedures on body dissatisfaction, anxiety related to physical appearance, and affect in a college-age female population. While mirror-image exposure procedure so far has only been used in populations with clinical psychopathology (e.g., eating disorders, body dysmorphic disorders), the current study indicates the need to incorporate these procedures as a treatment component even in non-clinical samples of high weight concerned female smokers. The fact that merely describing their mirror-image influenced body dissatisfaction and anxiety related to their physical appearance (and urge to smoke) highlights the role that body and

weight concerns play in maintaining smoking behavior and relapse (e.g., Borrelli et al., 2001; French & Jeffery, 1995; King et al., 2005). Moreover, it has been suggested that female smokers in general have an exaggerated preference for a lean body shape (Pomerleau & Saules, 2007). These findings taken together indicate that female smokers, particularly those with higher weight concerns, may require help in attaining a more realistic body image as well as managing anxiety related to body image; thereby emphasizing the importance of including cognitive behavioral therapy and weight management strategies to assuage body and weight concerns in smoking cessation programs within this population.

Another finding (similar to Phase 1) was the significant decrease in positive affect without an increase in negative affect at post-test. This adds evidence to findings that positive and negative affect are not opposite ends of a single mood but instead distinct constructs with different biological (Davidson, 1992) and psychological basis (Watson et al, 1988) and that a decrease in one need not mean an increase in the other. Thus, similar to Phase1, the body-image exposure session influenced affect more by reducing positive affect rather than decreasing negative affect. Secondly, the non-significant increase in negative affect could be attributed to the nature of the items. Negative affect is a general factor of subjective distress and subsumes a wide range of aversive mood states such as 'hostile,' 'nervous,' 'jittery,' 'afraid,' or 'scared.' The body-image exposure session may have been less effective in changing these broad emotions and more effective in reducing feelings of 'interested,' 'alert,' 'attentive,' or 'enthusiastic' that are captured by the positive affect schedule.

Finally, the association between depression and urge to smoke was explored using partial correlation analyses. Results showed that there was an increase in baseline depressive symptoms was associated with increased self-reported post-test urge after controlling for nicotine dependence, withdrawal, weight concerns, and BMI. Studies have consistently shown associations between smoking behavior and depressive symptoms in cross-sectional and follow-up data (Anda et al., 1990; Murphy et al., 2003; Patten et al., 2001), with female smokers more likely to smoke to manage mood (Cepeda-Benito & Reig Ferrer, 2000; Ward et al., 1997). However less is known on the effects of baseline depressive in a controlled lab environment. Most lab studies that observe the effects of mood on smoking urge examine the effects of changes in negative affect on smoking behavior (e.g., Baker et al., 2004; Conklin et al., 2005; Lopez et al., 2009). These studies show that in conditions where negative affect is manipulated (either through mood induction or body-image related negative affect), there is an increase in smoking urge indicating that negative affect can be a stimulus in eliciting smoking urge. While participants in the current study reported greater urge to smoke, they did not experience significant increases in negative affect pre and post exposure session ($p= 0.78$). One could speculate that the increase in post-test urge may be more related to depressive symptoms than to changes in negative affect due to the situational changes in body dissatisfaction brought on by the body-image exposure task, though this needs to be further explored. However, results show that baseline depressive symptoms can influence smoking urge in a controlled lab situation that manipulates body and weight concerns. Interestingly, the inclusion of physical activity in the model,

made the relationship between depressive symptoms and post-test urge non significant showing the potential protective effects of physical activity. With depressive symptoms associated with smoking behavior and exercise participation consistently shown to be related to reduced baseline depressive symptoms (Focht, Knapp, Gavin, Raedeke, & Hickner, 2007; Hassmen, Koivula, & Uutela, 2000), findings from this current study may suggest the mediating effects of exercise on urge and depression. However, there is a need for additional research to better examine the directionality of these associations. To my knowledge, this is the first study that shows the protective images of physical activity on smoking urge-depression relationship in an experimental design that manipulates body and weight concerns among female smokers.

The association between anxiety symptoms and post-test urge was not significant; however, the results show a trend in the hypothesized direction. It may be possible that the post-test urge may be less associated with baseline anxiety in general and more related to anxiety specifically related to body-image states. Though exploring the effects of body image anxiety on smoking urge was beyond the aims of this paper, future studies could study these relationships to better understand the influence of body-specific anxiety on smoking urge and behavior. Similar relationships were seen between latency to first puff and depressive and anxiety symptoms with associations in the hypothesized direction but failing to reach statistical significance indicating that in the future, studies that use similar procedures may need larger sample sizes.

Theoretical Implications of Findings

Results of the current study suggest that increased time spent in vigorous intensity physical activity is associated with reduced smoking urge in a sample of female smokers. The Expectancy Theory can be used to understand smoking behaviors among weight concerned smokers. Based on this theory, the associative learning between weight concerns and smoking is likely a result of the expectancy that smoking can alleviate weight concerns. Exercise has been shown to be effective in alleviating negative affect, withdrawal, and weight concerns (Daniel et al, 2004; Audrain-McGovern et al., 2003) and regular exercisers engage in physical activity because they expect its positive consequences (Conn et al., 2003; Symons-Downs & Hausenblas, 2004). Thus, interpreting the results of this study within the context of the Expectancy Theory, it is possible that participants with lower levels of physical activity experienced a greater urge to smoke because, in the absence of another behavior that could alleviate their weight and body concerns (i.e., physical activity), they expected smoking to relieve weight and body concerns that followed the body-image exposure session. Physically active participants, having experienced the positive effects of physical activity, may have lower expectancies that cigarettes could help them manage their weight concerns. This lower expectation may have contributed to the negative association between post-test urge to smoke and time spent in physical activity. Thus, based on these results and within the framework of the Expectancy Theory, physical activity can be an effective smoking cessation intervention. The associative learning between engaging in exercise, urge to smoke and negative affect reduction could lead to smokers expecting exercise to

alleviating their urge to smoke and negative affect once they quit smoking, thereby increasing likelihood of successful quit attempts and reducing chances of relapse.

Limitations

While the dissertation was theory-based and designed with deliberation, the study does have limitations. Many of these occurred due to the limited resources and time constraints to complete the study. These are mentioned in the following sections.

Methodological Limitations

The methods of this study were developed to best achieve the aims of the study in a time-efficient manner and only focused on Temple University's student population. The participants in this sample were largely college female smokers (only 1 participant was not a college student), resulting in a relatively homogenous sample of predominantly Caucasian (76%) and college-educated women. The second limitation deals with the number of cigarettes smoked per day. Due to the lower number of cigarettes smoked by the college-age population nationwide, the eligibility criteria for Phase 2 was lowered to a daily smoking rate of 5 or more cigarettes. This resulted in a sample of relatively lighter smokers. Participants in this study smoked an average of approximately 8 cigarettes per day and the time between the baseline and post-test cigarette might not have been long enough for them to experience nicotine-related smoking urge, which might be one of the reasons for lack of significant differences in other smoking topography variables of puff number, inter puff interval, and puff duration.

Finally, as mentioned above, another limitation of the study was the criterion for categorizing participants into the PA and SE groups. A more recent study of 270 young smokers and non-smokers (50% were smokers) showed that the sample, on an average, engaged for approximately 117 minutes of vigorous intensity exercise (Tart et al., 2010) (almost double than the cut-off for this study). Thus, while there is a negative association between physical activity and smoking status (Kaczynski, 2008), college-age smokers may be more physically active than expected. Also, participants self-reported their level of physical activity over the past 30 days, which could result in recall bias. Future studies can overcome this limitation by using more objective measures of physical activity (e.g., accelerometers, pedometers, etc) so as to have a more reliable measure of exercise time and intensity.

Analytical Limitations

The smaller sample size (N=37) was a limitation, with many of the analyses showing a non-significant trend in the expected direction. Moreover, the small sample size made it difficult to use more powerful statistical tests like multiple regression analyses to observe the effects of variability in physical activity on urge or examine the influence of anxiety and depressive symptoms on urge to smoke. Thus, a larger sample size in future studies would enable the use of multivariate statistical procedures to gain a better understanding of the relationships between physical activity and smoking urge.

External Validity of Findings

While the study is theory-based and has high internal validity, as is typical with lab based studies, this study has issues with external validity. It is difficult to determine

if external factors such as presence of the researcher, or the novelty of a different environment (lab setting) could have influenced participant responses. However, these factors are inherent limitations of a lab-based study and are difficult to overcome.

Future Research

The study was designed to address the gap in literature between the influence of physical activity on urge to smoke among weight concerned female smokers. Findings of the current study illustrate the protective effects of engaging in vigorous intensity of physical activity on urge to smoke and highlight the importance of incorporating physical activity components to smoking cessation research.

While results from this study suggest that engaging in physical activity is associated with lower urge to smoke, speaking from a smoking cessation intervention point of view, less is known regarding benefits of engaging in exercise before vs. after a quit attempt is made. This in turn could help in identifying if physical activity should be introduced before a person attempts to quit smoking or once the person has made a quit attempt. Future research could start answering this question by having an experimental design where timing of physical activity (along with a similar body-image session) is manipulated in a lab setting. For instance, using a within subjects design, participants could engage in a short bout of vigorous physical activity either immediately before or after exposure to the body-image exposure session after which their urge to smoke could be assessed. This could help understand association between urge and physical activity (i.e., if physical activity is protective by prolonging urge to smoke after

exposure session or if physical activity serves as an effective coping mechanism when dealing with urge after exposure to a body-image exposure session).

Cue-reactivity and cue-exposure treatments have been implicated in understanding and treatment of addictive behaviors, including nicotine addiction. One hypothesis that is common to learning-based models of addictive behaviors is that the presence of antecedent stimuli associated with drug use or administration can elicit addiction-specific responses (i.e., psychological, psychophysiological, behavioral, and self-report). The intensity of these responses (i.e., cue-reactivity) is considered a reflection of the responses underlying craving or urge to smoke (Overduin et al., 1997). However, there is a distinct dearth of studies that examine the influence of physical activity on cue-exposure and reactivity. It remains to be seen if physical activity is protective of smoking behavior by influencing reactivity to smoking-related cues. This study is the first to find that physical activity is associated with lower urge after exposure to cues related to body-image. Future studies could further examine this relationship to study if smoking cue reactivity differs by levels of physical activity and additionally, if engaging in physical activity influences extinction responses to smoking-cues.

Initial studies involving weight concerns focused primarily on Caucasians with the belief that concerns about body shape and weight were more prevalent in this population. Recent studies show that weight concerns associated with smoking is prevalent among African American women (e.g., Collins et al, 2008;(Pollak, Namemek Brouwer, Lyna, Taiwo, & McBride, 2003; Sánchez-Johnsen et al., 2010), but there is a

lack of lab-based studies that include African American women. Future studies could examine these relationships across different populations, especially considering the need to reduce tobacco-related health disparities across diverse racial and ethnic groups.

Summary and Implications

This study was designed to better understand relationships between physical activity and urge to smoke among weight concerned female smokers who were exposed to a novel behavioral task that was aimed at increasing body and weight concerns. These aims were accomplished using two phases. Phase 1 involved pilot testing of a novel behavioral stimulus and any modifications made in this phase were incorporated for the next phase. Phase 2 examined the effects of this modified stimulus on urge to smoke and the influence of physical activity on urge. Findings from the study reveal: a) exposure to the novel body-image exposure session increases both self-reported urge to smoke and quickens latency to first puff, b) there is a significant association between urge to smoke and time spent in vigorous intensity of exercise such that increased time spent in physical activity is associated with a lower urge to smoke, c) vigorous intensity physical activity is protective of the depression-smoking urge relationship.

To my knowledge, this is the first study to manipulate body and weight concerns and observe the effects of physical activity on smoking urge in a controlled lab environment. This study has large-scale implications in the area of physical activity-smoking cessation intervention research. First, it adds to the evidence of the protective effects of physical activity on smoking urge in a sample of young women and the need

for including a physical activity component, especially when treating nicotine addiction among women with high weight concerns. Second, the body-image exposure session not only increased urge to smoke but also increased body dissatisfaction and physical appearance-related anxiety. Mirror-image exposure has been used as a therapeutic procedure to correct distorted body perceptions in populations with clinical psychopathology (e.g., eating disorders, restrained eaters). The fact that even non-clinical population of high weight concerned female smokers experience distress and change in affect at the end of this session suggests the need for having cognitive behavioral therapy (CBT) (along with exercise) to assuage concerns about weight and/or weight gain. CBT can be effective in correcting misperceptions and thoughts regarding weight concerns among women and help them manage negative affect and withdrawal that often accompanies quitting smoking. Moreover, CBT procedures can be augmented by incorporating similar mirror-exposure procedures to change cognitions and self-perceptions of the body while working with young weight concerned women who intend to quit smoking.

Women in this study experienced increased body dissatisfaction, physical appearance-related anxiety, and urge to smoke following a session in which they described their physical body appearance. This is indeed disconcerting considering that college females are recurrently exposed to images via the media that constantly make them re-evaluate their perceived body shape and size. This coupled with social pressures for thinness often leads these young women to persist in behaviors (such as

smoking) that creates serious health risks while creating additional hurdles for female smokers as they attempt to quit smoking and bring about a lifestyle change.

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APPENDIX A
RECRUITMENT MATERIALS USED FOR PHASE 1 AND 2

Classroom Announcement

Dear Students,

My name is Uma Nair and I am a doctoral student in the department of Kinesiology. As a part of my dissertation, I am looking for 18-25 year old college-age female smokers as participants for my study. I am handing out flyers of the study which has my contact information in case you are interested in participating. I am also passing along a signing sheet where you could write your name and contact information if you would rather have me get back to you. I will collect this from Dr. _____ at the end of the class. You will be compensated with a gift card for your participation in the study.

Thank you for your time and patience,

Thank you Dr. _____ for your time!

Correspondences to other university officials:

Dear _____,

I am a doctoral student in Kinesiology currently commencing my dissertation research. My research involves understanding smoking behavior and habits among college-age female smokers (18-25 years), focusing on smoking behavior among weight concerned smokers. I realize that your clinic may have female students who could meet the eligibility criteria for my study. Would it be possible for me to post flyers in the clinic to spread the word of the research around? I would be more than happy to meet with you at a time that is convenient for you to discuss the research study and answer any questions that you may have regarding the same.

Really appreciate the help,

Regards,

Uma

Announcement on student List-serves:

Dear _____,

I am a doctoral student in the department of Kinesiology. As a part of my dissertation, I am recruiting college-age (18-25 years) female smokers for my study. Could you please post the following information on the _____ student list-serve?

ARE YOU A FEMALE CIGARETTE SMOKER BETWEEN THE AGES OF 18-25 YEARS?

DO YOU FEEL CIGARETTES HELP YOU CONTROL YOUR WEIGHT?

IF YES, YOU CAN PARTICIPATE IN A RESEARCH STUDY LOOKING AT SMOKING HABITS AMONG COLLEGE-AGED FEMALES.

YOU WILL BE COMPENSATED WITH A GIFT CARD FOR YOUR PARTICIPATION.

FOR MORE INFORMATION CALL UMA NAIR at (215)-204-6251.

(This information is approved by Temple University for public display and is associated with project # 12417)

Email: uma.nair@temple.edu

APPENDIX B
REFERRALS

Mood Referrals

Local Resources

Psychology Internship Counseling Services
3307 N. Broad St.
Jones Hall
Temple University
215-707-8666

Psychological Service Center
Temple University
Weiss Hall
215-204-7324

Adult Anxiety Clinic of Temple
Temple University
Weiss Hall
215-204-1575

Anxiety and Agoraphobia Treatment Center
112 Bala Avenue
Bala Cynwyd, PA 191004
610-667-6490

Crisis Response Center
Temple Episcopal Campus
100 E. Lehigh Avenue
Philadelphia, PA 19125
T: 215-707-2577

Temple University Department of Psychiatry and Behavioral Sciences
Temple Episcopal Campus
1st and 3rd Floors
100 E. Lehigh Avenue
Philadelphia, PA 19125
Appointments: T: 215-707-8496

Northwest Human Services
215-248-6764

Weight Loss Referrals

Temple University CORE
3223 N. Broad St., Suite 175
Philadelphia, PA 19140
215-707-8633

Trevoze Behavioral Weight Management program
Post Office Box 11674
Philadelphia, PA 19116
<http://www.tbmp.org/>

Weight Watchers
215-648-1000

www.ediets.com

Medical Assistance

Temple University Hospital
215-707-2000

Temple University Student Health Center
Temple University
Mitten Hall
215-204-7500

Hospital of the University of Pennsylvania
215-662-4000

APPENDIX C
FAGERSTROM TEST OF NICOTINE DEPENDENCE

- 1- How soon after you wake up do you smoke your first cigarette?
- a) Within 5 minutes
 - b) 6-30 minutes
 - c) 31-60 minutes
 - d) After 60 minutes
 - e) Don't know
- 2- Do you find it difficult to refrain from smoking in places where it is forbidden, e.g. at the mosque (church), at the bus?
- a) Yes
 - b) No
 - c) Don't know
- 3- Which cigarette would hate most to give up?
- a) First one in the morning
 - b) All others
 - c) Don't know
- 4- How many cigarettes/day do you smoke?
- a) 10 or less
 - b) 11-20
 - c) 31 or more
 - d) Don't know
- 5- Do you smoke more frequently during the first hours after waking than the rest of the day?
- a) Yes
 - b) No
 - c) Don't know
- 6- Do you smoke when you are so ill that you are in bed most of the day?
- a) Yes
 - b) No
 - c) Don't know

APPENDIX D
WEIGHT CONCERN SCALE

1) How important is losing weight or maintaining your current weight compared with other personal health concerns?

0	1	2	3	4	5	6	7	8	9	10
Not at all				sometimes			very much			

2) People smoke for many reasons. Compared with all your reasons for smoking, how important is smoking to control your weight?

0	1	2	3	4	5	6	7	8	9	10
Not at all				sometimes			very much			

3) How much do cigarettes help you control your weight?

0	1	2	3	4	5	6	7	8	9	10
Not at all				sometimes			very much			

4) How concerned are you about gaining weight as a result of quitting?

0	1	2	3	4	5	6	7	8	9	10
Not at all				sometimes			very much			

5) How likely do you think it is that you will gain weight as a result of quitting?

0	1	2	3	4	5	6	7	8	9	10
Not at all				sometimes			very much			

6) How likely is it that you would go back to smoking after quitting if you gained too much weight?

0	1	2	3	4	5	6	7	8	9	10
Not at all				sometimes			very much			

APPENDIX E
BODY IMAGE STATES SCALE

For each of the items below, check the box beside the one statement that best describes how you feel RIGHT NOW AT THIS VERY MOMENT. Read the items carefully to be sure the statement you choose accurately and honestly describes how you feel right now.

1. Right now I feel . . .

- Extremely dissatisfied** with my physical appearance
- Mostly dissatisfied** with my physical appearance
- Moderately dissatisfied** with my physical appearance
- Slightly dissatisfied** with my physical appearance
- Neither dissatisfied nor satisfied** with my physical appearance
- Slightly satisfied** with my physical appearance
- Moderately satisfied** with my physical appearance
- Mostly satisfied** with my physical appearance
- Extremely satisfied** with my physical appearance

2. Right now I feel . . .

- Extremely satisfied** with my body size and shape
- Mostly satisfied** with my body size and shape
- Moderately satisfied** with my body size and shape
- Slightly satisfied** with my body size and shape
- Neither dissatisfied nor satisfied** with my body size and shape
- Slightly dissatisfied** with my body size and shape
- Moderately dissatisfied** with my body size and shape
- Mostly dissatisfied** with my body size and shape
- Extremely dissatisfied** with my body size and shape

3. Right now I feel . . .

- Extremely satisfied** with my weight
- Mostly dissatisfied** with my weight
- Moderately dissatisfied** with my weight
- Slightly dissatisfied** with my weight
- Neither dissatisfied nor satisfied** with my weight
- Slightly satisfied** with my weight
- Moderately satisfied** with my weight
- Mostly satisfied** with my weight
- Extremely satisfied** with my weight

4. Right now I feel . . .

- Extremely** physically *attractive*
- Very** physically *attractive*
- Moderately** physically *attractive*
- Slightly** physically *attractive*
- Neither attractive nor unattractive**
- Slightly** physically *unattractive*
- Moderately** physically *unattractive*
- Very** physically *unattractive*
- Extremely** physically *unattractive*

5. Right now I feel . . .

- A great deal worse** about my looks than I usually feel
- Much worse** about my looks than I usually feel
- Somewhat worse** about my looks than I usually feel
- Just slightly worse** about my looks than I usually feel
- About the same** about my looks as usual
- Just slightly better** about my looks than I usually feel
- Somewhat better** about my looks than I usually feel
- Much better** about my looks than I usually feel
- A great deal better** about my looks than I usually feel

6. Right now I feel that I look . . .

- A great deal better** than the average person looks
- Much better** than the average person looks
- Somewhat better** than the average person looks
- Just slightly better** than the average person looks
- About the same** as the average person looks
- Just slightly worse** than the average person looks
- Somewhat worse** than the average person looks
- Much worse** than the average person looks
- A great deal worse** than the average person looks

APPENDIX F
PHYSICAL APPEARANCE STATE AND TRAIT ANXIETY SCALE- STATE

The statements listed below are used to describe how anxious, tense, or nervous you feel **right now** about your body or specific parts of your body.

Right now, I feel anxious, tense or nervous about:

	Not at all	Slightly	Moderately	Very much so	Exceptionally so
The extent to which I look overweight	0	1	2	3	4
My thighs	0	1	2	3	4
My buttocks	0	1	2	3	4
My hips	0	1	2	3	4
My stomach (abdomen)	0	1	2	3	4
My legs	0	1	2	3	4
My waist	0	1	2	3	4
My muscle tone	0	1	2	3	4
My ears	0	1	2	3	4
My lips	0	1	2	3	4
My hands	0	1	2	3	4
My forehead	0	1	2	3	4
My neck	0	1	2	3	4
My chin	0	1	2	3	4
My feet	0	1	2	3	4

APPENDIX G
POSITIVE AND NEGATIVE AFFECT SCHEDULE

This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the appropriate answer next to that word. Indicate to what extent you have felt this way during the past week.

Use the following scale to record your answers.

(1) = Very slightly or not at all (2) = A little (3) = Moderately (4) = Quite a bit (5) = Extremely

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
Interested	1	2	3	4	5
Distressed	1	2	3	4	5
Excited	1	2	3	4	5
Upset	1	2	3	4	5
Strong	1	2	3	4	5
Guilty	1	2	3	4	5
Scared	1	2	3	4	5
Hostile	1	2	3	4	5
Enthusiastic	1	2	3	4	5
Proud	1	2	3	4	5
Irritable	1	2	3	4	5
Alert	1	2	3	4	5
Ashamed	1	2	3	4	5
Inspired	1	2	3	4	5
Nervous	1	2	3	4	5
Determined	1	2	3	4	5
Attentive	1	2	3	4	5
Jittery	1	2	3	4	5
Active	1	2	3	4	5
Afraid	1	2	3	4	5

APPENDIX H
GODIN'S LEISURE TIME EXERCISE QUESTIONNAIRE (MODIFIED)

Think about the **month**, on how many days did you do the following kinds of exercise for **more than 10 minutes** during your **free time**? Write on each line the appropriate number.

<p>a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) (e.g., running, jogging, hockey, football, soccer, basketball, cross country skiing, skateboarding, vigorous swimming, vigorous long distance bicycling, tennis, running/jogging on elliptical)</p>	<p># of Days</p> <p>_____</p>	<p>Average Minutes Per Day on those days</p> <p>_____</p>
<p>b) MODERATE EXERCISE (NOT EXHAUSTING) (e.g., fast walking, baseball, tennis (doubles), easy bicycling, volleyball, badminton, golf, easy swimming, alpine skiing, fast walking on elliptical, fishing standing/wading, popular and folk dancing)</p>	<p>_____</p>	<p>_____</p>
<p>c) MILD EXERCISE (MINIMAL EFFORT) (e.g., yoga, bowling, fishing sitting, bowling, horseshoes, golf, snow-mobiling, easy walking, slow walking on elliptical)</p>	<p>_____</p>	<p>_____</p>

APPENDIX I
SMOKING MOTIVES QUESTIONNAIRE

1) I have found a cigarette in my mouth without recalling putting it there

0	1	2	3
Not at all			very much so

2) I light up a cigarette without realizing I still have one burning in the ashtray

0	1	2	3
Not at all			very much so

3) I find myself smoking without remembering lighting up

0	1	2	3
Not at all			very much so

4) I smoke more when I am worried about something

0	1	2	3
Not at all			very much so

5) smoking calms me down when I feel tense

0	1	2	3
Not at all			very much so

6) I light up a cigarette when I feel angry about something

0	1	2	3
Not at all			very much so

7) It is easier to talk and get in with other people when smoking

0	1	2	3
Not at all			very much so

8) While smoking I feel more confident with other people

0	1	2	3
Not at all			very much so

9) I smoke much more when I am with other people

0	1	2	3
Not at all			very much so

10) I want to smoke most when I am comfortable and relaxed

0	1	2	3
Not at all			very much so

11) I like a cigarette best when I am having a quiet rest

0	1	2	3
Not at all			very much so

12) I usually only smoke when I can really sit back and enjoy it

0	1	2	3
Not at all			very much so

13) when I run out of cigarettes I find it almost unbearable until I can get them

0	1	2	3
Not at all			very much so

14) without a cigarette I don't know what to do with my hands

0	1	2	3
Not at all			very much so

15) I get a real gnawing hunger to smoke when I haven't smoked for a while

0	1	2	3
Not at all			very much so

16) I smoke for the pleasure of having something in my mouth

0	1	2	3
Not at all			very much so

17) part of the enjoyment of smoking is watching the smoke as I blow it out

0	1	2	3
Not at all			very much so

18) part of the enjoyment of smoking comes from the steps I take to light up

0	1	2	3
Not at all			very much so

19) I like smoking while I am busy and working hard

0	1	2	3
Not at all			very much so

20) I get a definite lift and feel more alert when smoking

0	1	2	3
Not at all			very much so

21) I smoke more when I am rushed and have lots to do

0	1	2	3
Not at all			very much so

APPENDIX J
BODY SHAPE QUESTIONNAIRE

	Never	Rarely	Some times	Often	Almost 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 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 being not firm enough?	1	2	3	4	5	6
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 share 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
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	1	2	3	4	5	6

ability to concentrate (e.g. while watching television, reading, listening to conversations)?						
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
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
23) Have you thought that you are in 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 fat 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) When in company have you worried about taking up too much room (e.g. sitting on a sofa, or a bus seat)?	1	2	3	4	5	6
28) Have you worried about your flesh being dimply?	1	2	3	4	5	6
29) 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
30) Have you pinched areas of your body to see how much fat there is?	1	2	3	4	5	6
31) Have you avoided situations where people could see your body (e.g. communal changing rooms or swimming baths)?	1	2	3	4	5	6
32) Have you taken laxatives in order to feel thinner?	1	2	3	4	5	6
33) Have you been particularly self-conscious about your shape when in the company of other people?	1	2	3	4	5	6
34) Has worry about your shape made you feel you ought to exercise?	1	2	3	4	5	6

APPENDIX K
HOSPITAL DEPRESSION AND ANXIETY SCALE

Directions:

Please choose one response from the four choices listed below. Please give your initial response and don't think too long about each answer. Please select the answer that describes your feelings right now.

1) I feel tensed or 'wound up':

- a) Most of the time
- b) A lot of the time
- c) From time to time occasionally
- d) Not at all

2) I still enjoy the things I used to enjoy:

- a) definitely as much
- b) not quite as much
- c) only a little
- d) hardly at all

3) I get a sort of frightened feeling as if something awful is about to happen:

- a) Very definitely and quite badly
- b) Yes, but not too badly
- c) A little, but it doesn't worry me
- d) Not at all

4) I can laugh and see the funny side of things:

- a) As much as I always could
- b) Not quite so much now
- c) Definitely not so much now
- d) Not at all

5) Worrying thoughts go through my mind:

- a) A great deal of the time
- b) A lot of the time
- c) From time to time, but not too often
- d) Only occasionally

6) I feel cheerful:

- a) Not at all
- b) Not often
- c) Sometimes

d) Most of the time

7) I can sit at ease and feel relaxed:

- a) Definitely
- b) Usually
- c) Not Often
- d) Not at all

8) I feel as if I am slowed down:

- a) Nearly all the time
- b) Very often
- c) Sometimes
- d) Not at all

9) I get a sort of frightened feeling like 'butterflies' in the stomach:

- a) Not at all
- b) Occasionally
- c) Quite Often
- d) Very Often

10) I have lost interest in my appearance:

- a) Definitely
- b) I don't take as much care as I should
- c) I may not take quite as much care
- d) I take just as much care as ever

11) I feel restless as I have to be on the move:

- a) Very much indeed
- b) Quite a lot
- c) Not very much
- d) Not at all

12) I look forward with enjoyment to things:

- a) As much as I ever did
- b) Rather less than I used to
- c) Definitely less than I used to
- d) Hardly at all

13) I get sudden feelings of panic:

- a) Very often indeed
- b) Quite often
- c) Not very often

d) Not at all

14) I can enjoy a good book or radio or TV program:

a) Often

b) Sometimes

c) Not often

d) Very seldom

APPENDIX L
QUESTIONNAIRE FOR SMOKING URGES- BRIEF

Indicate the extent to which you agree or disagree with each of the following statements by placing a single checkmark (like this:) along each line between **STRONGLY DISAGREE** and **STRONGLY AGREE**. The closer you place your checkmark to one end or the other indicates the strength of your agreement or disagreement. We're interested in how you are thinking or feeling ***right now*** as you fill out the questionnaire.

1) I have a desire to smoke right now

STRONGLY		:		:		:		:		:		STRONGLY	
DISAGREE												AGREE	
	┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		
	1		2		3		4		5		6		7

2) Nothing would be better than smoking a cigarette right now

STRONGLY		:		:		:		:		:		STRONGLY	
DISAGREE												AGREE	
	┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		
	1		2		3		4		5		6		7

3) If it were possible, I probably would smoke now

STRONGLY		:		:		:		:		:		STRONGLY	
DISAGREE												AGREE	
	┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		
	1		2		3		4		5		6		7

4) If could control things better right now if I could smoke

STRONGLY		:		:		:		:		:		STRONGLY	
DISAGREE												AGREE	
	┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		
	1		2		3		4		5		6		7

5) All I want right now is a cigarette

STRONGLY		:		:		:		:		:		STRONGLY	
DISAGREE												AGREE	
	┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		┌───┐		
	1		2		3		4		5		6		7

6) I have an urge for a cigarette

STRONGLY : : : : : : STRONGLY
DISAGREE AGREE

1 2 3 4 5 6 7

7) A cigarette would taste good now

STRONGLY : : : : : : STRONGLY
DISAGREE AGREE

1 2 3 4 5 6 7

8) I would do almost anything for a cigarette now

STRONGLY : : : : : : STRONGLY
DISAGREE AGREE

1 2 3 4 5 6 7

9) Smoking would make me less depressed

STRONGLY : : : : : : STRONGLY
DISAGREE AGREE

1 2 3 4 5 6 7

10) I am going to smoke as soon as possible

STRONGLY : : : : : : STRONGLY
DISAGREE AGREE

1 2 3 4 5 6 7

APPENDIX M
WITHDRAWAL SYMPTOM CHECKLIST

These phrases may or may not describe how you feel right now. Please respond to each word or phrase with how you feel RIGHT NOW

	Not present	Mild	Moderate	severe
1- Urges to smoke	0 _____	1 _____	2 _____	3 _____
2- Irritability/Frustration/Anger	0 _____	1 _____	2 _____	3 _____
3- Anxious	0 _____	1 _____	2 _____	3 _____
4- Difficulty concentrating	0 _____	1 _____	2 _____	3 _____
5- Restlessness	0 _____	1 _____	2 _____	3 _____
6- Hunger	0 _____	1 _____	2 _____	3 _____
7- Impatient	0 _____	1 _____	2 _____	3 _____
8- CRAVING a cigarette/Nicotine	0 _____	1 _____	2 _____	3 _____
9- Insomnia/Disturbed sleep	0 _____	1 _____	2 _____	3 _____
10- Increased eating	0 _____	1 _____	2 _____	3 _____
11- Drowsiness	0 _____	1 _____	2 _____	3 _____
12- Depression/Feeling blue	0 _____	1 _____	2 _____	3 _____
13- Desire for sweets.	0 _____	1 _____	2 _____	3 _____

APPENDIX N
BIVARIATE CORRELATIONS BETWEEN MEASURES OF SMOKING URGE AT
PRE AND POST TEST

Table 11

Bivariate Correlations between Measures of Smoking Urge at Pre-test

	QSU _a	Latency to First Puff	Puff Duration	Number of Puffs	Interpuff Interval
QSU _a	1	-	-	-	-
Latency to First Puff	-0.11	1	-	-	-
Puff Duration	-0.31	0.06	1	-	-
Number of Puffs	0.06	-0.43 **	-0.53 **	1	-
Interpuff Interval	-0.11	0.13	0.25	0.01	1

**p<.01; *p<.05

QSU_a-Questionnaire for Smoking Urges

Table 12

Bivariate Correlations between Measures of Smoking Urge at Post-test

	QSU _a	Latency to First Puff	Puff Duration	Number of puffs	Interpuff Interval
QSU _a	1	-	-	-	-
Latency to First Puff	-0.04	1	-	-	-
Puff Duration	-0.14	-0.05	1	-	-
Number of Puffs	0.34 *	-0.26	-0.39 *	1	-
Interpuff Interval	-0.20	0.27	0.21	-0.18	1

**p<.01; *p<.05

QSU_a-Questionnaire for Smoking Urges