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Effects of a Body Image Challenge on Smoking Motivation Among College Females

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Abstract

Objective—Previous correlational and quasi-experimental research has established that weight concerns and negative body image are associated with tobacco smoking, cessation, and relapse, particularly among young women. This study examined the causal influence of body image upon smoking motivation by merging methodologies from the addiction and body image literatures.

Design—Using a cue-reactivity paradigm, the study tested whether an experimental manipulation designed to challenge women's body image—specifically, their weight dissatisfaction—influenced their motivation to smoke. Female college smokers ($N = 62$) were included in a 2×2 factorial, within-subjects design (body image cues $\times$ smoking cues).

Main Outcome Measures—Self-reported urge to smoke was the primary dependent measure, with skin conductance as a secondary measure.

Results—As hypothesized, the presentation of smoking images and thin model images produced greater urges to smoke than control images. Additionally, trait weight concerns moderated the effect of the body image manipulation such that those women with greater weight concerns produced greater craving to the thin model image (when smoking cues were not present).

Conclusion—These findings provide initial evidence that situational challenges to body image are causally related to smoking motivation.

Keywords

tobacco smoking; weight concerns; body dissatisfaction; cue reactivity; women

Tobacco smoking is the leading cause of preventable mortality and morbidity in women (Husten, 1998; United States Department of Health and Human Services [USDHHS], 2001). The decline in smoking prevalence over the past three decades has been slower among women than among men (Escobedo & Peddicord, 1996, 1997; National Center for Health Statistics, 1993; Ockene, 1993), with 19.2% of women smoking as of 2003 (Centers for Disease Control and Prevention [CDC], 2005). Females are not only initiating at higher rates than males, but they appear to have more difficulty in quitting and remaining abstinent (Bjornson et al., 1995; Blake et al., 1989; CDC, 1994; Cepeda-Benito, Reynoso, & Erath, 2004; Ockene, 1993; Ortner, Schindler, Kraigher, Mendelsohn, & Fischer, 2002; Swan, Ward, Carmelli, & Jack, 1993; Ward, Klesges, Zbikowski, Bliss, & Garvey, 1997; Wetter et al., 1999).

Gender differences are also found among smokers' outcome expectancies. Outcome expectancies are beliefs about the consequences of one's actions, and are posited to play a motivational role in behavior (Bandura, 1977). Smoking outcome expectancies, specifically, are beliefs about the consequences or effects of smoking, and there is substantial correlational and experimental evidence that these expectancies influence smoking behavior (Brandon, Juliano, & Copeland, 1999). One key gender difference concerns expectancies regarding weight and body image. Women report weight control as a perceived benefit of smoking (Cepeda-Benito & Reig Ferrer, 2000; Ward et al., 1997). Women, more so than men, appear to tie their smoking behavior to reasons of weight control, weight loss, fear of weight gain, or actual, post-cessation weight gain (Killen, 1998; Klesges & Klesges, 1988; Klesges et al., 1998; M. D. Levine, Perkins, & Marcus, 2001; Ogden, 1994; Perkins, Levine, Marcus, & Shiffman, 1997; Ward et al., 1997). Thoughts about weight, eating disorder symptoms, weight control attempts, body image disturbances, and general weight concerns are predictive of females – but not males – initiating smoking (French, Perry, Leon, & Fulkerson, 1994; Killen, 1998; Stice & Shaw, 2003). Younger women smokers are up to 4 times more likely than men to report weight gain as a cause of relapse (Swan et al., 1993). And in general, women hold higher outcome expectancies than men of cigarette's utility for controlling appetite and weight (Brandon & Baker, 1991).

Whereas these relationships appear across women of all ages, college students represent a particularly important subpopulation. First, individuals in the age group of 18–24 have not decreased their prevalence of smoking and continue to have among the highest smoking prevalence (CDC, 2002). In addition, the prevalence of current smoking increased among those aged 20–24 with 13 or more years of education. There is also evidence suggesting that university females report greater body dissatisfaction and beliefs of being overweight than they had as high school seniors (Vohs, Heatherton, & Herrin, 2001). Within the college student population, it is a high priority to achieve and maintain an ideal weight, and the use

of dieting strategies of all types are extremely high in this group (Klesges & Klesges, 1988; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). In addition to these risk factors, college females are often transitioning from occasional to regular smoking (Lantz, 2003; Ling & Glantz, 2002); thus, understanding this specific population may lead to the development of secondary prevention interventions.

Although the descriptive, correlational, and quasi-experimental findings reviewed above suggest a general relationship between smoking and weight concerns among women, direct evidence of a causal relationship between weight concerns or body image and smoking motivation is lacking. Moreover, it is not known whether phasic fluctuations in body image influence situational cravings for cigarettes, and if this relationship is moderated by a woman's general body satisfaction. Such a relationship would be consistent with a causal influence of body image on smoking motivation.

The Current Study

The current study was designed to address the causality gaps in the literature noted above by examining the role of state body dissatisfaction in the situational motivation to smoke among college women. State body dissatisfaction refers to the transitory dimension of one's body image, which may fluctuate over time and vary in intensity (Thompson, 2004). For example, studies have found that women, immediately following exposure to images of thin models, report increased shame, body and weight dissatisfaction, and weight concern (e.g., Birkeland et al., 2005; Cattarin, Thompspon, Thomas, & Williams, 2000; Groesz, Levine, & Murnen, 2002; see M. Levine & Harrison, 2004 for a review; Pinhas, Toner, Ali, Garfinkel, & Stuckless, 1999; Posavac, Posavac, & Posavac, 1998). In contrast, trait body dissatisfaction refers to a relatively stable individual difference the evaluation of one's body, upon which state body dissatisfaction is superimposed (Thompson, 2004).

The primary aim of this study was to test if state body dissatisfaction would lead to a situational increase in smoking motivation among young college females. Thus, we examined whether a body image manipulation (BIM) affected self-reported urge to smoke and physiological responses associated with smoking motivation. The study also included a more traditional smoking cue manipulation (SCM) that has repeatedly been shown to produce subjective, physiological, and behavioral reactivity, thought to reflect prior classical conditioning (Brandon, Piasecki, Quinn, & Baker, 1995; Carter & Tiffany, 1999; Niaura et al., 1988; Rohsenow, Niaura, Childress, Abrams, & Monti, 1990). Cue reactivity can help identify the stimuli and situations that provoke ongoing smoking and relapse (e.g., Tiffany, 1990). The most robust indices of cue-reactivity have been self-reported urge to smoke and skin conductance response (Carter & Tiffany, 1999). The SCM was included in this initial study because we were unsure as to whether a smoking cue might be necessary to evoke an effect of the BIM on smoking motivation. This was based on Lang's theory (1984) that the probability of accessing an affective state (urge, in this case) appears to be a function of the number of propositions that are matched to the emotion prototype. Thus, because we did not know if a smoking cue would have an additive or synergistic effect upon the effect of the body image cue, or alternatively if it might mask an effect of the BIM, we presented the body image cue both with and without a simultaneous smoking cue. We hypothesized that

greater urges to smoke would be found for both the SCM (replicating previous research) and the BIM. In addition, we tested for interactions between the two factors, although we had no a priori hypotheses about the relationship.

In past research on body image satisfaction, greater effects of BIMs were found among participants with greater trait body dissatisfaction (Groesz et al., 2002; Thompson et al., 1999). Therefore, our second aim was to evaluate level of trait body dissatisfaction as a moderating variable in the BIM, hypothesizing that those individuals with greater trait body dissatisfaction would show the greatest impact of the body image challenge on smoking urge. Because weight appears to be the dimension of body image most closely associated with smoking, we focused specifically on weight dissatisfaction with both our state and trait measures.

Methods

Experimental Design and Overview

The study used a randomized 2 (BIM) X 2 (SCM) crossed factorial, within-subjects design. Pairs of cues associated with each factor were presented simultaneously on a split screen. Thus, the four conditions were thin models/smoking cues (T/S), thin models/neutral cues (T/N), neutral cues/smoking cues (N/S), and neutral cues/neutral cues (N/N). Participants completed measures assessing basic demographics, smoking history, smoking expectancies, and weight dissatisfaction. The primary dependent measure was self-reported smoking urge, with skin conductance response as the secondary dependent measure.

Participants

Participants were 62 college females recruited through fliers posted on local college campuses, freshman orientation screenings, classroom recruitment, and psychology courses that offered extra credit for participating in research. Potential participants were screened over the telephone for the following inclusion criteria: female, currently attending college, aged 18–24, smoking at least 10 cigarettes per day for at least 1 year. Aside from those receiving extra course credit, participants were paid \$20.00.

Measures

Smoking Status Questionnaire (SSQ)—This form was used to assess the participants' smoking status and nicotine dependence. Along with questions assessing years smoked and frequency of inhaling when smoking, it included the Fagerström Test for Nicotine Dependence (FTND), the standard, validated measure of nicotine dependence (Heatherton, Kozlowski, Frecker, & Fagerström, 1991).

Short Smoking Consequences Questionnaire (Short SCQ; Myers, MacPherson, McCarthy, & Brown, 2003)—This is a 21-item version of the original 50-item Smoking Consequences Questionnaire (SCQ; Brandon & Baker, 1991), a standard instrument for measuring smoking expectancies among college students. We were interested in only the Appetite/Weight Control factor ($\alpha = .94$), although we administered the entire short form.

Eating Disorders Examination-Questionnaire Version-Weight Concern subscale (EDEQ-WC; Fairburn & Beglin, 1994)—The EDEQ is a self-report measure based on the Eating Disorders Examination clinical interview (Cooper & Fairburn, 1987), with excellent psychometric properties. We administered only the Weight Concern subscale ($\alpha = .88$, for the current sample), which served as our measure of trait weight dissatisfaction.

Urge to Smoke Visual Analogue Scale (Smoke VAS)—Participants used a computerized system to rate their urge to smoke. A computer trackball was mounted on the arm of the recliner in which the participant sat, on the side with the dominant hand. The trackball controlled a computer-generated horizontal bar graph that was displayed on a computer screen following each trial. The bar-graph rating provided a score between 0 and 20, with higher numbers indicating a greater urge to smoke. This scale assessed participants' immediate urge to smoke following the experimental trials. The alpha coefficient was greater than .93 in each condition.

Weight Dissatisfaction Visual Analogue Scale (Weight Dissatisfaction VAS)—This state measure of weight dissatisfaction was administered in a similar fashion as the Smoke VAS, above, and was included as a manipulation check for the BIM (i.e., the ascertain that the body image cues produced changes in degree of weight dissatisfaction). The bar-graph rating provided a score between 0 and 20, with higher numbers indicating greater satisfaction with their weight. This scale was then reverse-coded so that higher scores indicated greater dissatisfaction. This type of state body dissatisfaction measure has been widely used in body image exposure studies (Birkeland et al., 2005; Thompson, 2004). The alpha coefficient was above .98 in each condition.

Object Desirability Form—On this form the participant indicated whether she wanted to own the items displayed in each image, including the clothing worn by the thin models. The instructions asked the participant to imagine using the item. This instrument served to reinforce the cover story as a study on consumer preferences, and it also encouraged social comparison to the thin models.

Other Materials

Carbon monoxide (CO) monitor—A BreathCo carbon monoxide recorder (Vitalograph, Inc., Lenexa, KS) was used to measure the participants' level of expired CO in parts per million (ppm). This measurement was taken immediately following informed consent. (This measure was not available for the first 7 participants.)

Body-related images—Six images of thin models, taken from fashion-oriented websites, were used in the experimental condition of the BIM. All models appeared to be in the age group of the participants, and a sampling of ethnically/racially diverse individuals was chosen. A separate sample of thirty college females evaluated these six images along with six images of average-weight models and six images of overweight models, in random order. Participants made their evaluations on a 1 to 7 Likert scale. Each image was evaluated on the model's appearance from *very underweight* to *very overweight* and the model's attractiveness from *very attractive* to *very unattractive*. The three sets of models were rated

as equivalent on attractiveness, but the thin model images were rated significantly lower in weight than either the normal-weight models or the overweight models ($ps < .001$).

Smoking cue images—Six images were used in the experimental condition of the SCM. The images were of standard smoking cues, such as lit cigarettes (e.g., Carter et al., 2006).

Neutral images—Thirty-six neutral images were selected as control images for the BIM and the SCM. Images chosen were inanimate objects with no obvious relation to eating, grooming, body weight, physical body image, or smoking, and thus were not expected to trigger any body or weight evaluation nor smoking urges. The images were devoid of any human figures. These neutral images (e.g., household appliances, furniture) were selected from the International Affective Picture System (IAPS; Center for the Study of Emotion and Attention [CSEA], 1995), and have been previously demonstrated to produce low arousal. Also used were comparable images taken with a digital camera of similar objects (e.g., office supplies, household objects). Such neutral images represent the most common control images used in experimental research on body image (Groesz et al., 2002). Although images of average size models offer a potentially cleaner design by controlling for human images, they are less often used in this research due to difficulties in obtaining such images and because female participants often perceive average sized models as being overweight (Groesz et al., 2002). Therefore, for this initial study, we chose to use inanimate objects rather than average weight women as control images.

Physiological measure—Skin conductance has been found to be a reliable index of cue-reactivity in previous drug studies, and it provides an objective measure of cue reactivity (Carter & Tiffany, 1999; Niaura et al., 1988). Skin conductance responses provide an index of sympathetic arousal (e.g., Raskin, 1973). To measure skin conductance, two large (8mm) Ag-AgCl electrodes filled with K-Y Jelly were attached to the hypothenar eminence on the participant's non-dominant hand. For each trial, skin conductance was recorded for a two-second baseline period and for 10 seconds from the beginning of the image onset. Skin conductance was sampled and stored at 20 Hz and later reduced to the median for each half-second value. These values were converted from A/D units to microsiemens and then normalized via log-transformation.

Procedure

Pre-manipulation—All participants who met inclusion criteria were scheduled for an individual appointment in the afternoon or evening. Upon their arrival, participants were informed that they were participating in a study to understand smokers' feelings and reactions to images of different consumer products. Participants provided a breath sample for the CO analysis and then were instructed to step outside to smoke one of their own cigarettes. This was done in an attempt to minimize and standardize nicotine withdrawal. Upon returning inside, the participant was asked to complete the demographic questionnaire, the SSQ, the Short-SCQ, and the TBD measures.

Manipulation—The participant was seated in a comfortable chair in front of a 17" color computer monitor. A female researcher attached the electrodes to the participant and then

left her alone for 4 minutes to acclimate to the testing situation. Upon returning, the researcher explained the procedure of the study, including instructions on how to evaluate the images, complete the Object Desirability Form, and use the trackball to make VAS ratings. The participant then was left alone to complete the session.

The participant was exposed to a series of slides containing paired images. Each slide, or trial, was comprised of a photo representing the BIM (thin model or neutral image) displayed next to an image representing the SCM (smoking cue or neutral image), with the two manipulations counterbalanced with respect to the two sides of the screen. One of each of the four trial types comprised a block, and participants were randomly exposed to a total of three blocks. An additional Neutral/Neutral slide was displayed after each of the experimental trials to allow the data collection to be a fluid process, while also producing some distraction to reduce carry-over effects from one experimental trial to the next.

The participant was instructed to view each slide for the entire 17 s presentation. A tone was presented 10 s into the trial, at which point the participant made her ratings on the Object Desirability Form. The VAS ratings then were displayed consecutively and followed by 7 s of black screen, during which a 2 s baseline for the next trial was collected.

Post-manipulation—Upon completion of the session and removal of electrodes, participants' height and weight were measured. The participants were asked to guess the purpose of the study (to confirm that the cover story was successful), debriefed, and paid.

Overview of Analyses—With skin conductance data, deviation scores were created by subtracting the 2-second baseline for each trial from each of the other 20 half-second time points for that trial. These scores were then averaged across the three trials of each type. Mean scores per trial type were also calculated for the VAS measures. These resultant means were used in subsequent analyses. The main analyses were conducted with a 2×2 (body image vs. neutral cues X smoking cues vs. neutral cues) repeated measure analyses of variance (ANOVA).

Results

Participant Characteristics

Demographic and smoking history characteristics are presented in Table 1. Although all participants met the inclusion criteria of smoking a minimum of 10 cigarettes per day for at least one year, the mean score on the FTND (3.29) indicates a relatively low level of nicotine dependence, as would be expected in a college student population.

Manipulation Check

No participants reported during debriefing that they disbelieved the cover story, and none guessed the purpose of the study. To confirm that the thin images increased weight dissatisfaction, we conducted a 2×2 repeated measure ANOVA with Weight Dissatisfaction VAS as the dependent variable. As expected, the thin images ($M = 10.30$, $SE = .82$) produced greater weight dissatisfaction than the neutral images ($M = 9.77$, $SE = .79$),

indicating that the manipulation was successful, $F(1, 61) = 13.02, p = .001$. No effect was found for the smoking images on Weight Dissatisfaction VAS, $F(1, 61) = .42, p = .52$.

Primary Analyses

Urge ratings—A 2×2 repeated measures ANOVA was conducted to test the effects of the manipulations on the VAS smoking urge ratings. As expected, a main effect of the SCM was found, $F(1, 61) = 17.13, p < .001, \eta_p^2 = .22$. Smoking images produced greater urges to smoke ($M = 8.97, SE = .77$) than neutral images ($M = 8.00, SE = .69$), replicating previous cue-reactivity research. The hypothesized main effect for the BIM was also found, $F(1, 61) = 5.80, p = .02, \eta_p^2 = .09$. As predicted, the thin model images produced greater urges to smoke ($M = 8.62, SE = .73$) than neutral images ($M = 8.35, SE = .72$). There was no interaction between the two manipulations ($p = .42$), indicating that they had independent, additive effects rather than synergistic effects (see Table 2).

Skin conductance—As shown in Figure 1, there was a clear initiation of a skin conductance response at 3 seconds after stimulus onset. The deviation scores were averaged across seconds 3 to 8 to create a mean response magnitude for each trial type per participant. A main effect was found for the SCM, $F(1, 61) = 11.27, p = .001, \eta_p^2 = .16$, with smoking images producing greater skin conductance reactivity ($M = -.004, SE = .002$) than neutral images ($M = -.011, SE = .002$), again replicating previous cue-reactivity research. As predicted, a main effect was also found for the BIM, $F(1, 61) = 6.39, p = .01, \eta_p^2 = .10$, indicating the thin model images produced greater skin conductance reactivity ($M = -.006, SE = .002$) than neutral images ($M = -.010, SE = .001$). However, a significant interaction was also found, $F(1, 61) = 5.64, p = .02, \eta_p^2 = .09$, indicating that the smoking cue and the thin model images had a synergistic effect on skin conductance. That is, the condition with both a smoking cue and a thin model cue produced a greater response than any of the other three conditions. Although main effects of both factors were found for urge and skin conductance, the two measures were not correlated within any of the four conditions ($r_s = -0.04 - 0.19, ns$).

Moderators

For our second aim, we had hypothesized that the level of trait weight dissatisfaction would moderate the effect of the BIM on smoking urge, such that the manipulation would have the greatest impact among women with higher trait weight dissatisfaction. The hypothesized moderator effect was tested as the interaction between the BIM and the EDEQ-WC ($M = 11.08, SD = 8.30$), which approached significance, $F(1, 60) = 2.125, p = .15$. Moreover, a significant three-way interaction was found between the two within-subjects factors and trait weight dissatisfaction, $F(1, 60) = 6.70, p = .01$. Separate ANOVAs were conducted within each condition of the SCM factor to determine the nature of the three-way interaction. In the absence of the smoking cue, a significant interaction effect with EDEQ-WC was found, $F(1, 60) = 7.58, p < .01$. In the presence of the smoking cue, there was no interaction with EDEQ-WC, $F(1, 60) = .69, p = .41$. Thus, only when smoking images were *not* present did trait weight dissatisfaction moderate the effect of the BIM. That is, in the absence of smoking cues, individuals with high trait weight dissatisfaction, as measured by the EDEQ-

WC, reported the greatest differential urge responses to the images of thin models versus the neutral images.

We also tested both body mass index (BMI: kg/m²), which was correlated with EDEQ-WC, $r(60) = .38, p < .01$, and the Appetite/Weight Control factor of the Short-SCQ as potential moderator variables. However, neither variable moderated the main effects of either the manipulations or their interaction.

Discussion

Given the wide range of descriptive and correlational evidence associating smoking with body image and weight-related variables among women, the overarching goal of the present experiment was to test the causal nature of this association in a controlled setting. That is, it examined how phasic fluctuations in one's weight dissatisfaction might influence motivation to smoke among college student women, a key demographic for body image distortion, weight-control behaviors, and associated disorders.

This study had two specific aims: to test the effects of a body image challenge and a traditional smoking cue presentation on smoking motivation, as indexed by self-reported urges to smoke and skin conductance response; and to test if trait body dissatisfaction moderated the relationship between the BIM and the reported urge to smoke. As we hypothesized, we replicated past studies finding that smoking cues produced greater urges to smoke than neutral images. More novel, however, was our hypothesis that the presentation of images of thin models would also produce stronger smoking urges compared to neutral images. This hypothesis was also supported, although the effect size was smaller than that achieved with the smoking cues. The effects of the two manipulations were independent and additive, but not synergistic.

Results for the skin conductance response were similar to those found for the self-reported urges in that main effects were found for both the SCM and the BIM. However, in this case, we found an interaction indicating a synergistic effect. Indeed, the presence of a smoking cue appeared to potentiate the reaction to the thin body image. No significant association was found between the two reactivity measures, urge and skin conductance. Such response dysynchrony is a common finding in studies of cue-reactivity or affect in general (Abrams & Wilson, 1979; Drobles & Tiffany, 1997; Lang, 1979; Tiffany, 1990), and it may be more likely among samples that are low in nicotine dependence and not experiencing withdrawal effects during testing, such as the present sample (Sayette, Martin, Hull, Wertz, & Perrott, 2003). Similarly, dysynchrony may be more likely in studies such as the current one that do not induce intense affective states among participants (Hodgson & Rachman, 1974; Lang, 1984; Sayette et al., 2003).

Because a main effect of the BIM on craving was found, we tested trait weight dissatisfaction as a potential moderating variable. Other studies have demonstrated that women with greater baseline body dissatisfaction are more affected by BIMs (Groesz et al., 2002). Our hypothesis that those women with higher trait body dissatisfaction would be most affected by the thin model image, and thus show greater urge responses, was

supported, but only in the absence of the smoking image. It may have been that the more potent smoking images overpowered or masked the more nuanced moderating effect of trait weight dissatisfaction on the presentation of body image cues. Nevertheless, the finding of any moderating effect, together with the main effect of the BIM, is consistent with a causal role of body image on smoking motivation. Moreover, it reinforces the evidence from earlier studies that trait body image dissatisfaction is a risk factor for smoking onset and maintenance (Bruckner, Spring, & Pingitore, 1994; Feldman, Hodgson, & Corber, 1985; King, Matacin, Marcus, Bock, & Tripolone, 2000; Stice & Shaw, 2003). In contrast with trait weight dissatisfaction, we found that participants' actual body mass, indexed by the BMI, although correlated with weight dissatisfaction, did not moderate the relationship between the BIM and reported urge to smoke. Thus, it was women's subjective weight dissatisfaction rather than their actual weight that appeared to influence their urge to smoke in response to images of thin models. This finding is consistent with a treatment study for women smokers that found that cognitive-behavioral therapy to reduce weight concerns was more effective at producing tobacco abstinence than a behavior program to prevent actual weight gain (Perkins et al., 2001). In this context, perception appears to be a stronger motivator than reality.

Limitations

The most notable limitation of this study is that, although hypotheses were largely supported, the effect sizes were modest. These include the group differences in weight dissatisfaction caused by the body image manipulation, as well as the main dependent variable of urge rating. There are several possible explanations for this. First, we selected an ethnically and racially diverse set of images of thin models as stimuli for the BIM, yet the participant sample was primarily Caucasian. This mismatch may have attenuated the intended social comparison (Birkeland et al., 2005; Brewer & Weber, 1994; Cattarin et al., 2000; Major, Sciacchitano, & Crocker, 1993; Miller, Turnbull, & McFarland, 1988), as found in a recent study of African American women presented with multi-race images (Frisby, 2004). Despite the advantages of standardization, it may be beneficial to tailor the images to participants' apparent ethnic and racial characteristics in future studies.

A second barrier to larger experimental effects may have been the use of a within-subjects design. We chose such a design because we wished to maximize the statistical power of this first study on the causal role of body dissatisfaction on smoking urges. However, in their meta-analysis, Groesz et al. (2002) found a greater effect size for BIMs that used between-subjects designs. A reasonable explanation for the relative weakness of within-subjects designs is that carry-over effects occur, even when distracter trials are used between experimental trials. The half-life of body image threats is unknown and may be longer than the inter-trial interval of this study.

The effects of the manipulations may have also been attenuated by our requirement that participants smoke a cigarette near the start of the session, about 30 minutes before beginning the exposure to the stimuli. We did this in an effort to standardize participants with respect to nicotine withdrawal. However, because college students tend to be light smokers, that single cigarette may have dampened subsequent urge responding. Future

studies might either increase the interval between the baseline smoking and the stimulus presentation, or raise the inclusion criterion for number of cigarettes smoked per day. The latter would likely increase the nicotine dependence and conditioning histories of the sample, which could produce greater cue-reactivity (Niaura et al., 1988). However, the cost would be a less representative sample of college-aged smokers.

Additionally, our cue-exposure methodology was unique in that we paired stimuli together to test for additive and synergistic effects. However, the use of the side-by-side images may also have reduced effect sizes by diffusing the participant's attention to any given stimulus. This might have been particularly the case with the body image stimuli, which may have been less salient in this context than were the smoking stimuli. Future studies could examine the effects of body image stimuli alone, or experiment with other techniques used to elicit body dissatisfaction that may be more potent (e.g., Fredrickson, Roberts, Noll, Quinn, & Twenge, 1998).

Ultimately, we cannot discount the possibility that the effect size is genuinely small. However, this does not negate the theoretical or public health significance of the finding. That we were able to elicit even a small increase in smoking motivation merely by displaying an image of a thin model for 17 seconds suggests the potential impact of a more powerful manipulation. Moreover, the compounding of relatively small risk factors may produce larger effects (c.f., Forehand, Biggar, & Kotchick, 1998), as seen by the additive effect of thin models and smoking cues. Similarly, cumulative effects over time may aggregate to produce significant impact on real-world outcomes (Abelson, 1985). In the case of threats to body image and its effect on smoking motivation, college women are constantly exposed to images of the thin ideal. Therefore, although our brief laboratory-based presentations of images of thin women may indeed model the immediate naturalistic effects of challenges to young women's body image, it cannot be expected to capture fully the totality and cumulative impact of repetitive real-world exposure to body image threats. A naturalistic study that maximizes external validity rather than internal validity – possibly using ecological momentary assessment (Stone & Shiffman, 1994) to examine the correspondence between body dissatisfaction and smoking motivation—would compliment the present experiment.

Finally, although we included multimodal assessment of situational smoking motivation (self-report and physiological reactivity), we did not measure actual smoking behavior. The findings from urge ratings and skin conductance supported our hypothesis that a body image challenge would increase responding on these measures, but we do not know the degree to which our laboratory paradigm models naturalistic smoking by young women. Nevertheless, several studies have demonstrated that smoking and alcohol cue reactions are predictive of subsequent self-administration behavior, particularly post-cessation relapse (e.g., Abrams, Monti, Carey, Pinto, & Jacobus, 1988; Cooney, Litt, Morse, Bauer, & Gaupp, 1997; Drummond & Glautier, 1994; Niaura, Abrams, Demuth, Pinto, & Monti, 1989; Rohsenow et al., 1994), which underscores the clinical significance of cue reactivity. Moreover, our paradigm, which was designed to maximize internal validity, produced results that were consistent with the descriptive and correlational studies reviewed earlier that emphasized external validity over internal validity. Thus, the studies complement each other and

together support the causal role of body image and weight control in the motivation of smoking. Our findings, however, do not address whether state body dissatisfaction exerts its influence on smoking motivation through a direct route (e.g., due to expectancies that smoking will control weight) or via a mediator such as negative affect. It is possible that the presentation of thin models induced negative affect in participants, which in turn increased motivation to smoke (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Brandon, 1994). Future research will need to examine mediators more closely.

In summary, this study drew upon theory and methodology from both addiction research and body image/eating disorder research to examine the role of phasic body dissatisfaction in motivating situational tobacco smoking. Through the use of an experimental design, the findings build upon and complement past descriptive and correlational research that has suggested a relationship between body image and smoking. It is the first study, to our knowledge, to manipulate body image in the laboratory and observe concomitant changes on indices of smoking motivation consistent with a causal relationship. Future research will need to examine how this relationship impacts smoking frequency and intensity, leading to the development or maintenance of tobacco dependence. Finally, downstream treatment implications include the possibility of using images of thin women or other cues for body dissatisfaction as stimuli for extinction-based cue-exposure therapies, as well as the more general conclusion that body dissatisfaction and weight concerns should be direct targets of cognitive-behavioral treatments for smoking cessation (c.f. Perkins et al., 2001). Our findings are most relevant to the population sampled – young college women – because of their high prevalence of body dissatisfaction as well as the clinical potential for intervening before they become more tobacco dependent. However, because body dissatisfaction is common throughout the general population, it will be important to examine the generalizability of the findings.

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Figure 1.

Skin conductance response for each trial type displayed as deviation scores from the trial baseline.

Table 1

Participant Characteristics

Variable	%	<i>M</i>	<i>SD</i>
Age		20.03	1.50
Smoking History			
Years smoked		4.58	2.37
Cigarettes smoked per day		15.65	4.89
Fagerström score		3.29	2.00
Carbon monoxide level (ppm)*		15.16	8.74
Race			
Caucasian	91.9		
African American	3.2		
Other	4.8		
Hispanic Ethnicity	8.1		
Year in school			
Freshman	32.3		
Sophomore	29.0		
Junior	22.6		
Senior	16.1		
Body Mass Index		23.93	6.35

* Breath CO was collected from 55 participants.

Table 2

Means (Standard Deviations) of Smoking Urge Ratings

Smoking Cue Manipulation ($p < .001$)	<u>Body Image Manipulation ($p = .02$)</u>	
	Thin	Neutral
Smoking	9.06 (6.10)	8.88 (6.13)
Neutral	8.19 (5.57)	7.82 (5.36)