THESIS

GRAPHIC CIGARETTE PACKAGE WARNING LABELS: INVESTIGATING THE

EFFECTIVENESS OF GRAPHIC IMAGES AMONG NEW AND OCCASIONAL SMOKERS

Submitted by

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ABSTRACT

GRAPHIC CIGARETTE PACKAGE WARNING LABELS: INVESTIGATING THE

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Smoking is a major public health concern. As a result of recent legislation, cigarette

manufacturers will soon be required to display graphic pictorial depictions of the health

consequences of tobacco on all products sold in the U.S. Research has shown that fear appeal

messages can be effective for health behavior change, but little research has examined the effects

of graphic imagery in warning messages. The present study explored the effectiveness of graphic

and non-graphic cigarette package warning labels and examined potential mediating processes

among occasional and recently initiating smokers. No significant direct effects of the graphic

warning labels (as compared to non-graphic labels) on explicit attitudes, implicit attitudes, and

intentions to not smoke were found. The results also show that graphic warning labels were

associated with increased perceived personal relevance and negative affective reactions

compared to non-graphic warning labels. Personal relevance was also found to mediate the

relationship between warning label condition and negative implicit attitudes. Implications for

prevention are discussed.

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INTRODUCTION

Tobacco use is a major public health concern, and it is estimated that 20.6% of adults in the United State smoke cigarettes (Centers for Disease Control and Prevention [CDC], 2010). Worldwide, cigarette smoking is the foremost cause of preventable death, accounting for 5,000,000 deaths every year (World Health Organization, 2011), with an estimated 443,000 in the United States alone. In addition, exposure to secondhand smoke has also been linked to premature death and disease in non-smokers (U.S. Department of Health and Human Services, 2006). Given the high prevalence of smoking and the associated health problems, prevention campaigns to address this health behavior are essential.

In accordance with the U.S. Family Smoking Prevention and Tobacco Control Act (2009), Food and Drug Administration (FDA) regulations outline that cigarette manufacturers must display large and visually graphic warning labels depicting the negative health consequences of smoking on cigarette packing and advertisements. Additionally, these required health warning labels must comprise at least 50% of front and rear panels of the package. According to the FDA regulations, manufacturers must be in compliance with the regulations by September 2012; however, recent litigation initiated by cigarette manufactures may impede the implementation of these labels. The U.S. follows the lead of Canada and Brazil in this effort; these countries have previously implemented strong text warnings and graphic pictures on cigarette package warning labels. While smoking rates in Canada have decreased since the introduction of the graphic warning labels (Health Canada, 2009), the causal role of warning labels in this trend is not clear given other measures simultaneously implemented (e.g., increased cigarette taxes, bans on public place smoking) (Mahood, 2004). Experimental work is needed to

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determine if these types of graphic warnings are able to actually cause attitude and intention change regarding smoking.

A great deal of work has been conducted to develop, study, and disseminate anti-tobacco messages. In general, media messages used in tobacco control programs have been shown to be effective for preventing smoking initiation and reducing smoking prevalence, especially among adolescents (Bauer, Johnson, Hopkins, & Brooks, 2000; Emery et al., 2005 Farrelly, Nonnemaker, Davis, & Hussin, 2009; Hopkins, Briss, & Ricard, 2001; Sly, Trapido, & Ray, 2002; Wakefield, Flay, Nichter, & Giovino, 2003). Anti-tobacco media campaigns have been associated with increased intentions to avoid smoking (Pechman & Reibling, 2006) and with lower smoking rates among youth (Terry-McElrath et al., 2007). Specific to pictorial cigarette package warning labels, research has shown that smokers perceive these warning labels to be effective in increasing motivations to quit (Hammond, Fong, McDonald, Brown, & Cameron, 2004; Willemsen, 2005). In sum, evidence suggests the utility of anti-tobacco messages and anti-smoking campaigns.

On the other hand, concerns have been raised regarding prevention campaigns that include graphic images and content. Some research has indicated that anti-substance use media campaigns with graphic content may be ineffective for behavior change (Anderson, 2010; Erceg-Hurn, 2008; Ringold, 2002), and messages intended to scare the recipient may have unintended or detrimental effects (Ruiter et al., 2001; Witte & Allen, 2000). In particular, anti-drug prevention programs using a fear-based approach have in some instances produced a boomerang effect, with interest in drugs and drug use rates increasing after program implementation (Hornik et al., 2002, 2003); therefore, there is a need for careful scrutiny of fear-based messages, including graphic warning labels on cigarette packaging.

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As graphic pictorial warnings will soon be required on all cigarette packaging, research is needed to investigate the effectiveness of these graphic warning labels on implicit smoking attitudes, explicit smoking attitudes, and smoking intentions. Additionally, investigation into the mechanisms by which these graphic pictorial warning labels operate may also prove fruitful. Given the incredible costs associated with cigarette smoking, examination of the effectiveness of this new anti-tobacco policy put forth by the U.S. government is a critically important next step.

Graphic Warning Labels

Public health campaign messages frequently highlight threatening consequences of a behavior to attract attention, induce fear of negative consequences, and motivate message recipients to change or avoid risky behaviors. One strategy to emphasize consequences is to incorporate graphic images on a warning label. Graphic images can be defined as visuals "marked by clear lifelike or vividly realistic description" and are "vividly or plainly shown or described" (Merriam-Webster Online Dictionary, n.d.). To the extent that a message or warning label contains vivid and lifelike depictions of negative health consequences, the message content can be classified as graphic. In anti-tobacco warnings labels, graphic content can take the form of images of diseased mouths, diseased lungs, second-hand smoke effects, and death-related images.

Graphic images on warning labels may be effective for attitude and behavior change. In a review of fear appeals and persuasion, Witte and Allen (2000) concluded that the strongest predictor of message effectiveness was severity of the consequence depiction, and severity was speculated to include vivid or gruesome pictures. Furthermore, Kees, Burton, Andrews, and Kozup (2010) found graphic pictorial warnings depicting mouth diseases on cigarette packaging to evoke fear and strengthen intentions to quit. This evidence suggests that graphic content may

be an effective component of a prevention campaign. Furthermore, Robinson and Killen *(*1997)
found text-only warning labels to be ineffective among adolescent smokers, as adolescents were
not seeing, reading, or remembering the warning label. In sum, graphic images may be an
effective means of preventing tobacco use, but an experiment is needed to determine if the new
packaging legislation actually works, and if it does, by what mechanisms does it affect behavior.

Attention and Message Processing

Social psychological theory would suggest that graphic images could have an effect on
the viewer. Attention allocation and message processing are critical components of an
individual's response to a warning label or public health campaign. From an information
processing perspective (McGuire, 1989), an individual must attend to the warning in order to
comprehend the persuasive message or warning label. Without this necessary attention and
comprehension, attitude and behavior change cannot occur. Text-only descriptions of health
consequences are unlikely to attract attention or to influence behavior (Argo & Main, 2004). As
a result, graphic images are often incorporated to increase attention to the message. The new
packaging requirements may grab the attention of potential user's to a greater degree than the
current, text-only warning messages.

Elaborative Processing

The graphic images may have an effect on the individual beyond just the initial
heightened attention allocation. After an individual attends to a warning label, the individual then
cognitively processes the warning with differing levels of elaboration. According to the
elaboration likelihood model of persuasion (ELM; Petty & Cacioppo, 1986), high elaborative
processing of messages occurs when message arguments are carefully considered. This
deliberate consideration is referred to as the central route to attitude change and persuasion.

Alternatively, less elaborative processing is characterized by reliance on message cues that are unrelated to the message arguments (e.g., source attractiveness or expertise). This less effortful processing is known as the peripheral route to attitude change and persuasion. Attitudes formed through the central route have been shown to be more temporally resilient, more predictive of behavior, and more resistant to counter persuasion (van Schie, Martijn, & van der Pligt, 1994). As graphic images can influence the extent to which the warning is processed, these warning labels can enhance elaborative central route processing and may be more effective for attitude and intention change than text-only warning labels. Hammond, Fong, McDonald and Brown (2003) found a strong positive relationship between the amount of processing of graphic Canadian cigarette warning labels and intentions to quit. The amount of processing also predicted smoking cessation, although this research relied on self-report of cognitive processing and attention.

On the other hand, the pictorial warning labels may also serve as a cue for peripheral processing. The peripheral route to persuasion may be activated when the recipient has low motivation for processing the message arguments, and cues such as attractiveness can influence persuasion (Petty & Cacioppo, 1986). In this sense, peripheral processing may influence warning label effectiveness on attitude and intention change when motivation to consider the warning label arguments is low. Smokers, particularly those who smoke occasionally or have recently begun smoking, may be unmotivated to consider message arguments if they do not feel that the warning label is personally relevant. As the peripheral route to persuasion can be a due to message characteristics such as attractiveness, the graphic content of warning labels may serve as a cue for peripheral processing.

Novelty Effects

One strategy to increase attention and central processing for a warning label is to include content that is novel to recipients, and graphic images on a warning label may be more novel to the recipient than standard text-only warnings. Research has shown that novel or unexpected events are processed more extensively than common events, and novel events come to mind more easily (Tversky & Kahneman, 1973; Wyer & Hartwick, 1980). Graphic images can be unexpected on cigarette package warning labels given the vivid depiction of consequences, as well as the history of text-only warning labels in the U. S. The novelty associated with graphic content may increase elaborative central processing, and this processing may result in increased accessibility of the image and warning in memory (Petty & Cacioppo, 1986). This increased accessibility could also enhance persuasion and message effectiveness as the recipient is better able to recall the warning, which could influence decision-making regarding the health behavior.

Personal Relevance

Elaborative central processing and warning label consideration can also be increased by promoting processing surrounding personal relevance (Petty & Cacioppo, 1986). Personal relevance is increased when the individual perceives the warning as being directly applicable to himself, which results in increased message processing. Graphic warning labels on cigarette packaging that feature images of people or bodies may elicit increased perceptions of personal relevance over text-only warning labels. O'Hegarty et al. (2007) found that Canadian cigarette warning labels depicting a diseased lung or a tumor were perceived as more personally relevant and more effective than text-only warning labels. As personal relevance and central processing is increased, graphic warning labels may increase effectiveness on attitude and intention change.

Affective Reactions

Attention and central processing can also be increased by eliciting a negative affective response or a negative mood in a message recipient (Petty, DeSteno, & Rucker, 2001). In line with the ELM, negative affect can lead to more attention and subsequent central processing while positive affect can lead to less attention and more peripheral processing. Graphic images on warning labels may serve to increase emotional responses and negative affect, as graphic images have been found to be associated with negative affective responses (Peter et al., 2007). Peter and colleagues (2007) found that Canadian graphic cigarette package warning labels produced negative affective responses in both smokers and non-smokers. Research has also found that emotionally-valenced images attracted attention (Calvo & Lang, 2004), and emotional arousal can enhance memory for events or messages (see Dolan, 2002). Moreover, emotionally arousing advertisements and visuals are better recalled than those that do not arouse emotion (Cahill & McGaugh, 1998; Lang, Dhillon, & Dong, 1995), suggesting the influence of affective reactions on processing. Biener, Ji, Gilpin, and Albers (2004) found that anti-tobacco advertisements were associated with increased recall and perceived effectiveness when the advertisement evoked negative emotion and provoked thought about serious health consequences. Furthermore, both affective reactions of fear and disgust to anti-tobacco advertisements have been shown to be associated with increased attention to the message and with increased memory for the message (Leshner, Bolls, & Thomas, 2009). However, when both high levels fear and disgust content were present in advertisements, message encoding and memory were impaired, suggesting a defensive response to messages inducing high levels of affective reactions.

Research does suggest that affective reactions to a message can influence judgments of risk and increase intentions for precautionary behaviors (Learner, Gonzalez, Small, & Fischhoff, 2003; Romer & Jamieson, 2001). Specifically, the negative affective reactions of fear and sadness have been shown to be associated with increased persuasiveness of prevention messages (Dillard & Anderson, 2004; Kang & Capella, 2008), and these affective reactions may motivate message processing (Bohner, Crow, Erb, & Schwarz, 1992; Schwarz, Bless, & Bohner, 1991). The negative affective reactions elicited by graphic warning labels may increase attention, processing, and memory for the warning label message, which may influence overall warning label effectiveness on attitude and intention change.

Increased Knowledge

Graphic warning labels also serve to increase processing of information and increase consumer knowledge of the health risks associated with smoking. In meta-analyses of health communication campaigns, anti-tobacco media messages were found to have large positive effects on knowledge of risks associated with tobacco use (Derzon & Lipsey, 2002). Among current smokers, Borland (1997) found that Australian graphic warning labels on cigarette packaging increased awareness of health effects. In focus groups, O'Hegarty, Pederson, Yenokyan, Nelson, and Wortley (2007) found that both non-smokers and smokers perceived graphic Canadian warning labels as more informative than current U.S. text-only warnings. Furthermore, graphic pictorial warnings may also serve to increase consumer knowledge of health risks among illiterate smokers. As text-only warnings labels would be ineffective with this population, pictorial warnings may be more effective for reducing smoking. In sum, graphic images on warning labels may increase attitude and intention change by increasing knowledge of health risks.

Fear Appeal Campaigns

Graphic images on cigarette packaging serve to warn consumers of the negative health consequences of smoking, and these warning labels can be considered a fear appeal message. A fear appeal is a communication message attempting to arouse fear in order to promote self-protective action (Rogers, 1975). Fear appeal messages are theorized to activate one of two competing processes in the message recipient, either a danger control or fear control response (Leventhal, 1970). The differential activation of these two processes can then influence message processing and message effectiveness.

Threat Perception

The extended parallel process model (EPPM; Witte, 1994) describes the differing motivational responses to induced fear and the subsequent perception of threat: protection motivation or defensive motivation. A protection motivation is elicited if an individual evaluates the message recommendations as feasible and perceives their own self-efficacy to perform precautionary behavior as sufficient. The individual is motivated to take steps to avoid potential negative consequences and reduce fear and threat appraisals. Kees et al. (2010) found fear to fully mediate the relationship between a graphic pictorial on cigarette packages on smoker's intentions to quit, indicating that fear elicited a protection motivation. Dillard and Anderson (2004) also found that fear in response to a health message increased persuasion. Additionally, the EPPM posits that imagery eliciting an affective response (e.g., fear) should increase attention to the arguments of a message and increase message effectiveness. Slater, Karan, Rouner, and Walters (2002) found that threatening visuals in televised alcohol warnings increased message responsiveness by increasing attention to the warning.

Alternatively, the message could elicit a defensive motivation (i.e., avoidance) as the subjective experience of fear is unpleasant and aversive (Carver, 2001). A high magnitude of threat may elicit a goal to immediately remove the fear by avoiding the message entirely and failing to attend to warning content. Fear appeals may inhibit a protection motivation, and elicit a defensive motivation due to fear control processes (Ruiter et al., 2001; Witte, 1994; Witte & Allen, 2000). In this case, graphic fear appeals may hamper effectiveness given this potential to elicit a defensive motivation. The graphic images on cigarette warning labels could result in a high magnitude of threat perception and subsequent defensive motivation as the graphic images may be aversive to some individuals. Research has shown that graphic message content may interfere with processing (Wyer, 1974) and reduce message recall (Kees et al., 2010), potentially resulting from a heightened fear response.

Boomerang Effects

A high magnitude of threat perception may also result in decreased effectiveness of warning labels or boomerang effects (i.e., opposite effects to those intended). Some research has shown boomerang effects in public health interventions aimed at reducing substance use (Fishbein, Hall-Jamieson, Zimmer, & Ringold, 2002). For fear appeal campaigns, some research (see Hornik et al., 2008) has found that anti-drug prevention media campaigns can lead to both an increased interest in drugs and increased rates of drug use after program implementation. Specific to warning labels, Bushman (2006) found that warnings labels on violent television programing operated to increase desire to watch the programming. These boomerang effects may be explained by psychological reactance theory (PRT; Brehm, 1966). According to PRT, psychological reactance will result to the extent an individual perceives threats to freedom and perceives an external source (e.g., FDA) threatening freedom by imposing restrictions. The

individual is motivated to bolster perceived freedom by engaging in the behavior being denigrated (e.g., smoking) or resisting the recommended behavior (e.g., quitting smoking). Among adolescents, Miller, Burgoon, Grandpre, and Alvaro (2006) found psychological reactance predicted higher risk for smoking in response to televised anti-tobacco advertisements. Psychological reactance may result in decreased effectiveness of cigarette packaging warning labels on smoking-related outcomes. Given the potential for these effects, there is surprisingly a lack of research attention to the effects of graphic images on warning labels and in public health campaigns despite the use of this imagery in campaigns designed to change health behaviors.

Implicit and Explicit Smoking Attitudes

Attitude change is often studied in prevention campaigns, as attitudes can be predictive of behaviors (Ajzen & Fishbein, 1980). On the other hand, a limitation of the assessment of direct attitude outcomes through explicit measurement is that these measures are susceptible to a social desirability response bias (Derzon & Lipsey, 2002; Slater & Kelly, 2002). In an effort to measure attitudes and evaluations independent of introspection and a social desirability bias, implicit measures are one alternative to explicit measurement (Fazio & Olson, 2003; Greenwald, McGhee, & Schwartz, 1998). Implicit attitudes are conceptualized as automatic, nondeliberative evaluations which are not controlled, whereas explicit attitudes refer to effortful, deliberative evaluations of an attitude object (Fazio & Olson, 2003). Implicit measurements have been used to study the influence of implicit attitudes on health behaviors including smoking (Swanson, Rudman, & Greenwald, 2001) as well as other health behaviors such as drinking (Jajodia & Earleywine, 2003; Palfai & Ostafin, 2003; Wiers et al., 2002). Implicit attitudes have also been implicated in motivation to smoke (Payne et al., 2007) and cravings to smoke (Waters et al., 2007) In general, research has shown that implicit attitudes can be activated and influence

behavior outside of conscious awareness (Chen & Bargh, 1999), and implicit attitudes can operate as a heuristic in decisions regarding risks and benefits (Finucane, Alhakami, Slovic, & Johnson, 2000). Graphic warning labels on cigarette packaging may influence both explicit and implicit attitudes.

According to the associative-propositional evaluation model (APE; Gawronski & Bodenhausen, 2006), implicit and explicit attitudes result from two different mental processes: associative and propositional processes. Implicit attitudes reflect associative evaluations based on automatic affective reactions and automatically activated associations in memory when perceiving a stimulus. Explicit attitudes are evaluative judgments of the validity of propositions inferred from these activated associations. The APE model posits that automatic affective reactions and associate evaluations (i.e., implicit attitudes) can form the basis for evaluative judgments (i.e., explicit attitudes). In addition, implicit attitude change can occur through evaluative conditioning. Research has shown changes in implicit attitudes as a result of parings of an attitude object with positive or negative stimuli (Baccus, Baldwin, & Packer, 2004; Mitchell, Anderson, & Lovibond, 2003; Olson & Fazio, 2002). Additionally, Czyzewska and Ginsburg (2007) found that exposure to anti-substance use public service announcements resulted in more negative automatic attitudes to the particular substance targeted by the message. The pairing of the attitude object (e.g., cigarette package) with negative stimuli (e.g., graphic images) can result in a negative valence and negative implicit attitudes associated with the attitude object (e.g., cigarettes). Explicit attitude change can then result from affective reactions and changes to implicit attitudes. Thus, graphic cigarette warning labels may result in implicit, automatic attitude change, which may predict explicit attitudes and eventual smoking behavior.

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The present research examined warning label effectiveness on implicit and explicit attitude change.

The Present Study

The current study assessed the effectiveness of graphic cigarette package warning labels on smoking-related outcomes. This study tested the following hypotheses:

H1: Those individuals exposed to graphic warning labels will report more negative explicit attitudes towards smoking than those individuals exposed to non-graphic warning labels.

H2: Those individuals exposed to graphic warning labels will display more negative implicit, automatically activated evaluations of smoking than those individuals exposed to non-graphic warning labels.

H3: Those individuals exposed to graphic warning labels will report more intentions to not smoke than those individuals exposed to non-graphic warning labels.

H4: Those individuals exposed to graphic warning labels will report more perceived personal relevance than those individuals exposed to non-graphic images.

H5: Perceived personal relevance will mediate the effect of the graphic warning labels on attitudes towards smoking and intentions to not smoke.

H6: Those individuals exposed to graphic warning labels will report more negative affective reactions of fear and distress than those individuals exposed to non-graphic images.

H7: Affective reactions of fear and distress in response to warning labels will mediate the effect of the graphic warning labels on attitudes towards smoking and intentions to not smoke.

In order to address these research questions, a series of studies was conducted with undergraduate students. First, a pilot-study was run to determine the level of graphic content of each of the FDA proposed warning labels (study 1). Next, study 2 was conducted to gather

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information regarding the prevalence of smoking behaviors, attitudes towards smoking, and intentions to not smoke among undergraduate students. From the study 2 sample, occasional smokers and smokers who recently initiated smoking were selected to participate in the treatment study (study 3), during which the effectiveness of the cigarette warning labels on smoking-related outcomes was tested.

METHODS

Study 1 Pilot Study Participants

Participants were 75 undergraduate students from introductory psychology courses at Colorado State University who reported smoking at least one cigarette in their life. The participants participated for partial fulfillment of course requirements. Previous research of pictorial cigarette warning labels with this sample size (Kees et al., 2010) has found significant differences in the perceived graphicness of different cigarette package pictorial warning labels. The mean age of the participants was 19.31 years. Seventy-two percent of the sample was female, 80% of the sample was Caucasian, 6.7% were Hispanic, 4% were African American, 5.3% were Asian, 1.3 % were American Indian, and 2.7% identified as another ethnicity. Twelve percent of the participants were current daily smokers, 20% were current occasional smokers, and 68% were former smokers. Additionally, 2.7% of the participants indicated that they had recently initiated smoking within the last month.

Study 1 Pilot Study Materials

Stimulus material. Participants were exposed to thirty-six warning labels presented in random order. Randomization order differed across participants, with each participant being presented with a unique order of labels. Warning labels consisted of FDA proposed warning labels for cigarette packaging. Color photographs of the warning labels on generic cigarette packages were presented on a computer screen.

Measures. The measurement instrument collected self-report information for two variables: (1) perceived graphicness (2) smoking behavior. Demographic information (age, gender, and ethnicity) was also collected.

Perceived graphicness. Participants perceptions of the extent to which the warning label was graphic were assessed. Adapted from Kees et al. (2010), participants were asked to report how graphic, vivid, powerful, and intense they perceived each warning label to be on a scale ranging from 1 (not at all) to 7 (very). This measure has been shown to have high reliability (α= .87) (Kees et al., 2010). Perceived graphicness scores were obtained by computing the mean of the four items. Higher scores indicate stronger perceptions of graphicness.

Smoking behavior. To assess smoking behaviors, participants were asked about past and current smoking behavior. Similar to a measure used by the CDC (2009), participants were asked (1) "Have you smoked at least one cigarette in your life?" (2) "Have you smoked at least 100 cigarettes in your life?" (3) "In the last 30 days, have you smoked cigarettes every day, some days, or not at all?" and (4) "Did you start smoking cigarettes (even if only on some days/occasionally) since the beginning of the semester or within the last 30 days?". Participants were considered non-smokers if they had never smoked at least 100 cigarettes in their lifetime. Participants were considered a current daily smoker if they had smoked 100 cigarettes in their lifetime and currently smoke every day within the last 30 days, and participants were considered a current occasional smoker if they had smoked 100 cigarettes in their lifetime and currently smoke on some days in the last 30 days. Former smokers were defined as participants who had smoked at least 100 cigarettes in their lifetime but had not smoked at all in the last 30 days. Recent initiators were defined as participants who had initiated smoking within the last 30 days.

Study 1 Pilot Study Procedure

All data collection occurred online via Qualtrics.com After reading a consent form online and agreeing to participate, participants were presented with the following prompt "Please look at the following pictures. After each picture, you will be asked to answer a set of questions."

Participants were then exposed to the thirty-six cigarette warning labels proposed by the FDA presented in random order. Each warning label was presented to the participants, and this presentation was followed by a measure designed to assess the extent to which the warning label was graphic as well as smoking behaviors. Participants were debriefed and thanked.

Study 2 Prescreen Participants

Participants were 778 undergraduate students in introductory psychology courses at Colorado State University who reported smoking at least one cigarette in their life. Participants participated for partial fulfillment of course requirements. Based on prevalence rates of different smoking behaviors (CDC, 2009), 778 participants were sampled in order to adequately capture different strata of smokers (e.g. current daily smoker, current occasional smoker, former smoker, recent initiator). Participants were excluded from participation if they participated in study 1 (pilot study). Ten point seven percent of the participants were current daily smokers, 32.8% were current occasional smokers, and 56.4 % were former smokers. Additionally, 12.1 % of the participants indicated that they had recently initiated smoking within the last month. The mean age of the participants was 19.08 years. Sixty-five percent of the sample was female, 83.9% of the sample was Caucasian, 5.9% were Hispanic, 2.7% were African American, 3.5% were Asian, 0.1% were American Indian, and 3.9% identified as another ethnicity.

Study 2 Prescreen Research Design

The proposed prescreen was a non-experimental cross-sectional survey design.

Study 2 Prescreen Materials

Smoking behavior. Smoking behavior was assessed with a measure detailed previously in the pilot study's methods section.

Explicit smoking attitudes. (α = .94) Explicit attitudes towards smoking were measured on a commonly used three item scale assessing attitude toward smoking (Ajzen & Fishbien, 1980). The items "In general, my attitude towards smoking cigarettes is…" (anchored by unfavorable/favorable, negative/positive, bad/good) were rated on a 5-point Likert scale. This scale has been shown to have high reliability in previous research (α= .96; Tangari, Kees, Andrews, & Burton, 2010).

Intentions to quit smoking. (α = .85) Behavioral intentions to quit smoking were measured using a measure adapted from Hoie, Moan, and Rise (2010) that has been shown to have high reliability (α= .96) in previous research. Four items assessed quitting intentions: "During the next month (a) I intend to not smoke, (b) I will try to not smoke, (c) I plan to not smoke, (d) I expect to not smoke" (1=very likely to 7= very unlikely).

Other measures. Demographic information (age, gender, and ethnicity) was collected. Participants were also asked if they have ever studied Chinese or if they are fluent in Chinese. This information was used to exclude potential participants for study 3 as the implicit measurement requires that the participant be unfamiliar with Chinese.

Study 2 Prescreen Procedure

All data collection occurred online via Qualtrics.com. After reading and signing a consent form, participants were asked to complete a series of self-report measures. After participants completed the measures, they were debriefed and thanked.

Study 3 Treatment Study Participants

Participants were 79 undergraduate students randomly selected from the prescreened sample who reported occasional smoking behavior or smoking initiation within the last 30 days. Data collected during the study 2 prescreen provided the information needed to sample

participants for study 3. Participants were excluded from participation if they participated in study 1 (pilot study). The mean age of the participants was 19.16 years. Fifty-six percent of the sample was female, 87.3% of the sample was Caucasian, 5% were Hispanic, 2.5% were African American, 2.5% were Asian, and 2.7% identified as another ethnicity. For smoking behavior, 69.6% were occasional, non-recently initiating smokers, 22.8% were occasional recently initiating smokers, and 6.3% were everyday, non-recently initiating smokers.

Study 3 Treatment Study Research Design

The proposed study used a pretest-posttest experimental design (pretest measures of explicit attitudes and intentions were drawn from study 2)**.** Participants were randomly assigned to one of two message conditions: (1) Graphic warning label condition (2) Non-graphic warning label condition. The independent variable was warning label condition, and the dependent variables were: (1) explicit attitudes towards smoking, (2) implicit attitudes towards smoking, (3) intentions to quit smoking, (4) perceived personal relevance, and (5) affective reactions.

Study 3 Treatment Study Materials

Stimulus material. Participants were exposed to three FDA proposed warning labels presented in random order. Previous research of anti-tobacco messages and public service announcements has demonstrated effects on outcome variables after the presentation of three messages (Goodall & Appiah, 2008; Kees et al., 2010; Strasser et al., 2009). Previous pilot testing data were used to determine which labels were categorized as graphic/non-graphic; warning labels with graphic rating scores in the top quartile ($M = 20.25$) were used for the graphic condition, and labels with graphic rating scores falling in the bottom quartile ($M = 9.84$) were used for the non-graphic condition (see Appendix). Color photographs of the warning labels on generic cigarette packages were presented on a computer screen. Each photograph was

displayed for ten seconds in order to increase realism and approximate the time a warning label would be exposed during the process of getting a cigarette from the packaging. Kees et al., (2010) examined time spent viewing the label as a factor in determining warning label effects, but no significant effects were found for time.

Explicit measures. Self-report information was collected for the dependent variables: (1) explicit attitudes towards smoking, (2) intentions to quit smoking, (3) perceived personal relevance, and (4) affective reactions. Demographic information was collected, and a manipulation check was also administered. Self-report information gathered during the prescreen (demographics, smoking behaviors, intentions to quit, and explicit smoking attitudes) was also used in the analysis of this study.

Explicit smoking attitudes. Explicit attitudes were assessed with a measure detailed previously in study 1's methods section.

Intentions to quit smoking. Behavioral intentions were assessed with a measure detailed previously in study 1's methods section.

Smoking behavior. Smoking behavior was assessed with a measure detailed previously in the pilot study's methods section.

Affective reactions. ($\alpha = .73$) Affective reactions to the warning labels were measured with two items from the PANAS assessing fear and distress (Watson, Clark, & Tellegen, 1988). The PANAS measure assesses emotions on a 1 (very slightly or not at all) to 5 (extremely) scale. Participants were instructed to report the extent to which they felt each emotion after viewing the warning labels. The PANAS has been shown to be highly internally consistent, high test-retest reliability, convergent validity, and discriminant validity (Watson et al., 1988).

Personal relevance. (α = .89) Subjective personal relevance of the warning label was measured with 8 items from the shortened Personal Involvement Inventory (PII), originally developed by Zaichkowsky (1985). The PII is a measure assessing personal involvement on a 1 (relevant) to 5 (irrelevant) scale. Participants responded to "To me, the messages are…" using items from the PII. Sample items are, "relevant, means nothing, and involving". The shortened PII has been shown to have high internal consistency (α = .95), test-retest reliability (r = .84), and convergent validity (Zaichkowsky, 1994).

Manipulation check. (α = .90) Participants' perceptions of the extent to which the warning label was graphic was assessed. Adapted from Kees et al. (2010), participants were asked to report how graphic, vivid, powerful, and intense they perceived the warning label to be on a scale ranging from 1 (not at all) to 7 (very). Participants were also asked if they were fluent in Chinese or if they have ever studied Chinese as this may affect responses to the implicit measurement described below.

Implicit measure. To assess implicit attitudes towards smoking, the Affect Misattribution Procedure (AMP; Payne, Cheng, Govorun, & Stewart, 2005) was used. AMP scores have been shown to be strongly correlated with behavioral measures (Payne, Govorun, & Arbuckle, 2007), and the AMP scores have been shown to be associated with attitudes, including when an individual is motivated to conceal attitudes (Payne et al., 2005). Research has also shown the AMP to be reliable (α =.89) (Payne et al., 2008).

Participants were informed that they would see pictures and then be asked to rate the pleasantness of Chinese pictographs. Smoking-related pictures (e.g., cigarettes, lighters) and control neutral images (e.g., staplers, wristwatches) served as the primes and consisted of images from the International Smoking Image Series (Gilbert & Rabinovich, 2003). Prime pictures were

presented for 75ms, followed by a blank screen for 125 ms, followed by Chinese pictographs presented for 100ms, and then followed by a black-and-white visual mask which remained on the screen until the participant has rated the favorability of the pictograph. Participants were asked to judge each pictograph dichotomously as ''more pleasant than average'' or ''less pleasant than average''. Similar to previous research with the AMP (Greenwald, Smith, Sriram, Bar-Anan, & Yoav, 2009; Payne, 2008), 72 trials were conducted (36 smoking-related pictures, 36 neutral pictures).

As the evaluative rating of the Chinese pictograph is ambiguous for an English speaking participant, the rating is considered an affective response to the primed images. Theoretically, the AMP assesses automatic response to the prime as individuals are unable to monitor and control the prime's influence on their responses. Participants are warned that the prime pictures may influence judgments of the Chinese pictographs so participants are able to intentionally avoid this influence. Previous research has not found any difference between participants warned and those not warned (Payne et al., 2005). The warning reads as follows:

It is important to note that the photographs flashed before each Chinese pictograph might influence your judgment of pleasantness. If you find the photo pleasant, you might judge the character more pleasant than you otherwise would. If you find the photo unpleasant, you might judge the character as less pleasant. *Please try your absolute best to avoid being influenced by the photos*. Your task is to evaluate the Chinese characters without any influence from the photos.

Study 3 Treatment Study Procedure

All data collection occurred in a computer lab (Clark C-79) using Media Lab Software (Version 2006.2) and Inquisit Software (Version 3). On average, Study 3 occurred 21.61 days

after the completion of Study 2. After reading and signing a consent form, participants were randomly assigned to either the graphic (N = 41) or non-graphic condition (N = 38). Next, the participant was presented with the following prompt "Please look at the following pictures. After these pictures, you will be asked to answer some questions". Participants were then exposed to three FDA proposed graphic or non-graphic cigarette warning labels (based on condition assignment) presented in random order. After being presented with the warning labels, participants were then presented with instructions for the AMP. Participants were presented with the warning message detailed above regarding the influence of prime pictures. Participants then completed the AMP. Following this task, the participants were asked to complete a set of self-report explicit measures assessing explicit smoking attitudes, intentions to quit smoking, affective reactions, and perceived personal relevance. A manipulation check was also administered. Participants were debriefed and thanked.

Study 3 Treatment Study Analytic Strategy

A multilevel model in which warning labels were nested in participant was specified to assess desensitization effects of the warning labels in the pilot study data. A simple linear model was also specified for a manipulation check for study 3. Next, simple linear regression models were specified to evaluate outcome variables. This analysis tested the between-participants effects of warning label condition on the dependent variables (implicit smoking attitudes, explicit smoking attitudes, and intentions to not smoke). The possible mediation of perceived personal relevance and affective reactions on the effect of warning label condition on smoking-related outcomes (implicit smoking attitudes, explicit smoking attitudes, intentions to quit) was also tested in a structural equation model following the procedures outlined by Preacher and Hayes (2004). No differences were found between the treatment and control condition on control

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variables (current smoking frequency, recency of smoking initiation, baseline explicit attitudes, baseline intentions, age, and gender) (see Table 1); therefore, these variables were not included in the models presented below.

Study 3 Treatment Study Power Analysis

In order to determine the sample size needed to detect a significant effect, a power analysis was conducted. Based on existing literature (Goodall & Appiah, 2008; Kees et al., 2010), I assumed that approximately 20% of the variance in the outcome variables will be explained by the covariates (age, gender, smoking status, affective reactions, perceived personal relevance, prior intentions to quit) and that an additional 5% (constituting a small to medium sized effect) of the variance will be accounted for by the treatment. Based on these assumptions, a total sample size of 128 was needed, with an equal number of study participants in each condition. This calculation was based on a power of .8.

RESULTS

Pilot Study

A multilevel model in which warning labels were nested in individuals was fit to determine if participant's ratings of the labels changed over time (i.e., from the first to the thirty-sixth label presented). Linear, quadratic, and cubic terms for time were created and entered into the model as fixed effects. A series of likelihood ratio tests were conducted to determine if random effects for the intercept, linear, quadratic, and cubic trends were needed. These tests indicated that only a random effect for the intercept significantly ($p < .05$) improved model fit. Results indicate that the predicted graphicness rating for the first warning label across individuals was 20.86. The linear time trend was significant ($b = -1.73$, $t(2622) = -15.46$, $p < .001$) indicating that there was an initial decrease in the level of rated graphicness over time (see Figure 1). On average, graphicness ratings decreased -1.73 units as the participants rated each additional warning label. The quadratic time trend was also significant ($b = .10$, $t(2622) = 14.47$, $p < .001$) indicating that the decrease of graphicness ratings decelerated over time. The extremum of the quadratic function was estimated at 11.97. In addition, the cubic time trend was significant ($b = -.002$, $t(2622) = -12.88$, $p < .001$), with the estimated extremum at 30.14. At this point, the decrease of graphicness ratings began to accelerate again. In sum, desensitization effects were observed in which participant's perceptions of graphicness decreased as they saw more labels. This habituation was stronger initially indicating that the warning labels had progressively less of an impact on graphicness perceptions over time.

Manipulation Check of Warning Labels

A simple linear model was specified to assess if the warning labels operated as intended in the treatment study (study 3). Warning label condition affected the perceived level of

graphicness of the presented stimuli ($b = 1.78$, $t(73) = 6.23$, $p < .001$), with the means in the expected direction. The labels presented in the graphic condition were rated as significantly more graphic (M = 4.35, SD = 1.44) than those labels presented in the nongraphic condition (M = 2.56, SD = 1.02).

Main Effects on Attitudes and Intentions

It was predicted that the graphic warning label condition would be associated with increased negative explicit attitudes towards smoking and increased intentions to avoid smoking in the future. The main effect of warning label condition on explicit attitudes was not significant ($b = .08$, $t(67) = -.44$, $p = .663$) indicating that the graphic warning label condition (M = 3.59) was not associated with stronger negative explicit attitudes than the non-graphic condition (M = 3.59). In addition, the warning label condition was associated with a very small proportion of variance explained in explicit attitudes towards smoking ($R^2 = 0.0001$). For intentions to not smoke, the main effect of warning label condition was also not significant ($b = -.35$, $t(67) = -1.01$, $p = .315$) indicating that the graphic warning label condition (M = 4.13) was not associated with stronger intentions to not smoke than the non-graphic condition (M = 4.50). Also, warning label condition was associated with a very small proportion of variance explained in intentions to not smoke ($R^2 = .012$). The results indicate no significant difference between the effectiveness of the graphic warning labels and the non-graphic labels at increasing negative explicit attitudes towards smoking or increasing intentions to not smoke.

Next, it was predicted that the graphic warning label condition would be associated with increased negative implicit attitudes towards smoking. As described in Payne et al. (2005), the AMP score can be scored as independent estimates for smoking and neutral images, rather than scored as relative preference. Because we are interested in estimating implicit attitudes towards

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smoking without comparison to a contrast category, the independent attitudes estimates are most appropriate here. AMP performance was computed as the proportion of "unpleasant" responses to pictographs for each prime type (smoking images and neutral images). Higher scores indicate negative evaluations of prime images. The effect of warning label condition on negative implicit attitudes towards smoking was not significant ($b = .06$, $t(65) = 1.10$, $p = .275$) indicating that the graphic warning label condition (M = .55) was not associated with stronger negative evaluations of smoking prime images than the non-graphic condition (M = .51). Warning label condition was also associated with a very small proportion of variance explained in implicit attitudes ($R^2 = .008$).

Mediation Analysis: Personal Relevance and Negative Affect

The hypothesized mediators on the relationship between warning label condition and outcomes variables were tested in a structural equation model. First, a confirmatory factor analysis was conducted to verify the measurement model. The standardized factor loadings are presented in Table 2. The indicators listed in the table all loaded positively and significantly onto the respective factors they represent. Fit indices for the model were: $\chi^2(112) = 146.76$; $p = .015$; Comparative Fit Index (CFI) = .95; Root Mean Square Error of Approximation (RMSEA) = .06. These results lend support for the measurement model proposed in this study.

Next, a model was constructed and estimated to assess the hypothesized mediation of perceived personal relevance and negative affect on the relationship between condition and the outcome variables (see Figure 2). As recommended for small sample sizes (see Preacher & Hayes, 2004), bootstrap standard errors were calculated in Mplus, Version 6.2. A total of 10,000 bootstrap resample were utilized. Fit indices for the model were: $\chi^2(123) = 168.82$; $p = .004$; (CFI) = .94; (RMSEA) = .07.

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Perceived Personal Relevance

It was hypothesized that perceived personal relevance would mediate the relationship between warning label condition and the outcome variables: explicit attitudes, implicit attitudes, and intentions to not smoke. First, the effect of condition on the mediator was assessed; this is commonly referred to as the "a" path in a mediation model. Warning label condition did have a significant effect on perceived personal relevance ($b = .67$, $p = .007$) (a path) indicating that the graphic condition increased personal relevance in comparison to the non-graphic condition (see Figure 3). Next, the effect of the mediator on the outcomes was assessed; this is commonly referred to as the "b" path in a mediation model. The effect on explicit attitudes was marginally significant ($b = .21$, $p = .055$), was not significant on intentions to not smoke ($b = .35$, $p = .193$), and was significant on implicit attitudes ($b = .11$, $p = .004$) (b paths). This indicates that increased personal relevance was associated with increased negative implicit attitudes. Controlling for perceived personal relevance, the direct effect (c' path) of warning label condition on implicit attitudes was not significant ($b = -.02$, $p = .695$). Given that both the "a" and "b" paths were significant for implicit attitudes which is a requirement for mediation (Baron & Kenny, 1986), the indirect effect of condition on implicit attitudes via perceived personal relevance was tested. Using bootstrapped standard errors, the indirect effect (a path * b path) was significant ($b = .07$, $p = .033$) indicating that perceived personal relevance mediates the relationship between warning label condition and implicit attitudes towards smoking. In comparison to traditional methods in which a total effect is tested to determine if there is an overall effect to mediate (Baron & Kenny, 1986), many researchers have argued that a significant total effect between the independent variable and outcome variable is unnecessary to detect meditational pathways (Cole & Maxwell, 2003; Collins, Graham, & Flatery, 1998;

Coffman, 2011; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Shrout & Bolger, 2002). While a significant total effect of condition on implicit attitudes was not observed, perceived personal relevance can still operate to mediate the relationship between condition and implicit attitudes (see discussion section for an extended description of potential operating mechanisms).

Negative Affect Reactions

It was also hypothesized that negative affective reactions would mediate the relationship between warning label condition and explicit attitudes, intentions to not smoke, and implicit attitudes. Warning label condition did have a significant effect on negative affective reactions (b = .58, p = .006) (a path) indicating that the graphic condition increased negative affect in comparison to the non-graphic condition (see Figure 4). The effect of negative affect on outcome variables was tested (b paths). The effect was not significant for explicit attitudes (b = -.04, p = .776), for intentions to not smoke (b = .04, p = .864), and for implicit attitudes (b = -.01, p = .754), indicating that negative affect did not mediate the relationships between condition and outcome variables.

DISCUSSION

In accordance with the U.S. Family Smoking Prevention and Tobacco Control Act (2009), cigarette manufactures may be mandated to include pictorial warning labels on packaging; however, it remains to be seen if recent litigation initiated by cigarette manufactures will block the implementation of these labels. Following the lead of other smoking prevention and cessation efforts in other countries, these new labels consist of pictorial depictions of smoking-related consequences, such as diseased lungs and death-related images. The present study sought to explore the effectiveness of graphic warning labels compared to non-graphic warning labels on increasing negative explicit attitudes towards smoking, negative implicit attitudes, and intentions to not smoke among occasional or recently initiating smokers. Potential mechanisms by which these pictorial warning labels operated were also explored including perceived personal relevance and negative affective reactions.

Inconsistent with previous research (FDA, 2010; Kees et al., 2010) and the present study's hypotheses, the results indicate that graphic warning labels were not directly associated with increased negative explicit attitudes, increased negative implicit attitudes, or increased intentions to not smoke compared to non-graphic warning labels. Furthermore, warning label condition effect sizes observed in the present study were quite small. Small effects can be meaningful in media health campaigns as large numbers of people are exposed to the campaign. Previous research using meta-analytic methods (Synder, 2007) has indicated that media campaigns are effective for health behavior change ($r = .09$). Specific to smoking cessation, campaign effects were notably smaller ($r = .04$) than those observed for other health promotion campaign targets including seat belt use, family planning, and alcohol reduction. These effects

are larger than effects observed in the present study (ranging from $r = .003$ to $r = .107$). Potential explanations of these inconsistencies are discussed in detail below.

Consistent with prior research (Peter et al., 2007; Witte & Allen, 2000) and as predicted by the hypotheses, the graphic warning labels were positively associated with both perceived personal relevance and negative affective reactions compared to non-graphic labels, suggesting that the graphic warning labels are operating to elicit an emotional and cognitive response. In addition, perceived personal relevance was found to mediate the relationship between warning label condition and implicit attitudes towards smoking (significant a, b, and indirect effects); however, a significant total effect (c path) was not found between condition and implicit attitudes in the present study. Emerging perspectives maintain that a significant total effect between the independent variable and outcome variable is unnecessary to detect mediational pathways (Cole & Maxwell, 2003; Collins, Graham, & Flatery, 1998; Coffman, 2011; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Shrout & Bolger, 2002).

Given the results of the present study, additional unmeasured variables may be operating that are serving to undermine the total effect of warning label condition on implicit attitudes. For instance, psychological reactance was not assessed in the present study; however, the process of reactance may elicit a defensive response which would undermine the graphic warning label's effectiveness on increasing negative implicit attitudes. In this sense, the graphic warnings may be increasing both perceived personal relevance and psychological reactance, and a significant total effect is not observed as these processes may elicit opposite effects for implicit attitudes. Personal relevance may increase negative implicit attitudes and reactance may impede implicit attitude change. Future work assessing reactance is needed to definitively maintain that this is indeed the case. In addition, the small sample size in the present study may also contribute to the

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lack of a significant total effect due to low power to detect such an effect (MacKinnon et al., 2002). As the effect sizes for warning label condition on explicit attitudes and intentions were quite small, the condition effect size on implicit attitudes may also be indeed quite small. Future research should examine these processes in a larger sample, which could increase the power of the design to detect a significant total effect. In addition, future work could examine the role of personal relevance with alternative measurement instruments. The measure used in the current study assessed perceptions of the general importance of the package warning labels, and other measurements may be beneficial in future research to further probe the impact of perceptions of relevance that relate directly to the individual.

The additional proposed mediation hypotheses for negative affective reactions were not supported. According to the ELM, negative affect in response to a message can lead to increased elaborative central processing and subsequent increased consideration of the message arguments. While the graphic warning labels were associated with negative affect, significant mediation for negative affect was not found. This suggests that participants responded emotionally to the graphic warning labels arguments (e.g., depicted health consequences) and central processing may have been increased; however, participants were not persuaded by the graphic warnings labels and change was not seen for attitudes and intentions. In this sense, increased central processing did not lead to increased persuasion.

There are a few potential explanations for the findings of the present study. It could be that graphic warning labels are not more effective than non-graphic warning labels on the elicitation of attitude and intention change. While the present study did not test the proposed FDA warning labels against a control condition (e.g., no image), we cannot explore the effectiveness of the new warning labels against the current, text-only package labels. The

findings of the current study highlight the similarity of effects observed for graphic and non-graphic warning labels. It is also important to note that this study occurred after the initial press release regarding the FDA proposed warning labels, and public interest toward these labels had decreased. As such, the aim of the present study was to assess personal attitudes, intentions, and reactions rather than perceptions of the general public's acceptance of the warning labels.

Alternatively, the graphic warning labels could be eliciting a different response compared to the non-graphic labels: a fear response. In line with the EPPM (White, 1994), the graphic warning labels could be eliciting fear and a defensive motivation (e.g. avoidance), which may result in an inhibition of protection motivated behaviors (e.g., intentions to quit smoking). The graphic warning labels were associated with increased perceived personal relevance and negative affective reactions. This suggests that the participants attended to the message and interpreted the graphic labels as more personally relevant than non-graphic labels while also experiencing the aversive states of fear and distress. The negative affective reactions could have activated a defensive motivation and fear control responses by which the individual is motivated to reduce the fear by avoiding the message; however, the increased perceptions of personal relevance suggest that the participants did indeed attend to the messages. It could be that participants attended to the graphic warning labels initially while the subsequent negative affective response elicited a defensive motivation, which can inhibit protective attitudes and behaviors. Peter et al. (2007) did not find defensive reactions from older everyday smokers in response to pictorial Canadian cigarette package labels; however, the present study sampled younger, occasional or recently initiating smokers which may have influenced defensive reactions. While the graphic warning labels may have elicited a defensive motivation, the non-graphic labels may not have

elicited either a defensive or a protection motivation; therefore, no difference was observed between conditions on outcome variables.

Future research should assess the extent to which the graphic warning labels elicit a defensive reaction. While the present study demonstrated an increase in negative affect (as measured by fear and distress), it is unknown whether this affect resulted in a defensive response. In addition, the graphic warning labels could have also elicited psychological reactance which would have inhibited change on the smoking-related outcome variables Future research could examine psychological reactance specifically by assessing affective reactions of anger or cognitive reactions of warning dismissal. Additionally, it was observed in the pilot study data that graphicness ratings attenuated overtime; however, the mechanisms underlying this attenuation is unknown. Future work could simultaneously assess change in negative affect with change in perceptions of graphicness to further probe the role of negative affect in defensive reactions. In sum, additional research is needed to further explore defensive and protective motivations that may have been elicited by the warning labels.

Furthermore, occasional and recent initiating smokers were chosen for this examination as individuals who have been smoking longer or everyday may be more resistant to anti-tobacco initiatives initially (Petty & Cacioppo, 1986; Slovic, 2001); however, graphic warning labels were not shown to be more effective for attitude and intention change than non-graphic labels in this population. It is possible that long-term smokers may have already considered quitting; therefore, the graphic warning labels may be more effective for this demographic of smokers. Previous research sampling adult everyday smokers has demonstrated effectiveness of graphic warnings on smoking attitudes and intentions (Kees et al., 2010), and additional research is needed with new or occasional smokers. Moreover, younger smokers may not identify with the

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distal health consequences depicted in many of the FDA proposed warning labels and may be less likely to be influenced by these labels. Future research should examine the effects of both graphic and non-graphic pictorial warnings across different smoker types (e.g., everyday long-term smokers, adolescent smokers, former smokers). In addition, occasional and recently initiating smokers may be less knowledgeable about risks related to smoking. For example, previous research (Slovic, 2001; Weinstein, 2001) found that adolescent smokers do not fully appreciate the risk associated with smoking; therefore, occasional and recently initiating smokers may be less likely to perceive health risks and be less likely to experience attitude and intention change. As the US Family Smoking Prevention and Tobacco Control Act (2009) aims to help current users quit and to also prevent the initiation of smoking among non-users, additional research is necessary to determine if these warning labels are equally effective among both users and non-users. The present study did not find a direct association between warning label condition and change on smoking-related outcomes among new and occasional smokers; however, these effects may be different among current users.

The results of the present study may also be explained by dosage effects. A single exposure to the graphic warning labels may not have been sufficient to elicit increased attitude and intention change; therefore, no differences were observed between the graphic and non-graphic condition. The salience of the experimental manipulation in the current study was high to explore if deliberate attention to the warning labels would influence outcomes of interest. If these FDA warning labels are required on packaging and are in the public market, exposure to the warning labels will be extensive and dosage effects could be examined in future research.

In addition, previous international research has detailed the effectiveness of pictorial cigarette package warning labels (Hammond et al., 2004; Willemsen, 2005), but the present

study utilized different warning labels (i.e., new FDA proposed warning labels) than those examined in previous research conducted in other countries. Moreover, most international research examining pictorial warning labels has tested the effectiveness of the pictorial labels compared to standard, text-only warning labels, which prevents conclusions about the effects of graphic compared to non-graphic warning labels. In one examination of Canadian pictorial cigarette package warning labels, Kees et al. (2010) found that high graphic warning labels were more effective than less graphic and control images; however, Kees and colleagues tested warning labels containing images of oral diseases only and did not assess other domains of graphic images. The FDA graphic warning labels tested in the present study depict oral disease but also depict death, cancer, and other domains, which may have influenced the effectiveness of the graphic warning labels. Specific to the FDA proposed warning labels, a large FDA sponsored study (FDA, 2010) examined nine FDA pictorial warning labels. These warning labels were associated with increased recall, knowledge of health risks, emotional reactions, and cognitive reactions compared with control warnings; however, the warning labels were not associated with strong cessation intentions. The FDA (2010) did not examine differences between graphic and non-graphic warning labels; however, the lack of strong cessation intentions suggests that it is unlikely that a difference would be found between graphic and non-graphic labels.

The results of the present study may also be explained by conflicting attitudes towards the behavior of smoking among current smokers. Research has demonstrated that college-aged smokers can simultaneously have both positive attitudes (i.e., I like smoking) and negative attitudes (i.e., smoking is bad for my health) towards smoking (Lipkus, Green, Feaganes, & Sedikides, 2001), which is referred to as ambivalence. According to the ambivalence amplification theory (Katz, Wackenhut, & Mass, 1986), exposure to a communication message

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that is inconsistent with positive views towards smoking (i.e., warning labels depicting health consequences) may elicit a response that is exceptionally positive. In this sense, participants in this study may have had both positive and negative attitudes towards smoking. When confronted with graphic warning labels, their positive attitudes towards smoking were potentially amplified and change was not seen on smoking-related variables.

Finally, there was not a significant difference between negative implicit attitudes between the graphic and non-graphic warning condition. The implicit measure was designed to capture the positive or negative evaluation of smoking-related images. Previous research indicates that individuals automatically classify stimuli as positive or negative, and these automatic evaluations have direct behavior consequences for approach or avoidance motivation (Chen & Bargh, 1999). It may be that a single exposure to the graphic warning labels was not sufficient to cause increased negative implicit attitudes compared to non-graphic warning labels. Some research indicates that many exposures are needed to change implicit attitudes (Deutsch, Gawronski, & Strack, 2006). In addition, desensitization may occur in response to multiple exposures to graphic warning labels; however, the individual may still be making automatic, nonconscious associations between the stimulus (i.e., aversive graphic picture) and the behavior (i.e., smoking), which could influence attitudes and behaviors over time. Again, the primary purpose of the present was to examine differences between graphic and non-graphic warning labels; therefore, the warning labels were not compared to a control condition. It may be the case that both graphic and non-graphic warning labels elicited negative implicit attitudes as compared to standard, text-only warning labels. Other lines of research have observed implicit attitude change in response to substance use prevention advertisements (Czyzewska & Ginsburg, 2007), and

future work should examine the effects of the new FDA warning labels compared to current warning labels on cigarette packaging on implicit attitudes towards smoking.

Limitations

As with any study, it is important to recognize limitations. The present study examined the effects of the graphic warning labels on outcome variables cross-sectionally, and evaluation of these relationships over time may prove fruitful. As discussed previously, repeated exposures may be needed over time to elicit attitude, intention, and behavior change. Longitudinal analyses may shed light on both dosage effects as well as novelty effects. If increased dosage to the graphic warning labels elicits a response over time, this potential effect could also degrade over time as the novelty of the warning labels decreases. Smokers may habituate to the warnings, and longitudinal designs have the potential to examine habituation effects as well. In addition, controlled exposure to warning labels in an experimental setting is not equivalent to real-world processing of health communication messages, and future work should explore effects of pictorial cigarette package warning labels in a field setting.

Next, sampled smokers were undergraduate, predominantly Caucasian, students. The effects of the warning labels may differ across ages, ethnicity, or education levels. Future work should extend this examination into more diverse samples. It is also possible that smokers who would have been most responsive to the graphic warning labels self-selected out of the study, which limits the generalizability of the results of the present study to all smokers. Another limitation of this study is that behavioral intentions were measured as opposed to actual behaviors; however, there is a well-documented link between intentions and behaviors (Ajzen & Fishbein, 1980) and it can be reasonably assumed that behavior change is unlikely without a change in behavioral intentions.

Implications

The results of the present study highlight the effectiveness of the graphic warning labels on cigarette packaging on eliciting emotional and cognitive responses, both of which have been associated with behavior change in previous research (Dillard, Weber, & Vail, 2007). On the other hand, the graphic warning labels were not associated with increased explicit attitude, implicit attitude, and intention change compared to non-graphic warning labels. While international research investigating the effects of pictorial warning labels on cigarette packages has been promising, further examination into the effectiveness of warning labels designed by the FDA is essential. The process of smoking cessation is complex, partly due to the addictive nature of nicotine; however, warning labels on cigarette packaging may provide one potential point of intervention. Further work is needed to examine message effects of these new warning labels to determine the effectiveness and potential consequence of such a campaign. Pending resolution of litigation by cigarette manufactures, the implementation of pictorial warning labels on cigarette packing will provide a unique opportunity to examine the effects of pictorial warning labels in quasi-experimental, longitudinal field studies. These studies have the potential to further the current state of the literature on health risk communication and marketing of health promotion campaigns.

Tables and Figures

Table 1. Means (Standard Deviations) for Outcome Variables and Control Variables by Warning

Label Condition

	Non-Graphic (N=38)	Graphic (N=41)
Dependent Variables		
Explicit Attitudes	3.59	3.59
Intention to Quit	4.13	4.50
Implicit Attitudes	0.51	0.55
Personal Relevance	2.88	3.38*
Negative Affect	3.61	4.76**
Control Variables		
Age	19.10	19.24
Baseline Explicit Attitudes	3.59	3.61
Baseline Intentions	4.49	4.74

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

Table 2. Standardized Factor Loadings

Indicator	Factor Loading
Personal Relevance	
Packages are important	.81
Packages are interesting	.68
Packages at relevant	.74
Packages mean a lot to me	.75
Packages are fascinating	.63
Packages are valuable	.87
Packages are involving	.67
Packages are needed	.76
Negative Affect	
Felt distressed	.90
Felt afraid	.66
Explicit Attitudes	
My attitude is unfavorable	.84
My attitude is negative	.91
My attitude is bad	.87
Intentions	
Intend to not smoke	.75
Will try to not smoke	.77
Plan to not smoke	.95
Expect to not smoke	.67

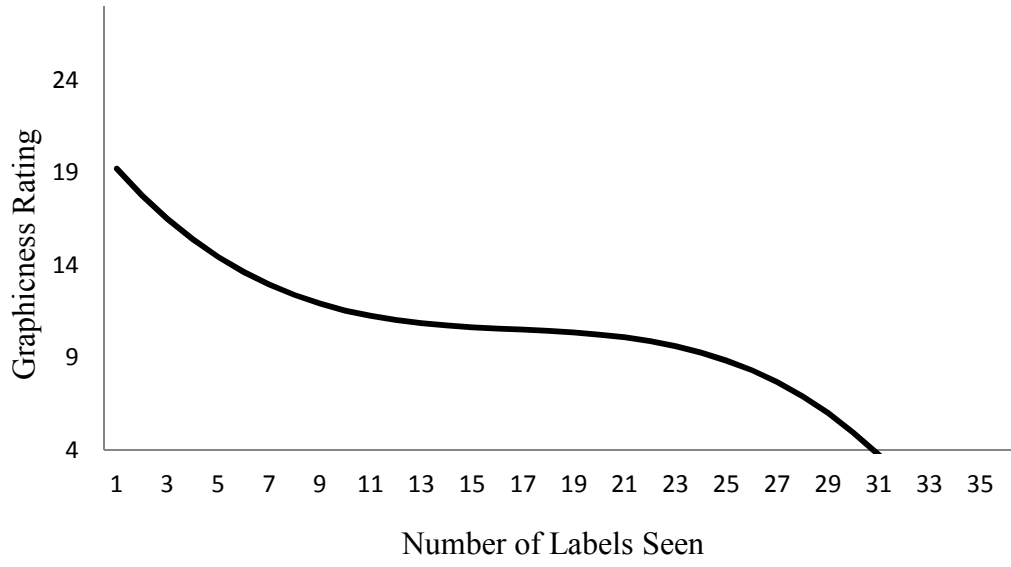*Note.* All factor loadings are significant, $p < .05$.

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Figure 1. Graphicness ratings by number of labels seen.
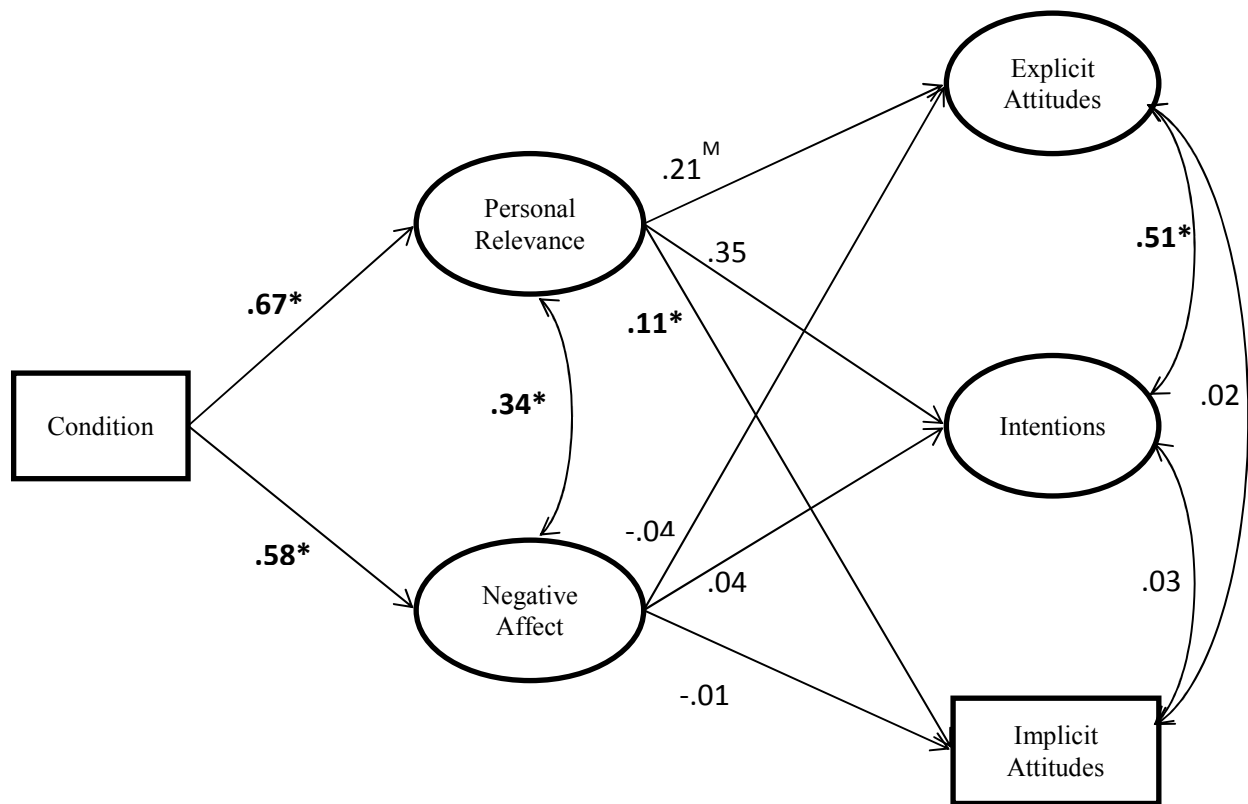
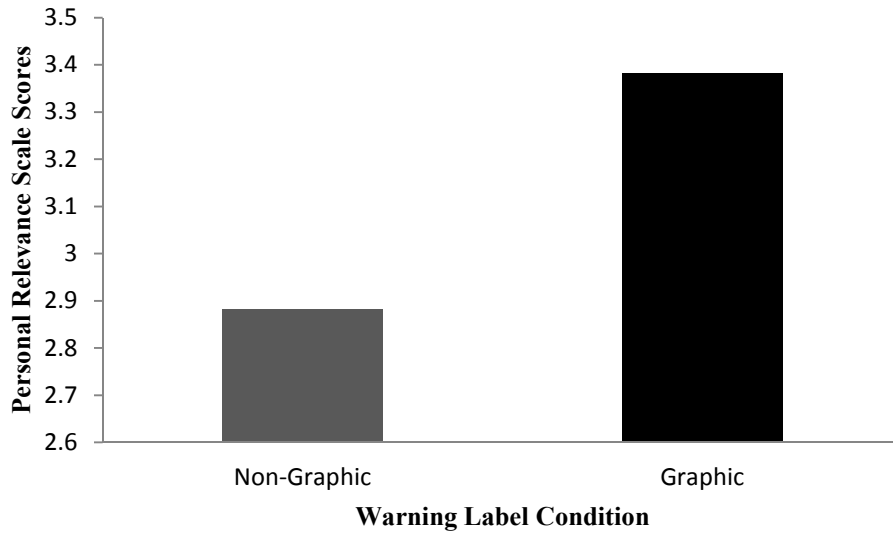*Figure 2.* Mediation model. *p<.05. [M] indicates marginal significance.

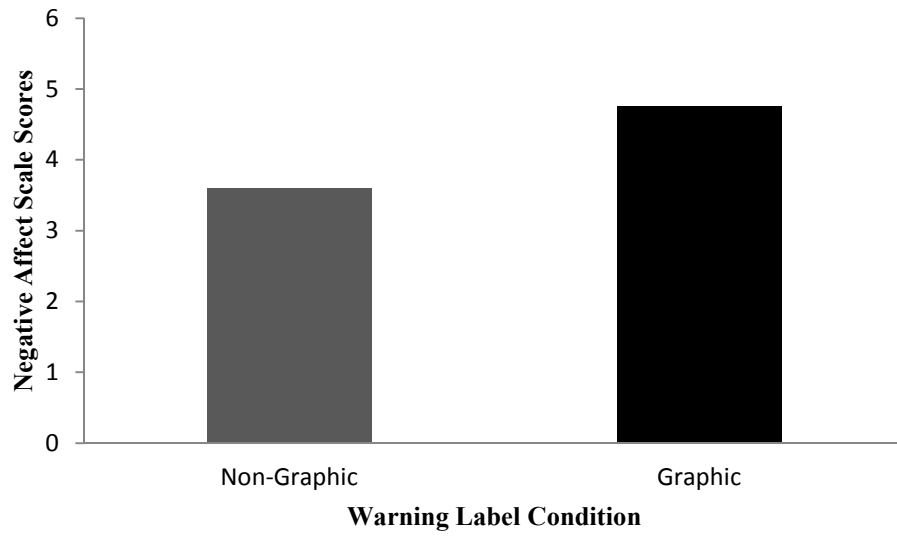*Figure 3.* Perceived personal relevance scale scores by condition.

Figure 4. Negative affect scale scores by condition.

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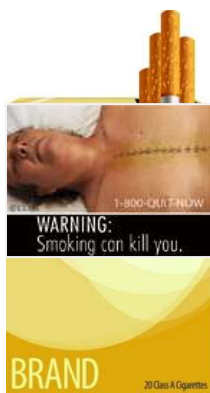
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Appendix 1

Study 3 Stimulus Materials

Graphic warning labels

Non-graphic warning labels