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Message Received? The Relationship between Graphic Warning Labels, Message Framing, and Psychological Responses among Smokers

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Message Received? The Relationship between Graphic Warning Labels, Message Framing, and

Psychological Responses among Smokers

by

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DEDICATION

I first would like to dedicate this dissertation to my mother Eileen, my father John, and my brother Mark. You all have had such significant roles in my professional and personal development, and I want to sincerely thank you for your consistent, unconditional support through all of my successes, failures, achievements, and challenges. I also would like to dedicate this dissertation to every mentor, supervisor, instructor, colleague, peer, and collaborator who has impacted my academic training at Louisiana State University, Pennington Biomedical Research Center, the University of South Florida, the Tobacco Research and Intervention Program at H. Lee Moffitt Cancer Center, and the VA San Diego Healthcare System. Finally, I would like to dedicate this dissertation to my co-major professor on this project and my primary graduate advisor, Dr. Thomas Brandon. Tom, your mentorship, guidance, support, advocacy, and belief in me all had such a significant influence on my growth, development, and progression during graduate school. Your mentorship had an immensely positive influence on me not only as a trainee, but more importantly, as a person. I feel very fortunate and blessed to call myself a branch of your academic family tree. Thank you for everything.

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ABSTRACT

Introduction: This study was designed to evaluate the effects of graphic components and message content on daily smokers' responses to cigarette pack warning labels. It was hypothesized that graphic warning labels (GWLs) would produce increases in state psychological reactance, that loss-framed messages would generate increases in risk perception and psychological reactance, and that GWLs and gain-framed messages would interact to generate increases in motivation to quit smoking when compared to the GWL/loss-framed condition. It was also hypothesized that trait reactance, smoking behavior, and baseline motivation to quit smoking would moderate effects of the warning label exposures.

Method: In a within-subjects design, sixty-two smokers completed four counter-balanced experimental tasks during which pictorial stimuli containing four possible combinations of warning labels and message frames were displayed (GWL/gain-framed, GWL/loss-framed, text-only/gain-framed, text-only/loss-framed). Participants answered self-report measures of reactance, cigarette cravings, motivation to quit smoking, and risk perceptions at baseline and after each experimental task.

Results: No primary hypotheses were supported (all p's $\geq$ .05). However, hypothesized moderations did emerge, as did other several unexpected main effects. More specifically, exposure to GWLs suppressed cigarette cravings and enhanced motivation to quit smoking. Gain-framed messages suppressed state reactance among heavier, more frequent smokers, while

loss-framed messages suppressed state reactance among smokers with higher motivation to quit. Gender, age, and race/ethnicity also moderated main effects of label type and label content. Discussion: These results suggest that cravings and state reactance are important constructs to consider when analyzing the impact of GWLs on smoking cessation. They also support the idea that targeting specific sub-populations of smokers with GWLs may increase the efficacy and impact of this tobacco control measure.

INTRODUCTION

Even though the prevalence of cigarette smoking is declining in the United States (Jamal et al., 2018), it remains a critical global public health concern. International prevalence statistics from 2015 showed that more than 933 million people were daily smokers, and more than six million deaths could be attributed to smoking (Reitsma et al., 2017). Many countries, including the United States, have implemented evidence-based tobacco control policies to reduce smoking prevalence and, consequently, tobacco-related morbidity and mortality. One population-level intervention designed to strengthen international tobacco control involves graphic warning labels (GWLs), which are pictorial messages printed on cigarette packs or other advertisements. GWLs represent an innovative tobacco control measure that has seen exponential growth in development and implementation in the past several years. Evidence of the utility of GWLs for promoting smoking cessation is critical to further inform policy development and to further develop ways to enhance their efficacy and reach.

Graphic Warning Labels: Development and Findings to Date

Warning labels were originally designed to make the public aware of the health issues associated with smoking, and they are characterized as a population-level intervention given their extensive reach, their cost-effectiveness, and their sustainability (Hammond, 2011). Warning labels have been mandated on cigarette packages in the United States since 1965 following the first U.S. Surgeon General's Report on Smoking and Health. Internationally, warning labels have undergone five "generations" of evolution that involved increased specificity of the health issues associated with smoking, more prominent label placement, and

rotating warning label messages (Hiilamo, Crosbie, & Glantz, 2014). Although cigarette warning labels have been traditionally text-based, an emerging method of disseminating potential consequences of cigarette use involves GWLs.

GWLs on cigarette packages were first introduced into formal legislation in Canada in 2000, and as of September 2014, they are now required on cigarette packs in 105 different countries (Canadian Cancer Society, 2016). GWLs were highlighted in the Framework Convention on Tobacco Control (FCTC) by the World Health Organization (WHO) as a strategy that would be more effective than text-based warnings at increasing awareness to consequences of cigarette use while simultaneously provoking emotional responses and quit-based cognitions (WHO, 2008). GWLs were scheduled to be incorporated into federal regulation by the U.S. Food and Drug Administration following passage of the Family Smoking Prevention and Tobacco Control Act in 2009. However, implementation has been delayed indefinitely due to litigation from the tobacco industry, which claims that mandating GWLs violates their First Amendment rights (Bayer, Johns, & Colgrove, 2013).

WHO recommends that GWLs include the following components: 1) full-color displays that cover at least 50% of both the front and back of cigarette packs; 2) text-based messages providing advice on cessation, describing the addictive nature of tobacco, or highlighting the negative outcomes associated with smoking cigarettes; and 3) a rotation-based system that utilizes many types of messages and a series of different images (WHO, 2008). Data from the International Tobacco Control Policy Evaluation Survey have shown that GWLs have greater perceived impact than text-based warnings among smokers (Hammond, Fong, Borland, Cummings, McNeill, & Driezen, 2007), and GWLs can promote thoughts of smoking cessation by increasing risk perceptions of smoking-related health concerns (Yong et al., 2014). Indeed,

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there is evidence that exposure to GWLs increases awareness of the negative health outcomes associated with smoking (Hammond, 2011), increases the rate of quit attempts among smokers (Azagba & Sharaf, 2013), and elicits stronger negative emotional reactions towards smoking (Noar, Hall, Francis, Ribisl, Pepper, & Brewer, 2016).

Despite evidence supporting the efficacy of GWLs, several recent studies have identified implementation factors that could further enhance these labels' effectiveness. For example, communicating messages about the benefits of quitting smoking, both for smokers and for those around them, could improve smokers' processing of GWLs (Mead, Cohen, Kennedy, Gallo, & Latkin, 2015). GWLs that include concrete visual manifestations of smoking-related illnesses have been shown to be salient to smokers regardless of their smoking history (Cameron & Williams, 2015). Finally, using a rotation of messages over time helps preserve the effectiveness of GWLs, as new content limits smokers' habituation to these messages and preserves their novelty (Yong, Borland, Hammond, Thrasher, Cummings, & Fong, 2016). Further empirical exploration of smokers' responses to potential GWL advancements would help researchers and policy makers make data-driven decisions regarding the evolution and implementation of this international tobacco control strategy.

Attention to (or Avoidance of) Graphic Warning Labels

To gain an understanding of how smokers respond to GWLs, a beneficial starting place would be to evaluate smokers' attention to (or avoidance of) GWLs. These constructs have been evaluated with both quantitative and qualitative methods; however, most of the research published to date has been concentrated in Australia and has produced mixed results. For instance, Yong et al. (2016) found that, following implementation of policies that demanded larger GWLs and plain packaging of cigarettes, smokers more frequently noticed the GWLs but

did not more frequently read them. Durkin, Brennan, Coomber, Zacher, Scollo, and Wakefield (2015) reported similar mixed results: although larger GWLs and plain packaging led some smokers to endorse increased quit intentions and quit attempts, others took measures to actively avoid larger GWLs such as concealing or covering their cigarette packs. Finally, Schüz and Ferguson (2015) demonstrated that, although smokers have more exposure to GWLs than non-smokers, they reported more defensive reactions to these warnings and were not as accepting of them as non-smokers.

These studies support the idea that individuals may not fully cognitively process GWLs despite their increased presence in the marketplace (White, Williams, Faulkner, & Wakefield, 2015). Smokers may attempt to avoid GWLs both physically (i.e., concealment/looking away from the label) and cognitively (i.e., claim the message communicated by the GWL is false; Pagano, Gubner, Tajima, Yip, Henderson, & Guydish, 2017). However, American smokers have been less exposed to GWLs than smokers in Australia or other countries where such warning labels have been integrated into legislative policy. Thus, less is known about whether American smokers would attend to or actively avoid GWLs. Preliminary studies suggest that, perhaps due to the novelty of these tobacco control measures, American smokers view GWLs as more noticeable than text-only warning labels (Mays, Murphy, Johnson, Kraemer, & Tercyak, 2014), spend more time attending to GWLs than text-only warning labels (McQueen et al., 2015), and consider larger GWLs to be effective at attracting attention and communicating health-related information (Bansal-Travers, Hammond, Smith, & Cummings., 2011). However, more recent studies of American smokers have found that younger smokers and smokers with some addiction to cigarettes were more likely to endorse intentions to avoid GWLs than smokers over the age of

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50 or smokers who with no perceived nicotine addiction, respectively (McCloud, Okechukwu, Sorensen, & Viswanath, 2017).

Eye-tracking studies that have evaluated attention to GWLs corroborate the inconsistencies seen with self-report research. Studies performed outside of the U.S. have shown that there is no significant difference in how smokers allocate their attention to image or text-based portions of GWLs (Süssenbach, Niemeier, & Glock, 2013). In fact, when combined with plain packaging, regular smokers do not spend more time attending to GWLs (Munafò, Roberts, Bauld, & Leonards, 2011), but instead preferentially attend to branding information (Maynard et al., 2014). In contrast, non-smokers demonstrate attentional biases towards GWLs (Shankleman, Sykes, Mandeville, Di Costa, & Yarrow, 2015) that are potentiated when they depict information regarding the health consequences of smoking (Kessels & Ruiter, 2012). Two eye-tracking studies using GWLs have been conducted in the U.S., both of which relied on warnings in advertisements as opposed to warnings on cigarette packages. Results showed that these GWLs were effective at attracting and holding attention from smokers, leading to better recall of the warnings themselves (Strasser, Tang, Romer, Jepson, and Cappella, 2012; Klein et al., 2015).

Taken together, if smokers tend to avoid and not attend to GWLs on cigarette packages, then the efficacy of these tobacco control policies could be limited. More research is needed to understand why smokers may attend to or avoid GWLs, with the hope that such data would clarify how GWLs can capitalize on both graphic components that attract attention and text components that promote cognitive processing of the labels. Designs that integrate multiple methods of measurement could provide converging evidence of how exposure to GWLs might impact smokers' cessation motivation and intentions to quit.

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Cognitive Dissonance, Psychological Reactance, and Attention to GWLs

The avoidance of GWLs among smokers may reflect an attentional manifestation of the construct of cognitive dissonance. Cognitive dissonance theory posits that individuals experience discomfort when they encounter information and facts that are inconsistent with their beliefs or behaviors (Festinger, 1957). Individuals experiencing this discomfort are motivated to engage in actions to reduce it (Elliot & Devine, 1994), especially if they view their pre-existing beliefs or behaviors as highly rewarding. Actions to reduce dissonance may include ignoring, avoiding, or changing perceptions to justify maintaining their beliefs or behaviors. Smokers tend to engage in dissonance-reducing behaviors by rationalizing the act of smoking (Fotuhi et al., 2013; McMaster & Lee, 1991) and endorsing beliefs minimizing the health consequences of smoking (Chapman, Wong, & Smith, 1993; Peretti-Watel, Halfen, & Gremy, 2007).

It is possible that prominent GWLs on plain cigarette packages might trigger smokers to engage in dissonance-reducing behaviors, such as attending away from GWLs (Süssenbach et al., 2013) or engaging in activities to reduce their exposure to GWLs (Hardcastle et al., 2016). However, GWLs may also serve as enhanced "hypocrisy manipulations," as reminding smokers of the inconsistencies between their smoking behavior and their beliefs about the consequences of smoking might motivate them to quit smoking (Strahan, White, Fong, Fabrigar, Zanna, & Cameron, 2002). Yong et al. (2014) used mediational modeling to support this proposed relationship, showing that warning labels primed smokers to contemplate the risks of smoking, which consequently evoked emotional reactions regarding these risks and increases in intentions to quit smoking. More importantly, Yong et al. (2014) also found that salient, prominent warnings stimulated avoidance behavior in smokers, but this avoidance was associated with greater perception of risk of smoking and did not reduce motivation to quit smoking.

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Attentional avoidance of GWLs might also represent a cognitive manifestation of psychological reactance. Psychological reactance theory posits that individuals will be motivationally aroused to regain freedoms that have been challenged or threatened (Brehm, 1966). The construct of reactance can reduce engagement in health behaviors via emotional (e.g., anger) and cognitive (e.g., defensiveness) mechanisms (Dillard & Shen, 2005). The promotion of health behaviors (e.g., staying smoke-free) often involves limiting an individual's freedom to engage in an unhealthy behavior that they enjoy (e.g., smoking), creating an unconscious tension when individuals encounter health messages that discourage participation in rewarding behaviors (Rains, 2007). Indeed, reactance to GWLs is negatively associated with quit intentions (Hall et al., in press). Smokers who are more likely to defend their smoking behavior do not experience increased intentions to quit following repeated exposure to GWLs (Dijkstra & Bos, 2015), perceive GWLs as threats to their freedom to smoke (LaVoie, Quick, Riles, & Lambert, 2017), and respond with psychological reactance when encountering them (Erceg-Hurn & Steed, 2011). A recent meta-analysis by Noar et al. (2015) confirms that GWLs elicit greater reactance than text-based warnings, and the authors encouraged further exploration of this relationship.

Overall, both cognitive dissonance theory and psychological reactance theory can potentially explain why smokers may actively avoid GWLs. Both theories imply that GWLs can arouse discomfort within smokers, who consequently may avoid GWLs to reduce the discomfort they feel about their smoking behavior. Avoidance of GWLs could limit the ability of these warning labels to communicate health risk, which might limit behavioral change such as smoking cessation. However, it is possible that inducing some dissonance through GWLs, without inducing excessive reactance, might enhance a smoker's motivation to quit. Recently published studies have shown that GWLs that induce stronger emotional reactions can produce

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greater engagement with the warning labels and stronger intentions to quit (Evans et al., 2017; Ophir, Brennan, Maloney, & Cappella, in press), but also stronger beliefs in misperceptions about the relative risk of smoking (Evans et al., 2018). Therefore, it is critical to develop an evidence-based approach for crafting GWLs that produces emotional reactions, capitalizes on the benefits of dissonance induction, and mitigates misperceptions of risk that are associated with reactance. Such evidence would be consistent with recommendations to identify aspects of GWLs that make them most effective while minimizing potentially negative effects of GWLs (Thrasher et al., in press).

Gain-Framed versus Loss-Framed Messages for Smoking Cessation

One element of GWLs that could directly influence dissonance and reactance experienced by smokers involves the framing of messages communicated by the GWLs. Before describing the evolution of messages communicated by GWLs, it is important to explore the role of message framing in the context of smoking cessation.

Message framing is a health communication paradigm that draws upon prospect theory, which is rooted in social psychology and public health, to understand how specific messages influence decision-making, actions, and perceptions of responsibility (Hallahan, 1999; Tversky & Kahneman, 1981). Prospect theory posits that decision-making is based on subjective assessments of potential gains and losses. When potential gains are salient to individuals, they avoid engaging in risky behaviors; when potential losses are salient to individuals, they actively engage in risky behaviors. Within the context of health communication, behaviors unassociated with potential risks (e.g. quitting smoking, healthy eating) are more strongly influenced by messages emphasizing potential gains from the behavior. In contrast, if behaviors are associated

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with elevated risk (e.g. continued smoking, eating processed foods), loss-framed messages are more persuasive.

Message framing has been widely implemented in health communication and health behavior research, and the effectiveness of gain-framed and loss-framed messages depends on the function of the health behavior being promoted (Rothman & Salovey, 1997). Loss-framed messages tend to be implemented for disease detection and are conceptualized as more effective at encouraging engagement in behaviors that yield a risk of an unpleasant outcome (Rothman, Bartels, Wlaschin, & Salovey, 2006). Thus, loss-framed messages are designed to motivate individuals who are unaware of potential medical conditions to take action to inform themselves of whether a disease is present (e.g., screening for lung cancer). Gain-framed messages are viewed as more effective in promoting disease prevention behaviors that lower risk of an unpleasant outcome (Rothman et al., 2006). Gain-framed messages are intended to encourage individuals to take action to prevent the onset of a potential medical condition, allowing them to maintain good overall health (e.g., quitting smoking). Meta-analyses provide some empirical support for these theoretical conceptualizations. Although loss-framed messages are significantly more likely to encourage disease detection behaviors (O'Keefe & Jensen, 2009) and gain-framed messages are significantly more likely to promote disease prevention behaviors (O'Keefe & Jensen, 2007), the effect sizes associated with these significant differences are small overall and often driven by one or two areas of behavior change.

One area of behavior change where message framing has seen exponential growth is smoking cessation. Message framing theory can be very useful for informing clinicians of how they can best encourage smokers to make a quit attempt. A review by Toll et al. (2014) provides examples differentiating loss-framed smoking cessation messages (e.g., "Continuing to smoke

will decrease how long you live") from gain-framed smoking cessation messages (e.g., "Quitting smoking will increase how long you live"). Smokers have been found to be more receptive to gain-framed messages that emphasize the benefits of quitting smoking over the risks of continuing to smoke (McKee, O'Malley, Steward, Neveu, Land, & Salovey, 2004), and a meta-analysis by Gallagher and Updegraff (2012) suggested that gain-framed messages promote smoking cessation more effectively than loss-framed messages. Based on these and other findings, Toll et al. (2014) generally recommend that health care providers deliver gain-framed messages over loss-framed messages when providing smoking cessation services. These findings have been recently explored within the context of Smartphone-based smoking cessation aids, with Oliver et al. (in press) finding that smokers judged gain-framed components to be both useful and engaging.

As the population of smokers continues to evolve, messages related to smoking cessation should also continue to evolve so that their reach can be maximized and their efficacy can be maintained. It will be important to learn what factors are associated with responses to gain-framed and loss-framed messages, what types of messages resonate more strongly with smokers, and whether gain-framed or loss-framed messages are associated with constructs like avoidance, reactance, cravings, or intentions to quit smoking. Such knowledge will allow for the development of tobacco control measures like public service advertisements and warning labels that are more salient to, and better received by, smokers.

Warning Labels and Gain-Framed versus Loss-Framed Messages

Warning labels on cigarette packs may be utilized as resources for communicating the benefits of quitting smoking and the risks of continuing smoking (Strahan et al., 2002). Thus, GWLs represent an evolution in health communication where, similar to health care providers,

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the messages that are conveyed to smokers can reflect gain-framed or loss-framed approaches. Consequently, research evaluating the effects of gain-framed versus loss-framed messages in warning labels has emerged as an important area for policy development and implementation. Policy makers face the regulatory challenge of identifying content for GWLs that promotes public health awareness without causing smokers to avoid the GWLs entirely. Thus, the interaction between message framing and GWLs represents an example of understanding how labeling regulations may impact consumer perceptions of cigarettes and their packaging, an area that is considered a significant tobacco control research priority (Hammond, 2012).

Preliminary studies have shown that, in contrast to the results seen with messages from health care providers, both smokers and non-smokers believe that loss-framed warning labels would better promote smoking cessation than gain-framed warning labels. Loss-framed GWLs are viewed as more effective at attracting attention and making stronger arguments for quitting smoking (Bansal-Travers et al., 2011; Nan, Zhao, Yang, & Iles, 2015), and these qualities are considered to be potentiated when they are paired with gruesome images (Berg, Thrasher, Westmaas, Buchanan, Pinsker, & Ahluwalia, 2011; Hammond, 2011). Mays, Turner, Zhao, Evans, Luta, and Tercyak (2015) argue that both types of messages can improve smoking-related outcomes, suggesting that smokers high in self-efficacy respond better to loss-framed warnings whereas smokers low in self-efficacy and high in perceived risks from smoking respond better to gain-framed warnings. Indeed, gain-framed messages in warning labels have also been shown to enhance intentions to quit smoking more strongly than loss-framed messages (Mays, Niaura, Evans, Hammond, Luta, & Tercyak, 2015; Mollen, Engelen, Kessels, &Ven Den Putte, 2017).

Despite these intriguing results, more research is needed to understand how smokers might respond to recently implemented strategies for improving cigarette warning labels, such as

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the inclusion of GWLs and the manipulation of message content. Study designs that incorporate empirically-supported psychological theories and multi-item measures would be particularly informative for understanding how interactions between these tobacco control strategies might influence smokers' attitudes, thoughts, and momentary processing of cigarette warning labels (Francis, Hall, Noar, Ribisl, & Brewer, 2017).

Study Aims and Hypotheses

This study was designed to evaluate daily smokers' psychological responses to a variety of cigarette warning labels. More specifically, the primary aim of this study was to determine how manipulation of warning label type (text-only versus GWL) and warning label message (gain-framed versus loss-framed) might impact levels of psychological reactance, risk perceptions for smoking, cigarette cravings, and motivation to quit smoking. The secondary aims of this project were to explore construct-related and demographic moderators of the relationships between warning label conditions and self-reported outcomes, as well as to identify specific types of warning labels that are salient to individuals who are intending to quit smoking. Adults in the United States have likely not been exposed to the variety of warning labels that have been implemented in other countries because changes in cigarette packaging remain under legal consideration in the United States. Thus, American smokers comprise a population for which GWLs and differences in message content are generally novel concepts. Understanding how American smokers respond to GWLs, determining what message content increases motivation to quit smoking, and exploring sub-group reactions to warning labels would inform how well these tobacco control policies might promote smoking cessation (especially among individuals who are already interested in quitting).

Using a blocked, counter-balanced, 2 X 2 within-subjects design, daily smokers completed four visual attention tasks, with each task including a variety of images of cigarette packs corresponding to one type of warning label: GWL/gain-framed, GWL/loss-framed, text-only/gain-framed, and text-only/loss-framed. The tasks also included stimuli that were meant to distract participants from viewing the cigarette packs (e.g., images of other consumer products). Such a design improves the external validity of the method because smokers do not encounter cigarette packs in isolation, and competing stimuli are always present to attract smokers' attention away from cigarette packs.

Primary Aim 1: To test how exposure to various types of cigarette warning labels influences psychological reactance, cigarette cravings, risk perceptions for smoking, and motivation to quit smoking.

Hypothesis 1a. I hypothesized a main effect of label type on psychological reactance. More specifically, because previous research has shown that GWLs elicit greater reactance than text-based warnings (Noar et al., 2015), I expected that, regardless of message content, GWLs would consistently produce greater state psychological reactance than text-only warnings.

Hypothesis 1b. I hypothesized a main effect for label content on psychological reactance and risk perception. More specifically, I expected that, regardless of label type, loss-framed messages would generate greater increases in risk perception and psychological reactance than gain-framed messages. These hypotheses were generated based on findings from previous research: despite higher receptivity to gain-framed messages (McKee, O'Malley, Steward, Neveu, Land, & Salovey, 2004), loss-framed GWLs have been found to be more effective at getting smokers to contemplate the risks of smoking (Bansal-Travers et al., 2011).

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Hypothesis 1c. I hypothesized additive, synergistic effects between label type and label content on psychological reactance and motivation to quit smoking. More specifically, I expected that the GWL/loss-framed condition would produce higher psychological reactance over the GWL/gain-framed condition, and I expected that the GWL/gain-framed condition would produce higher motivation to quit smoking when compared to the GWL/loss-framed condition. The reactance-based interactions were hypothesized based on data and proposals suggesting that both GWLs (Noar et al., 2015) and loss-framed messages (O'Keefe & Jensen, 2008) may produce stronger reactance. The motivation-based interactions were hypothesized based on previous research suggesting that GWLs can promote thoughts about smoking cessation (Yong et al., 2014), whereas gain-framed warning labels can strengthen intentions to quit smoking (Mays, Niaura, Evans, Hammond, Luta, & Tercyak, 2015).

Secondary Aim 1: To evaluate construct-related, theory-based moderators of reactions to cigarette warning labels.

Hypothesis 2a. I hypothesized a moderating effect of trait reactance on the relationship between label type and outcome variables as well as label content and outcome variables. More specifically, I expected that, compared to participants with low trait reactance, participants high in trait reactance would exhibit greater state reactance, greater cigarette cravings, and lower cessation motivation when exposed to GWLs and when exposed to loss-framed messages.

Hypothesis 2b. I hypothesized a moderating effect of smoking behavior on the relationship between label content and outcome variables. More specifically, I expected that participants who smoked more cigarettes per day and who reported higher levels of nicotine dependence would exhibit greater state reactance and greater cigarette cravings when exposed to loss-framed messages. These hypotheses were based on previous research showing that higher

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levels of nicotine dependence were associated with more positive responses to gain-framed messages over loss-framed messages (Fucito, Latimer, Salovey, & Toll, 2010). Thus, I expected that gain-framed messages would attenuate dependent variables that could be associated with negative smoking-related outcomes (e.g., cravings, psychological reactance).

Hypothesis 2c. I hypothesized a moderating effect of baseline cessation motivation on the relationship between label content and post-task cessation motivation. More specifically, I expected participants with high baseline cessation motivation to exhibit higher post-task cessation motivation after exposure to gain-framed warning labels than after exposure to loss-framed labels. In contrast, I expected participants with low baseline cessation motivation would not respond as favorably to this type of message content. This hypothesized moderation effect is based on previous research showing that gain-framed messages can promote smoking cessation (Toll et al., 2014), a behavior that often requires smokers to be higher in readiness to quit.

Secondary Aim 2: To explore demographic moderators of reactions to cigarette warning labels, including gender, race/ethnicity, education, income, and age. These data could be valuable for understanding how specific sub-populations of smokers respond to different types of cigarette warning labels, a research aim encouraged by a recent grantees' meeting focused on future research directions with GWLs (Thrasher et al., in press).

Secondary Aim 3: To explore reactions to warning labels among smokers who are preparing to quit smoking within the next 30 days. This aim may help identify specific label type/label content combinations that are salient to smokers intending to quit. Previous research has explored how GWLs (Hammond, 2011) and messaging strategies (Toll et al., 2014) can impact quit attempts, but this aim would allow for an exploration of how different label types,

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label content, and label type/label content combinations can impact several potential mechanisms of successful quit attempts (e.g., risk perceptions, motivation).

METHOD

Design Overview

This study utilized a 2 (label type: GWL versus text-only) X 2 (label message: gain-framed vs. loss-framed) within-subjects design. After completing screening procedures, eligible participants were scheduled for one 90-minute experimental session. Participants provided informed consent, completed a carbon monoxide (CO) breath test to confirm smoking status, and completed baseline self-report measures at the start of the session. Participants then completed four counter-balanced computerized visual attention tasks. During each experimental task, participants sat in front of a desktop computer screen and viewed a series of images containing one combination of labeling components (GWL/gain-framed, GWL/loss-framed, text-only/gain-framed, text-only/loss framed). While viewing these images, participants were also shown competing images of other consumer products placed in various quadrants of the computer screen (e.g., office supplies, toiletries).

Of note, an original aim of this study was to evaluate visual attention to warning labels, as these tasks were designed to allow for collection of gaze data with eye-tracking technology. However, despite attempting to collect eye-tracking data from the sample, a majority of the data was unanalyzable due to machine error and technical difficulties. Thus, those data were not analyzed as a part of this report. Please see Appendix A for the hypotheses associated with this original study aim, as well as a timeline laying out the occurrence and results of the technical difficulties that made these data unanalyzable.

After finishing each experimental task, participants completed self-report measures of state reactance, risk perceptions, cigarette cravings, and motivation to quit smoking. Participants completed 10-minute washout tasks (word search puzzles) between each experimental condition and received $30 compensation at the end of the session.

Participants

Power analyses for this study were conducted using GPower 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). The target sample size was determined to allow for adequate power ($\geq$ .80) for identifying small-to-medium effect sizes for eye-tracking outcome variables (e.g., gaze duration, latency to first gaze). Based on these power analyses, a sample of 62 participants enrolled in this study. Participants were eligible for inclusion if they were 18-65 years old, were current daily smokers, had been smoking for at least one year, were not currently taking action to quit smoking (e.g., using nicotine replacement therapy), and reported no current significant visual or memory impairments. To mask the primary outcomes of the project, the study was advertised as a study of visual perception for consumer products. Participants were recruited from the University of South Florida (USF) and from the greater Tampa community through fliers and classroom advertisements. Individuals who had participated in previous research studies at the Tobacco Research and Intervention Program (TRIP) were also contacted to assess their interest in participating in this study. All participants completed a phone screen prior to scheduling an experimental session to confirm eligibility, and all participants provided informed consent before beginning any experimental procedures. This study was approved by the institutional review board (IRB) at USF, and a copy of the IRB's approval letter can be found in Appendix B. A blank copy of the study's informed consent for can be found in Appendix C.

Materials

Self-report questionnaires were administered at baseline and after every experimental task. Each experimental task employed static images containing a variety of consumer products, including cigarette packages with accompanying warning labels.

Questionnaires. All self-report measures and questionnaires can be found in Appendix A following the original eye-tracking aims associated with this study. Participants completed a demographic questionnaire at baseline as well as a smoking status form assessing current smoking status, number of years spent smoking, number of cigarettes smoked per day, and time since last cigarette, among other smoking variables. Contained within the smoking status questionnaire was the Fagerström Test for Nicotine Dependence (FTND), a six-item measure of nicotine dependence with a range of scores from 0-10 (Heatherton, Kozlowski, Frecker, & Fagerström, 1991). Participants also completed the 14-item version of the Hong Psychological Reactance Scale (HPRS; Hong & Page, 1989) at baseline. This is a measure of trait psychological reactance that includes four factors: Freedom of Choice, Conformity Reactance, Behavioral Freedom, and Reactance to Advice and Recommendations. Finally, participants were asked at baseline whether they were planning to quit smoking in the next six months or the next thirty days. Participants who reported that they were planning to quit in the next thirty days represented smokers who were in the preparation stage of the transtheoretical model of behavior change (Prochaska & Velicer, 1997).

A 4-item measure of state reactance was completed immediately after each experimental task. The State Reactance Scale (SRS) has been used to evaluate smokers' responses to graphic warning labels, and higher scores reflect higher state reactance (Erceg-Hurn & Steed, 2011).

Finally, participants the following three questionnaires were administered five times during the experimental session – at baseline and immediately following each experimental task: 1) the Questionnaire on Smoking Urges – Brief version (QSU-B; Cox, Tiffany, & Christen, 2001), a 10-item version of the Questionnaire on Smoking Urges (Tiffany & Drobes, 1991) that quantifies cigarettes cravings that produces a total score that integrates smoking for reward and smoking for relief; 2) the Contemplation Ladder (CL; Biener & Abrams, 1991), a measure of current motivation to quit smoking that depicts a ladder as a continuum of readiness to quit smoking; scores on this measure range from 0 (No thought of quitting) to 10 (Taking action to quit), and the ladder includes anchor points to help classify participants across the five stages of the transtheoretical model of behavior change (Prochaska & Velicer, 1997; precontemplation, contemplation, preparation, action, maintenance); 3) a risk perception questionnaire (RPQ; Vidrine, Simmons, & Brandon, 2007) that assesses smokers' perceptions of the general likelihood that they will develop a smoking-related disease and the specific likelihoods for developing one of four specific smoking-related diseases.

Experimental Tasks. The experimental tasks were designed, constructed, and presented to participants within E-Prime® 2.0 (Psychology Software Tools, Inc., Sharpsburg, PA). Each task comprised 10 "test trials" that included images of cigarette packs with warning labels and 5 "filler trials" that did not include images of cigarette packs whatsoever. Each test trial and filler trial was presented for 10,000 milliseconds (ms), was followed by a 500 ms inter-trial interval, and was preceded by a fixation cross that was displayed for 200 ms. Previous studies of cigarette packaging and GWLs have displayed test stimuli for 4000 ms (Süssenbach et al., 2013), 5000 ms (Shankleman et al., 2015) and 10,000 ms (Maynard et al., 2014). This study implemented a longer viewing time because, in theory, a longer presentation period provides a more reliable

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estimate of sustained attention (Hogarth, Dickinson, & Duka, 2009), which may be of importance due to the novelty of the stimuli that were presented to participants.

The order of experimental tasks was counterbalanced across participants using a Latin Square procedure. The order of trials within each task was held constant across participants, as was the placement of each cigarette pack and distractor image. Distractor images represented several types of commonly-encountered consumer products, including snack foods, toiletries, office supplies, etc. The on-screen display for each test trial and filler trial was divided into quadrants, with cigarette packs and distractor images placed in pre-determined quadrants. This arrangement was used so that no stimuli ever appeared in the center of the display.

The size of the cigarette packs and competing consumer products were kept constant for each trial of each experimental block. Warning label areas were standardized across conditions to subsume 50% of the front of the cigarette pack and included content that represented one of four combinations: GWL with gain-framed text, GWL with loss-framed text, text-only warning with gain-framed text, and text-only warning with loss-framed text. The graphic components within each GWL condition reinforced the message content of the text, with gain-framed text accompanied by gain-framed graphics (e.g., doctors helping patients) and loss-framed text accompanied by loss-framed graphics (e.g., diseased body organs). Messages inherent in the warning labels were succinctly constructed to represent the following consequences of smoking: 1) reduced life expectancy (e.g., "Smokers die younger than non-smokers"); 2) smokers' development of disease and chronic illness (e.g., "Quitting smoking reduces your risk for emphysema"); 3) non-smokers' development of disease and chronic illness (e.g. "Smoking around pets increases their risk of cancer"); 4) financial burden (e.g., "Quitting smoking will save you money"); and 5) stigma associated with smoking (e.g., "Smokers often feel ashamed of

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their smoking"). The text of the gain-framed and loss-framed messages was matched for content and reading level.

Cigarette packs and accompanying warning labels that were included in "test trials" were selected following pilot testing, during which undergraduate research staff rated pilot stimuli's salience, clarity, and ability to induce emotional reactions. Multiple cigarette brands that were well known to American smokers (e.g., Marlboro, Newport, etc.) were used for the test trials in the experimental tasks. The order and location of all test stimuli and distractor stimuli were randomized prior to study initiation, such that although the order of conditions was counterbalanced across participants, participants had the same experimental experience within each condition.

Procedure

Participants presented to the TRIP research lab for their experimental visits. Two members of the research team were responsible for leading each experimental session – one would interact with the participant in the experimental room, while one would set up eye-tracking experiments in the lab's control room. Prior to beginning each session, staff would initialize the stimulus and eye-tracking PCs and test the calibration process to ensure that the data collection PC was able to pick up a potential participant's face. The stimulus PC was located in the research lab's control room outside of view of participants. The eye-tracking PC was located in one of the lab's experimental rooms and was in view of participants through their sessions.

Upon the start of their experimental session, participants reviewed and signed an informed consent form and completed baseline questionnaires after doing so. Staff then confirmed the order of task presentation and prepared the proper experimental block. After

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participants completed baseline questionnaires, they were given more information about the eye-tracking equipment and made aware that their gaze would be monitored during a series of computerized experiments.

Next each participant completed the eye-tracker calibration process. During calibration, participants were instructed to sit in front of the eye-tracking PC, remain as still as possible, and maintain their gaze towards the computer screen. If the participants' orientation to the PC was correct, the software on the monitoring PC would be able to identify a participant's bridge of the nose and upper lip and use these facial landmarks to locate the eyes on the face. Participants were then presented with a series of nine dots – organized in three rows of three – on the eye-tracking PC screen. Participants were instructed to look at these dots in sequential order, starting at the top left corner, working across then down towards the bottom right corner. As participants gazed at these dots, the experimenter monitoring the stimulus PC would ensure that the system was consistently picking up the participant's eyes and gaze direction. This process was repeated as many times as necessary to ensure proper calibration.

After calibration, the experimenter monitoring the stimulus PC loaded the proper experimental task. The experimenter in the experimental room shared with the participant that they would view a series of consumer products on the screen and reminded them to maintain their gaze on the screen at all times. Participants then completed the experimental task, and immediately after doing so, they completed a post-task questionnaire packet. Participants then completed a word search puzzle for ten minutes while staff saved data and loaded the appropriate next task. This process was repeated three times, yielding data for four experimental tasks. Participants were then debriefed, given time to ask questions about the study, and compensated $30 for their participation.

Data Analytic Plan

All statistical analyses were conducted in SPSS version 24 and STATA version 13. Demographic and baseline characteristics reflect frequency and mean/standard deviation calculations. To assess internal consistency within and relationships between measures, Cronbach's alpha was calculated for all self-report measures, and Pearson correlation coefficients were calculated between baseline measures and between measures for each individual experimental condition.

For the primary aim of this study, which was to explore responses to manipulations of warning label type and warning label content, a series of four 2 X 2 within-subjects analyses of variance (ANOVAs) was conducted. This allowed for evaluation of both main and interaction effects on the outcome variables of interest (CL, QSU-B, SRS, and RPQ). Independent variables included label type (text-only vs. GWL) and label content (gain-framed vs. loss-framed).

For Secondary Aim 1, which was to explore smoking-related moderators of participant responses, a series of twenty three-way mixed ANOVAs was conducted. These models included the same two within-subjects factors as the primary analyses (label type and label content) and explored moderation for all four post-task dependent variables (QSU-B, CL, SRS, RPQ). However, for this aim, five dichotomous variables were entered as between-subjects moderators: baseline reactance (total HPRS score, baseline cessation motivation (baseline CL score), cigarettes per day (CPD), nicotine dependence (FTND score), and baseline cigarette cravings (baseline QSU-B total score. All smoking-related moderators were held continuous for each analysis.

For Secondary Aim 2, which was to explore demographic moderators of participant responses, another series of twenty three-way mixed ANOVAs were conducted. These models

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included the same two within-subjects factors as the analyses conducted for Primary Aim 1 and Secondary Aim 1 (label type and label content). However, for this aim, five demographic factors were entered as between-subjects moderators: gender (male vs. female), race/ethnicity (Caucasian vs. minority), education ($<$ college degree vs. $\geq$ college degree), annual household income ($<$ \$30,000 vs. $\geq$ \$30,000) and age. Dichotomous moderators were entered into a 2 X 2 X 2 ANOVA model, while age was entered as a continuous moderator. Like Secondary Aim 1, this approach allowed for evaluation of moderation for all four post-task dependent variables (QSU-B, CL, SRS, RPQ).

Finally, for Secondary Aim 3, which was to explore the extent to which intentions to quit smoking in the next thirty days moderated participant responses, a two-step approach was used that integrated aspects of the other primary and secondary study aims. First, a series of four 2 (intending to quit in the next 30 days – yes/no) X 2 (GWL/text-only warning label) X 2 (gain-framed/loss-framed) mixed ANOVAs were conducted to identify specific dependent variables that were moderated by intentions to quit in the next thirty days. After identifying variables that were moderated by quit intentions, sub-group analyses were conducted using post-hoc 2 X 2 within-subjects ANOVAs, with one independent variable being quit intentions (yes/no) and the other being the warning label factor that was moderated by quit intentions (label type/label content).

RESULTS

Recruitment, Demographics, and Baseline Characteristics

A total of 209 screening interviews were conducted for this study. Of those 209 interviewees, 171 (81.8% of screeners) were eligible to participate in the study and scheduled for experimental sessions. Of these, 65 (38.0% of eligible interviewees) presented for their experimental session and consented to participate in the study. Of the 65 consented participants, three were determined to be ineligible during the experimental session. One participant disclosed during the experimental session that they were not a daily smoker, and two participants withdrew from participation before completion of all four experimental conditions. Thus, the final sample considered for analysis included 62 participants.

Table 1 reports demographic and baseline characteristics for the sample. Figures 1-5 include histograms showing the distributions for continuous dependent and independent variables that were considered for analysis. Of note, all four post-task SRS measures demonstrated significant positive skew (i.e., skewness values $\geq$ 1.223), as did cigarettes per day (skewness value = 2.361). For the four post-task SRS measures, between 50.0% and 54.8% of participants reported a score of 0 on the measure, meaning that nearly half of participants rated themselves as having no reactance across all four measures. Although it is possible that this consistently significant skew may preclude any meaningful analyses of warning labels' impact on state reactance, the primary and secondary aims related to this outcome variable were still evaluated as proposed earlier in this document. The post-task CL following exposure to GWL/loss-framed warning labels showed significant negative skew (skewness value = -1.062).

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The sample was 67% Caucasian, 61% female, and reported a mean age of 39.9 years. Over 67% reported less than a college education, and over 66% reported an annual household income of less than $30,000. Participants smoked on average about 16 cigarettes per day and reported on average that they had been regular smokers for more than 20 years. Based on mean FTND and baseline CL scores, participants on average reported moderate nicotine dependence and being in the contemplation stage of change regarding their smoking behavior.

Internal Consistency and Correlations between Measures

Table 2 reports Cronbach's alpha calculations for each dependent measure and covariate. All of the measures demonstrated adequate to good internal consistency reliability. Table 3 reports bivariate correlation coefficients between dependent measures at baseline and across all four experimental conditions.

Primary Analyses

Table 4 reports F statistics for all ANOVAs conducted in line with the primary study aim. Table 5 reports descriptive statistics across both levels of independent variables for all primary outcome variables.

Results of these analyses did not support any of the hypotheses associated with the primary aims of this study:

1. There was no observed main effect of label type on post-task SRS score, meaning that across the entire sample, GWLs did not produce greater state reactance than text-only labels ($p = .653$).

2. There were no observed main effects for label content on post-task SRS or RPQ scores. Although loss-framed messages did not produce greater risk perceptions (p

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= .326) than gain-framed messages, but there was a trend upon state reactance, $F(1,$

60) = 2.892, p = .089).

3. Statistically significant interaction effects between label type and label content were not found for either post-task SRS score (p = .618) or post-task CL score (p = .329).

Even though hypothesized main and interaction effects were not supported, the following main effects, which are visually depicted in Figures 6 and 7, were statistically significant at the p < .05 alpha level:

1. Exposure to GWLs produced lower cravings (estimated marginal mean of QSU-B score = 31.266) than exposure to text-only warning labels (estimated marginal mean of QSU-B score = 33.435), $F(1, 61)$ = 4.056, p = .048, η_p^2 = .062.

2. Exposure to gain-framed messages produced lower cravings (estimated marginal mean of QSU-B score = 31.331) than exposure to loss-framed messages (estimated marginal mean of QSU-B score = 33.371), $F(1, 61)$ = 4.819, p = .032, η_p^2 = .073.

3. Exposure to GWLs produced higher post-task cessation motivation (estimated marginal mean of CL score = 6.669) than exposure to text-only warning labels (estimated marginal mean of CL score = 6.460), $F(1, 61)$ = 6.210, p = .015, η_p^2 =.092.

Construct-Related Moderators

Tables 6 and 7 summarize significant moderators of main effects of label type and label content, respectively. Regarding Secondary Aim 1, the following hypotheses were not supported:

1. Trait reactance did not moderate the main effects of label type (p's ≥ .712) or label content (p's ≥ .107) on post-task SRS, QSU-B or CL scores.

2. Cigarettes per day (p = .776) and FTND score (p = .489) did not moderate the main effect of label content on post-task QSU-B score.

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3. Baseline cessation motivation did not moderate the main effect of label content on post-task CL score ($p = .538$).

However, elements of Hypothesis 2.b – which specified that aspects of smoking behavior would moderate psychological responses to label content – were supported. More specifically, the main effect of label content on state reactance was moderated by both cigarettes per day $F(1, 164) = 4.91$, $p = .028$, and FTND score, $F(1, 178) = 8.74$, $p = .004$, $\eta_p^2 = .047$. In addition, the main effect of label content on state reactance was also moderated by baseline CL score $F(1, 175) = 4.09$, $p = .045$, $\eta_p^2 = .023$, and by baseline QSU-B score $F(1, 178) = 4.16$, $p = .043$, $\eta_p^2 = .023$. Figure 8 shows line graphs demonstrating these interactions. Summaries of these interaction effects follow:

1. At lower levels of nicotine dependence and lower daily smoking rates, gain–framed messages produced greater reactance than did loss-framed messages. This difference disappeared as nicotine dependence and cigarettes per day increased, with higher levels of those moderators being associated with greater state reactance to loss-framed messages.

2. At lower levels of baseline cessation motivation, loss-framed messages produced higher levels of state reactance. However, this difference was reversed as baseline cessation motivation increased, with higher levels producing reductions in state reactance. Gain-framed messages produced a relatively stable level of reactance regardless of baseline cessation motivation.

3. At lower levels of baseline cravings, loss-framed messages produced greater state reactance than gain-framed messages. However, as levels of baseline cigarette cravings increased, the difference in state reactance scores between gain-framed and

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loss-framed messages reversed, with gain-framed messages producing higher ratings

of state reactance as levels of cigarette cravings increased.

When considering other construct-related moderators, the following three variables

emerged as unexpected moderators of the main effect of label type on outcome variables, all of

which are depicted in Figure 9:

1. Baseline QSU-B score on post-task QSU-B scores, $F(1, 179) = 8.75$, $p = .004$, η_p^2
   $= .047$. At lower levels of baseline cravings, GWLs produced higher levels of post-
   task craving scores; however, this effect was reversed at higher levels of baseline
   cravings, with text-only labels producing higher levels of post-task cravings.

2. Baseline QSU-B score on post-task RPQ scores, $F(1, 173) = 5.25$, $p = .023$, η_p^2
   $= .029$. At lower levels of baseline cravings, text-only warning labels produced higher
   levels of post-task risk perceptions; however, this effect was reversed at higher levels
   of baseline cravings, with GWLs producing higher levels of post-task risk
   perceptions.

3. HPRS total score on post-task RPQ scores, $F(1, 173) = 4.17$, $p = .043$, $\eta_p^2 = .023$. At
   lower levels of trait reactance, text-only warning labels produced higher levels of
   post-task state reactance; however, this effect was reversed at higher levels of trait
   reactance, with GWLs producing higher levels of post-task state reactance.

Demographic Moderators

When considering demographic moderators, gender, age, and race/ethnicity all interacted

with label content to produce statistically significant differences in post-task QSU-B scores at the

$p < .05$ alpha level. Thus, these three demographic factors identified sub-groups of the sample

where the suppression of post-task cravings by exposure to gain-framed labels was enhanced.

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That said, it should be noted that there was a significant relationship between gender and age, $\chi^2(1) = 7.900$, $p = .005$, such that 65.8% of women were above age 38 while 70.8% of men were age 38 or younger. Below are the F statistics for the significant demographic moderation results on post-task craving scores:

1. Gender – $F(1, 60) = 4.356$, $p = .041$, $\eta_p^2 = .068$

2. Age – $F(1,179) = 5.61$, $p = .019$, $\eta_p^2 = .030$

3. Race/Ethnicity – $F(1,60) = 5.445$, $p = .023$, $\eta_p^2 = .083$

Regarding gender, among female smokers, exposure to gain-framed labels produced lower cravings (estimated marginal mean QSU-B score = 28.646) than exposure to loss-framed labels (estimated marginal mean QSU-B score = 33.063), $p = .004$; this discrepancy did not emerge among male smokers (estimated marginal mean gain-framed QSU-B score = 33.026, estimated marginal mean loss-framed QSU-B score = 33.334). When considering age, among older smokers, gain-framed labels produced lower craving than loss-framed labels; this did not occur among younger smokers. Finally, among minority/non-Caucasian smokers, exposure to gain-framed labels produced lower cravings (mean QSU-B score = 24.432) than exposure to loss-framed labels (mean QSU-B score = 29.298), $p = .002$; this discrepancy did not emerge among Caucasian smokers (gain-framed mean QSU-B score = 35.125, loss-framed mean QSU-B score = 35.613).

Two other demographic moderation analyses were statistically significant. First, an interaction between age and label type on risk perceptions emerged, $F(1, 173) = 5.14$, $p = .025$, $\eta_p^2 = .029$. As age increased, GWLs were less salient at promoting risk perceptions than text-only warning labels. Second, a significant three-way interaction between age, label type, and label content emerged for state reactance emerged, $F(1, 178) = 4.09$, $p = .045$, $\eta_p^2 = .022$.

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Intentions to Quit Sub-Group Analyses

Finally, all *F* statistics for Secondary Aim 3 can be found in Table 8 when considering intentions to quit smoking in the next thirty days, results for the four 2 X 2 X 2 mixed ANOVAs proposed for this aim produced one significant interaction between intentions to quit smoking in the next thirty days and label type upon post-task craving scores, $F(1, 59) = 10.475$, $p = .002$. Sub-group analyses confirmed that, among participants intending to quit smoking in the next thirty days, exposure to GWLs produced lower cravings (estimated marginal mean of QSU-B score = 25.382) than exposure to text-only warning labels (estimated marginal mean of QSU-B score = 32.853), $F(1, 16) = 6.227$, $p = .024$, $\eta_p^2 = .280$. This between-group difference is graphically demonstrated in Figure 10.

DISCUSSION

This study was designed to evaluate how different types of cigarette warning labels and different message content within warning labels would impact smokers' motivation to quit smoking, cigarette cravings, psychological reactance, and risk perceptions. For this primary goal of the study, I hypothesized that GWLs would increase state reactance, that loss-framed messages would increase state reactance and risk perceptions, that loss-framed GWLs would increase reactance, and that gain-framed GWLs would increase motivation to quit smoking. I also explored moderators of these relationships and sub-group responses to these warning labels, hypothesizing that trait reactance, aspects of smoking behavior, and baseline motivation to quit smoking would impact participants' responses to viewing the warning labels. In sum, none of the primary hypothesized main or interaction moderating effects were supported. However, several unexpected main effects and both hypothesized and unexpected moderating effects emerged from this study on targeted outcomes. More specifically, exposure to GWLs suppressed cravings and enhanced motivation to quit smoking, with the cravings effects being particularly effective among participants preparing to quit smoking. Several demographic and smoking-related variables also emerged as moderators of these main effects, including gender, age, race/ethnicity, baseline cigarette cravings, and baseline cessation motivation. Finally, it is noteworthy that several smoking-related factors, including cigarettes per day and nicotine dependence, moderated the effects of exposure to different label content on state reactance.

GWLs, Gain-Framed Warning Labels, Motivation, and Cravings

Although the primary hypotheses for this study were not supported, this study produced some evidence that GWLs and gain-framed warning labels may be efficacious emerging tobacco control strategies. First, exposure to GWLs enhanced motivation to quit smoking within the sample. This is consistent with previous research that has shown that GWLs can reduce smoking (Ngo, Cheng. Shang, Huang, & Chaloupka, 2018) and promote quit attempts (Azagba & Sharaf, 2013), especially when they possess emotion-inducing images (Evans et al., 2017). The finding that GWLs did not increase reactance among the general sample is also promising, as reactance could result in avoidance of warning labels and, consequentially, reduced efficacy of the emerging labels. However, despite previous research showing that gain-framed warning labels can enhance motivation and intentions to quit smoking (Mays, Niaura, et al., 2015; Mollen et al, 2017), this was not found to be the case in this study. This may be due to a variety of key methodological differences from previously published studies, such as a smaller sample size, a different sample composition, and the use of a within-subjects study design (all of which are discussed in the Limitations section of this manuscript).

Second, several results from this study converge to identify cravings as another key outcome to consider in cigarette pack warning label research. Results indicate that cigarette cravings are correlated with psychological reactance after exposure to loss-framed warning labels, suggesting that if loss-framed warning labels do indeed produce strong emotional reactions, one of those reactions could be an increase in cigarette cravings. Results also indicate that exposure to GWLs can reduce cigarette cravings, which is consistent with several previous studies (Do & Galván, 2016; Lin, Zimmermann, Manderski, Schmelzer, & Steinberg, 2011). Finally, exposure to gain-framed warning labels also produced suppression of cravings,

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supporting the idea that gain-framed messaging is a communication strategy that could promote smoking cessation (Toll et al., 2014).

Cigarette cravings have been shown to be predictive of smoking behavior and smoking relapse (Killen & Fortmann, 1997; Shiffman et al., 1997), and favorable attitudes about smoking are associated with cigarette cravings (Bertin, Lipsky, & Erblich. 2018). Warning labels comprise a population-level intervention that is designed to change thoughts, beliefs, and attitudes about smoking. If exposure to GWLs and gain-framed warning labels can effectively reduce cravings for cigarettes, then it is possible that exposure to such warning labels would effectively reduce active smoking behavior. Thus, these results provide indirect evidence that, despite not impacting risk perceptions, GWLs and gain-framed warning labels are more effective at altering thoughts, beliefs, and attitudes about smoking than text-only warning labels and loss-framed messages, respectively.

Moderation and Sub-Group Implications

Not only did GWLs and gain-framed warning labels impact outcomes such as cravings and cessation motivation, but they also influenced risk perceptions and psychological reactance among certain sub-groups of smokers. More specifically, gain-framed messages seemed to suppress state reactance among smokers with greater smoking rates and higher nicotine dependence, and GWLs seemed to increase risk perceptions among smokers with higher levels of trait reactance and baseline cigarette cravings. Some previous research has shown that exposure to GWLs (Erceg-Hurn & Steed, 2011; LaVoie et al, 2017) and to loss-framed messages in general (Shen, 2015) can produce psychological reactance. There is also some previous research suggesting that GWLs and loss-framed messages in cigarette warning labels could increase risk perceptions (Bansal-Travers et al., 2011). The results reported here partially support

these findings and also partially support discussions from a recent National Cancer Institute grantees' meeting on GWLs summarized by Thrasher et al. (in press). Their conclusions suggest that reactance to GWLs may not negatively impact cessation outcomes and that there was not enough research evidence connecting GWLs to changes in risk perceptions. Their conclusions also mention other potential mechanisms of action, such as attention to the labels, memory for label content, and other aspects of negative affect. The results from this study support the recommendation from Thrasher et al. (in press) for further laboratory-based experiments and cross-sectional mediation analyses into these potential mechanisms of action. To that end, it is possible that individuals are not always fully aware of changes in risk perceptions, reactance, and other underlying mechanisms, and although eye-tracking outcomes were unable to be evaluated in this study, this still constitutes a promising direction for measuring such a form of reactance/risk perception.

Although not all secondary hypotheses for this study were supported, several interesting and unexpected moderation and sub-group effects were identified through exploratory analyses. Results indicate that both demographic factors and smoking-related variables can moderate warning label effectiveness, suggesting that sub-populations of smokers may respond differently to exposure to cigarette warning labels. Smokers who identified as female, older, or a member of minority race/ethnicity experienced suppression of cravings when exposed to gain-framed warning labels. Further, participants with low baseline cravings experienced increases in risk perceptions following exposure to loss-framed messages, while participants with lower motivation to quit smoking experienced motivation enhancement following exposure to GWLs (although these results may reflect floor/ceiling effects). Finally, among smokers in the

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preparation stage of change who were intending to quit within the next 30 days, GWLs suppressed cravings.

The diverse set of results in regard to readiness for change beg some additional discussion. GWLs enhanced cessation motivation among smokers with low readiness to quit while suppressing cigarette cravings among smokers with high readiness to quit (i.e., intentions to quit in the next 30 days). Exposure to emotion-inducing GWLs have been shown to reduce cravings (Wang, Romer, Elman, Turetsky, Gur, & Langleben, 2015) and enhance motivation to quit smoking (Evans et al., 2017). These results build upon research such as this and suggest that the impact of GWLs on these types of variables may differ across readiness to change. Although GWLs may not enhance motivation to quit among smokers intending to do so, perhaps due to ceiling effects, this sub-group of smokers still seems to receive benefit from exposure to this type of warning label (namely, craving reduction).

These moderation results are consistent with the idea that individual characteristics may impact the salience of GWLs (Pagano et al., 2017) and of gain-framed and loss-framed messages (Toll et al., 2014). These results also support several previous studies connecting gender, race/ethnicity, and age to the salience of gain-framed messages. More specifically, research has demonstrated that females respond more favorably to gain-framed messages for smoking cessation (Toll, Salovey, O'Malley, Mazure, Latimer, & McKee, 2008), members of minority racial/ethnic populations respond favorably to gain-framed messages for cancer screenings (Lucas, Hayman, Blessman, Asabigi, & Novak, 2016), and older adults respond favorably to gain-framed messages that promote healthy, disease-preventing behaviors (Notthoff & Carstensen, 2014).

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Results from this study also support the recommendation of studying the impact of GWLs across different sub-populations of smokers (Thrasher et al., in press). One potential avenue for such research is to evaluate the efficacy of tailoring messages and content of warning labels to target specific populations of interest. Theories like the "hardening hypothesis" (Irvin & Brandon, 2000) suggest that present-day smokers are experiencing more difficulty quitting smoking and less success from engaging in smoking cessation treatments. There are also many different demographic, psychological, and sociological risk factors for cigarette smoking in the general population, including male gender, psychological distress, identification as lesbian/gay/bisexual, and low socioeconomic status, among several others (Jamal et al., 2018). Finally, there are some high-risk sub-populations of smokers where individual factors might predict smoking behavior, including pregnant women (Simmons, Sutton, Quinn, Meade, & Brandon, 2014), patients with cancer (Simmons et al., 2013), and individuals with other types of chronic illnesses and health disparities (Quiñones, Nagel, Newsom, Huguet, Sheridan, & Thielke, 2017).

One potential way to reach these high-risk, hard-to-reach smokers is to adapt evidence-based smoking cessation interventions for these populations to maximize their potential benefit. Such practices have been implemented for self-help (Meltzer et al., 2017), Internet-based (Mavrot, Stucki, Sager, & Etter, 2017), and Smartphone-based smoking cessation resources (Iacoviello et al., 2017). The moderation results reported here suggest that tailoring messages should be considered for cigarette warning labels. Doing so would likely increase the size of the rotation of messages communicated by warning labels, a suggestion generated by the WHO FCTC (WHO, 2008). Preliminary research has already begun to look into how warning labels designed to reach high-risk sub-populations of smokers may be received, with one study showing

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that GWLs depicting smoking-related pregnancy risks are salient to its target audience – women of reproductive age (Kollath-Cattano, Osman, & Thrasher, 2017). Dewhirst and Lee (2018) also argue for adapting cigarette warning labels based on market, geographic, behavioral, and psychological segmentation. They propose that, in addition to comprising an evidence-based intervention, warning labels represent a form of marketing by which tailored messages would elicit more positive responses than undifferentiated messages towards the market at large. Sub-group analyses also suggest that certain messages resonate more strongly with smokers trying to quit, and further development and differentiation of cessation versus prevention messages represent an intriguing future direction for the warning label research area.

Limitations

These results should be considered within the context of several limitations. First, this study was originally designed to evaluate attention to or avoidance of cigarette warning labels using eye-tracking technology. However frequent system errors led to inconsistent data collection and poor data quality. Thus, no eye-tracking analyses were conducted for this study. This still comprises an important direction for future research into American smokers' responses to novel warning labels. Second, although the sample was relatively diverse demographically, participants had a mean age of nearly 40 and a mean smoking history of nearly 21 years. Because the sample was generally composed of middle-aged smokers with long histories of smoking, this may make it difficult to generalize these results across the entire population of smokers, including individuals who are younger or who have fewer years of regular smoking. More experienced smokers may be more resistant to influences from warning labels, or they may be more responsive to warning labels due to greater health concerns. Indeed, we found that age moderated the effects of label content on craving. Third, because of the inability to analyze eye-

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tracking data collected in this study, the study design was revised to include a large number of exploratory analyses of self-report measures. It is possible that some of the statistically significant findings from these exploratory analyses could represent spurious results, and replication would be essential to increase confidence of the impact of graphic warning labels and gain-framed messages on cigarette cravings and motivation to quit smoking. Fourth, and related to the previous limitation, because several aspects of this study were exploratory and designed to identify areas for future research, the alpha level was set at $p < .05$ for all results. Had the alpha level been corrected for multiple comparisons, it is likely that many of the significant effects reported here would vanish. Fifth, the study's measure of state reactance showed limited variability and high levels of skewness, with nearly half of the sample reporting no reactance for each of the four experimental conditions. This limits interpretability of the findings regarding the impact of label content on state reactance, as well as the follow-up moderation analyses. Finally, the experimental stimuli were pilot tested with a sample of undergraduate non-smokers. It is possible that, had the experimental stimuli been pilot tested with smokers, there may have been differences in selecting the types of warning labels that were used in the final experimental tasks.

Conclusions and Future Directions

This study sought to evaluate how graphic warning labels and different messaging approaches would impact smokers' responses to this emerging tobacco control strategy. This study was designed to contribute to the developing body of theory-based research on how various types of warning labels work, a research area that remains in need of additional contributions (Noar et al., 2015). This study was also designed to utilize multi-item, previously validated measures to assess responses to warning labels, a suggestion that is consistent with recently published reviews of this research area (Francis et al., 2017). Although hypothesized

main effects and interactions were not found, these data suggest that exposure to GWLs and gain-framed messages can impact psychological aspects of smoking behavior, such as cigarette cravings and cessation motivation. These results yield several potentially fruitful future directions and research questions to continue to evaluate the efficacy of GWLs and gain-framed warning labels on American smokers. First, these results encourage further experimental research into both cognitive (e.g., attention, recall) and behavioral (e.g., topography, ad-libitum smoking behavior) reactions to GWLs and gain-framed warning labels. Second, replicating this design with a more diverse sample (e.g., both smokers and non-smokers) and across more diverse tobacco products (e.g., e-cigarettes, cigarillos) would allow for a better understanding of what messages promote prevention versus cessation and what types of messages effectively communicate risks associated with alternative tobacco products. Third, evaluating how high-risk populations of smokers (e.g., pregnant women, cancer patients) respond to GWLs and gain-framed warning labels might inform further tailoring and evolution of warning labels to reach people who need to quit smoking as soon as possible. Finally, plain packaging of cigarette packs is another emerging international tobacco control strategy. Although there has been some research evaluating American smokers' responses to the combination of plain packaging and GWLs (Bansal-Travers et al., 2011), this research area would likely benefit from study of the gain-framed/loss-framed messaging approaches that were utilized in this study.

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APPENDIX A:

ORIGINAL STUDY AIMS AND MEASURES

The purpose of this portion of Appendix A is two-fold: 1) To list the aim and hypotheses associated with the eye-tracking data collected during this project; and 2) To lay out a timeline that explains shortcomings encountered with collecting eye-tracking data and how and when investigators became aware of the poor quality of the eye-tracking data that was collected.

Eye-Tracking Aims and Hypotheses

The original primary purpose of this study was to evaluate attentional biases to a variety of cigarette warning labels among daily smokers. More specifically, the original primary aim was to to evaluate whether attention allocation towards warning labels was influenced by two manipulations: 1) label type (GWLs versus text-only warnings); and 2) label content (gain-framed versus loss-framed messages). Using the 2 X 2, within-subjects, counter-balanced design described in the body of this document, eye-tracking technology was supposed to be used to measure participants' gaze during all four experimental tasks, yielding two dependent variables: latency to initial fixation, which represents initial attention, and gaze duration, which represents maintained attention. The following were hypotheses associated with this aim:

Hypothesis 1: Given the novelty of the GWLs to this population of smokers, I hypothesized a main effect of label type on latency to initial fixation. More specifically, I expected that smokers would demonstrate initial attentional biases (i.e., shorter latency to initial fixation) to GWLs over text-based warnings. However, because GWLs may cause smokers to feel increased discomfort and arousal, I hypothesized a contrasting main effect for label type on gaze duration, such that smokers will demonstrate greater maintained attentional biases (i.e., greater gaze duration) to text-based warnings over GWLs.

Hypothesis 2: Because gain-framed messages are often more readily accepted by smokers, I hypothesized a main effect of message content on both initial and maintained attention. More specifically, I hypothesized that smokers would produce shorter latency to initial fixation and greater gaze duration towards gain-framed messages than loss-framed messages.

Hypothesis 3: Because I expected that both GWLs and loss-framed messages would increase psychological reactance among smokers, I hypothesized an interaction effect between label type and label content on both initial and maintained attention. More specifically, I expected that, when compared to GWLs that included gain-framed messages, smokers would demonstrate significantly longer latency to initial fixation and significantly shorter gaze duration towards GWLs that included loss-framed. I did not expect such significant differences for gain-framed/text-only warning labels and loss-framed/text-only warning labels.

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Obtaining the Eye-Tracker and the Unexpected Closure of Applied Science Laboratories

The eye-tracking device that was utilized in this study was an Applied Science Laboratories (ASL) D6 120 Hz Desktop Eye-Trac PC. Our research group purchased this device in 2014 based on feedback from other eye-tracking researchers regarding the reliability of the equipment and the helpfulness of the technical support services (which came free from the company with the purchase of the system). Staff and graduate students in our lab spent over a year setting up the system's hardware. It is important to note that this set-up process was extensively delayed due to the company sending faulty/broken equipment to the lab upon the initial purchase of the system.

Unbeknownst to our research group, ASL closed its business in early 2016, and after this closure, data analysis software and complimentary technical support were no available from the company. To the best of our knowledge, the company did not notify any of their existing customers or product users of the closure, including our research group. In fact, our group did not learn of the company's closure until April 2016 after consulting with another graduate student at USF. This student had emailed a former ASL employee expressing interest in acquiring an ASL system, and in the correspondence shared by this graduate student, the former employee said "I do need to inform you that several weeks ago, Applied Science Laboratories closed its business and ceased trading…and ASL no longer exists as a company." Despite this sudden closure and the unanticipated absence of technical support services, our research group actively decided to continue to develop projects using the device because of the money we had invested in the system. One of the projects proposed was this dissertation, which was approved by the members of the dissertation committee on July 19, 2016 (nearly 3 months after we learned of the company's closing).

Study Initiation, Consultation, and Data Collection Difficulties

From August 2016 through December 2016, the following study initiation activities were completed: 1) obtained IRB approval; 2) developed and administered pilot tests of cigarette pack images; and 3) created final versions of the eye-tracking experiments that included both cigarette pack and distractor (i.e., consumer product) stimuli. After completing these study initiation activities, the functionality of the ASL D6 Eye-Trac PC was tested extensively in the lab, and experimental procedures were drafted and revised based on the initial tests with the eye-tracking system. During this initial testing, several laboratory staff members served as test subjects, and the system's calibration and data collection processes were tested at least ten times. In the midst of this preliminary testing, significant issues with both calibration and collection f gaze data were encountered. Several potential solutions were tried by experimental staff: adapting experimental instructions, comparing overhead versus lamp-based lighting, changing the brightness of the stimulus PC monitor, shortening the distance from the eye-tracking cameras to the participant's chair, etc. None of these in-house solutions resolved our issues.

We learned during study initiation that several former ASL employees had started a consulting firm called Argus Science, LLC. This firm was offering consultation services for ASL products at a cost of $175 per hour. They also offered repairs/evaluations of hardware on a "best efforts basis," meaning that the firm could not guarantee successful repairs to eye-tracking systems because they no longer had access to any ASL inventory. Because of the persistent difficulties with our system, we sought out assistance from this firm in December 2016 and completed two conference calls/web consultations – one on January 30, 2017, and one on February 9, 2017. The system's reliability improved following these calls, although there were

still some inconsistencies with calibration/data collection. Nevertheless, we believed that the system was now reliable enough to fulfill the aims of the dissertation study, and our first experimental session was completed on March 7, 2017.

Recruitment lasted for nearly 8 months, and our last participant was seen on November 30, 2017. During the course of data collection, the study team continued to encounter various problems with system calibration and data collection. However, the study team prioritized recruitment and data collection for this project given inconsistent show rates among individuals who were scheduled following telephone screenings. Further, because of the inability to acquire data analysis software following ASL's closure, the data management steps for significant time involved in processing the eye-tracking data (about 4 hours per participant). Thus, a backlog of data quickly developed, and the study team was unable to immediately realize the severity of the problems with data collection. After a systematic problem was identified, consultation with Elizabeth Schotter, Ph.D., a member of the USF psychology department faculty, was held on December 4, 2017. Following this consultation, it was determined that a majority of the eye-tracking data that was collected was of insufficient quality for meaningful analysis. That is, although we had recruited the proposed sample size of 62 participants, the amount of usable gaze data collected from enrolled participants had been below expectations and below data processing standards that are regularly incorporated in eye-tracking research. Moreover, because the expensive equipment that we invested in for this project appeared to be faulty, without any way to repair it, there was no reasonable, practical, or efficient option for collecting higher quality data. Therefore, the principal investigator proposed alternative aims and hypotheses to the dissertation committee on February 8, 2018, and the committee approved these revised aims and hypotheses on February 12, 2018.

SELF-REPORT MEASURES

Demographic Form (DF)

Instructions: Please complete the following questions about yourself and your life situation. All answers will be kept confidential.

Gender: (check one)   □ Male   □ Female

What is your age? _____

What is your marital status?
- ❑ Single
- ❑ Married
- ❑ Separated
- ❑ Divorced
- ❑ Widowed

With which racial category do you most identify yourself? (please check one)
- ❑ American Indian/Alaska Native
- ❑ Asian
- ❑ Native Hawaiian or Other Pacific Islander
- ❑ Black or African American
- ❑ White

Are you Hispanic/Latino?
- ❑ Yes
- ❑ No

What is the highest grade level you have completed? (please check one)
- ❑ Did not graduate high school
- ❑ High school graduate
- ❑ Some college
- ❑ Technical school/Associates degree
- ❑ 4-year college degree
- ❑ Some school beyond 4-year college degree
- ❑ Professional degree (e.g. MD, JD, PhD)

What is your total household income?

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- Under $10,000
- $10,000 - $29,999
- $30,000 - $49,999
- $50,000 - $69,999
- $70,000 - $89,999
- Over $90,000

Smoking Status Form (SSF)

Instructions: Please complete the following questions about your history of smoking and experience with tobacco products. All answers will be kept confidential.

Do you smoke cigarettes every day? □ Yes   □ No

   If you answered No, how many days per week do you smoke cigarettes? _____

On average, how many cigarettes do you currently smoke per day? _____ cigarettes

Have you used any of the following products in the past 30 days (check all that apply)?
   □ Cigars/cigarillos/little cigars
   □ Hookah/waterpipe tobacco
   □ Chew/dip/smokeless tobacco
   □ Snuff/snus/dissolvables
   □ E-cigarette/electronic cigarette/vape pen/personal vaporizer

At what time did you smoke your last cigarette? _____

Which brand of cigarettes do you consider your regular brand (please be specific)?

_____ (*e.g., Marlboro Lights*)

Do you smoke more frequently in the first hours after waking than during the rest of the day?
   □ Yes   □ No

How soon after you wake up do you smoke your first cigarette? (Check one)
   □ Within 5 minutes
   □ 6-30 minutes
   □ 31-60 minutes
   □ After 60 minutes

Of all the cigarettes you smoke each day, which would you hate most to give up? (Check one)
   □ The first one in the morning
   □ The one with breakfast
   □ The one with lunch
   □ The one with dinner
   □ The last cigarette before going to bed
   □ Other (please specify):_____

Do you smoke if you are so ill that you are in bed most of the day?

□ Yes   □ No

Do you find it difficult to refrain from smoking in places where it is forbidden (*e.g. in church, at the library, in cinemas, etc.)?*
□ Yes   □ No

How old were you when you smoked your first cigarette?   _____ Years old

How old were you when you first became a regular smoker?   _____ Years old

How many cigarettes were you smoking each day when you were smoking the most?
_____ cigarettes

Have you tried to quit smoking?
□ Yes → if yes, how many times have you tried to quit? _____
□ No

How hard was it for you to quit smoking on your most recent quit attempt?
□ Easy
□ Slightly Difficult
□ Difficult
□ Very Difficult
□ Not Applicable

What was the longest period of time that you were able to quit smoking?
□ Minutes
□ Hours
□ Days
□ Weeks
□ Months
□ Years
□ Not Applicable

Are you seriously considering quitting smoking cigarettes within the next six months?
□ Yes   □ No

Are you planning to quit smoking cigarettes in the next 30 days?
□ Yes   □ No

Rate, on a scale from 1 to 10, how confident you are about your ability to stop smoking.

1	2	3	4	5	6	7	8	9	10
Not at all confident									Very confident
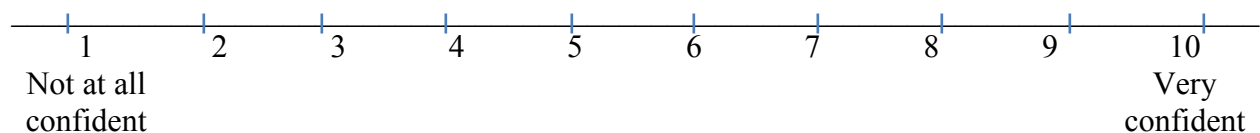
How committed are you to quitting smoking?

```
  |——|———|———|———|———|———|———|———|———|———|——
     1   2   3   4   5   6   7   8   9   10
  Not at                              Extremely
   all
```
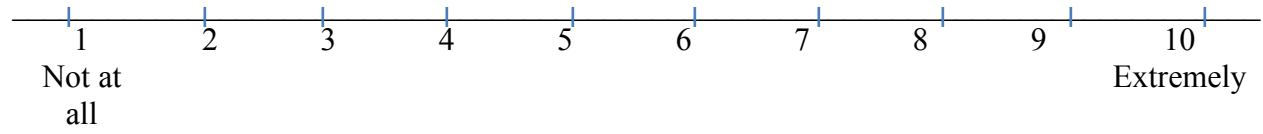
Hong Psychological Reactance Scale (HPRS)

Instructions: The following statements concern your general attitudes. Read each statement and please indicate how much you agree or disagree with each statement. If you strongly agree mark a 5. If you strongly disagree, mark a 1. If the statement is more or less true of you, find the number between 5 and 1 that best describes you. There are no right or wrong answers.
Just answer as accurately as possible.

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
Regulations trigger a sense of resistance in me.	1	2	3	4	5
I find contradicting others stimulating.	1	2	3	4	5
When something is prohibited, I usually think "that's exactly what I am going to do."	1	2	3	4	5
The thought of being dependent on others aggravates me.	1	2	3	4	5
I consider advice from others to be an intrusion.	1	2	3	4	5
I become frustrated when I am unable to make free and independent decisions.	1	2	3	4	5
It irritates me when someone points out things which are obvious to me.	1	2	3	4	5
I become angry when my freedom of choice is restricted.	1	2	3	4	5
Advice and recommendations usually induce me to do just the opposite.	1	2	3	4	5
I am content only when I am acting on my own free will.	1	2	3	4	5
I resist the attempts of others to influence me.	1	2	3	4	5
It makes me angry when another person is held up as a role model for me to follow.	1	2	3	4	5
When someone forces me to do something, I feel like doing the opposite.	1	2	3	4	5
It disappoints me to see others submitting to society's standards and rules.	1	2	3	4	5

State Reactance Scale (SRS)

Instructions: You just viewed several cigarette packages that contained different types of warning labels. Please write down as many of the warning labels as you can remember.

The cigarette warning labels that I just viewed made me feel…	None of This Feeling				A Great Deal of This Feeling
Irritated	0	1	2	3	4
Angry	0	1	2	3	4
Annoyed	0	1	2	3	4
Aggravated	0	1	2	3	4

Questionnaire on Smoking Urges – Brief (QSU-Brief)

Instructions: Indicate how much you agree or disagree with each of the following statements by marking one of the circles between STRONGLY DISAGREE and STRONGLY AGREE. The closer you place your mark to one end or the other indicates the strength of your agreement or disagreement. We are interested in how you are thinking and feeling *right now* as you are filling out the questionnaire.

1.   I have a desire for a cigarette right now.

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

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

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

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

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

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

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

5.   All I want right now is a cigarette.

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

6.   I have an urge for a cigarette.

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

7.   A cigarette would taste good right now.

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

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

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

9. Smoking would make me less depressed.

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

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

STRONGLY   STRONGLY
DISAGREE   O   O   O   O   O   O   O   AGREE

Contemplation Ladder (CL)

Instructions: Each rung on this ladder represents where various smokers are in their thinking about quitting. Circle the number that indicates where you are now.

10	Taking action to quit (e.g., cutting down, enrolling in a program) .
9	
8	Starting to think about how to change my smoking patterns.
7	
6	
5	Think I should quit but not quite ready.
4	
3	
2	Think I need to consider quitting someday.
1	
0	No thought of quitting.
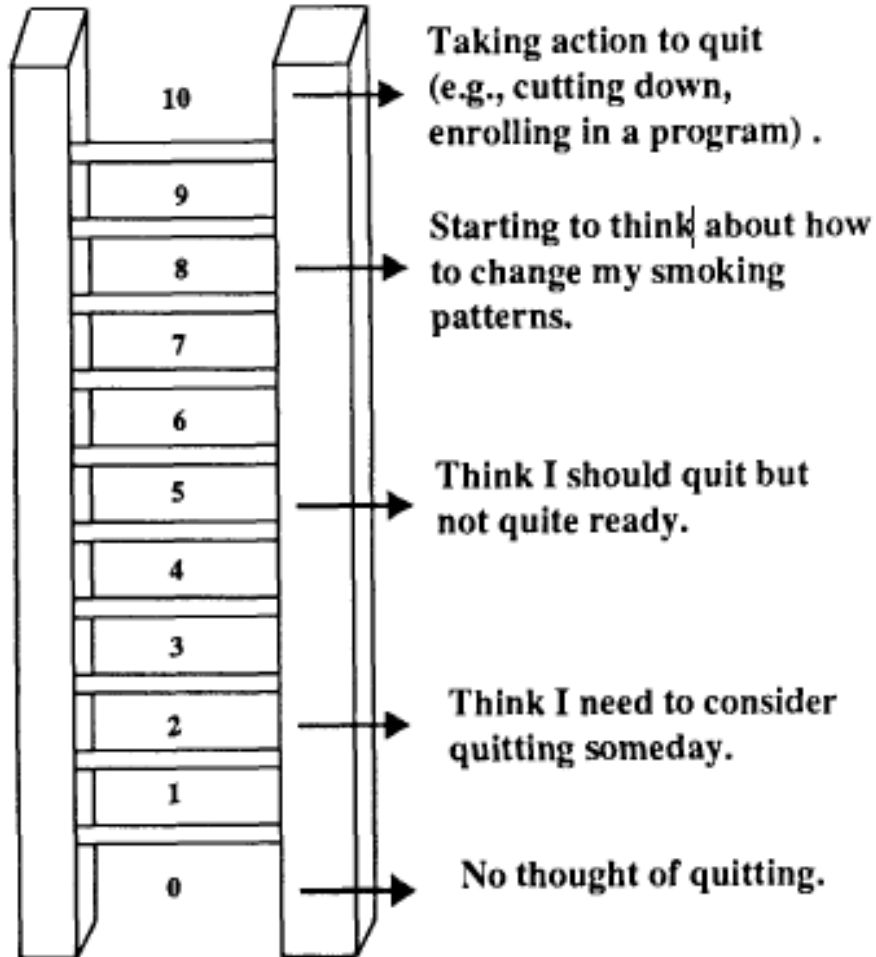
Risk Perception Questionnaire (RPQ)

Instructions*: The questions below ask about your perceptions of smoking-related health risks. For each question below, please circle the response that best matches the way you feel **right now, at this moment**.*

How likely do you think you are to develop a smoking-related disease as a result of smoking?

Extremely Unlikely	*Unlikely*	*Somewhat Unlikely*	*Neither Likely Nor Unlikely*	*Somewhat Likely*	*Likely*	*Extremely Likely*
1	2	3	4	5	6	7

How likely do you think you are **personally** to develop each of the following health conditions as a result of your smoking?

	Extremely Unlikely	*Unlikely*	*Somewhat Unlikely*	*Neither Likely Nor Unlikely*	*Somewhat Likely*	*Likely*	*Extremely Likely*	*Please mark an X below if you have experienced or been diagnosed with the following health conditions.*
Gastroinestinal (GI) problems (chronic heartburn, ulcers, Crohn's Disease)	1	2	3	4	5	6	7	_____
Circulatory Diseases (heart disease, stroke, Buerger's Disease)	1	2	3	4	5	6	7	_____
Some type of cancer (skin cancer, cervical cancer)	1	2	3	4	5	6	7	_____
Fertility and/or Sexual Problems	1	2	3	4	5	6	7	_____

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APPENDIX C:

USF IRB APPROVAL LETTER

USF
UNIVERSITY OF
SOUTH FLORIDA

9/23/2016

John Correa, B.S.
Psychology
4202 East Fowler Ave, PCD4118G
Tampa, FL 33620

RE: **Expedited Approval for Initial Review**
IRB#: Pro00027829
Title: Attentional Bias to Warning Labels and Motivation to Quit Smoking: Influence of
        Graphic Warning Labels and Message Framing

Study Approval Period: 9/23/2016 to 9/23/2017

Dear Mr. Correa:

On 9/23/2016, the Institutional Review Board (IRB) reviewed and **APPROVED** the above
application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Dissertation Proposal_Version 2

Consent/Assent Document(s)*:
Informed Consent.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the
"Attachments" tab. Please note, these consent/assent document(s) are only valid during the
approval period indicated at the top of the form(s).

It was the determination of the IRB that your study qualified for expedited review which
includes activities that (1) present no more than minimal risk to human subjects, and (2) involve
only procedures listed in one or more of the categories outlined below. The IRB may review
research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR
56.110. The research proposed in this study is categorized under the following expedited review
category:

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(4) Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John Schinka, Ph.D., Chairperson
USF Institutional Review Board

Informed Consent to Participate in Research Involving Minimal Risk and Authorization to Collect, Use and Share Your Health Information

USF IRB Pro # 27829/MCC Pro # 18868

You are being asked to take part in a research study. Research studies include only people who choose to take part. This document is called an informed consent form. Please read this information carefully and take your time making your decision. Ask the researcher or study staff to discuss this consent form with you, please ask him/her to explain any words or information you do not clearly understand. The nature of the study, risks, inconveniences, discomforts, and other important information about the study are listed below.

We are asking you to take part in a research study called:

The Perception for Consumer Products Study.

The person who is in charge of this research study is **John B. Correa, M.A.** This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. This research is a dissertation study being conducted in partial fulfillment of the doctoral degree in clinical psychology at USF. Mr. Correa is being guided in this research by **Thomas H. Brandon, Ph.D**.

The research will be conducted at **Moffitt Cancer Center, at the Tobacco Research and Intervention Program (TRIP) facility at the University of South Florida (USF).**

Purpose of the study

This is a study interested in studying visual perception and attention to consumer products among adults. As part of your participation, you will be asked to complete questionnaires and a visual perception task. The duration of the study will be approximately 1.5 hours.

Why are you being asked to take part?

We are asking you to take part in this research study because you are an adult between the ages of 18-65, smoke cigarettes every day, and do not have a history of memory impairments or uncorrected visual impairments.

Study Procedures:

If you take part in this study, you will be asked to:

- **Attend one experimental session at TRIP that will last for approximately 1.5 hours.**

- **Complete a breath test and a series of baseline questionnaires.**

- **Complete an image-viewing task during which you will be shown images of consumer products on a computer screen. During this task, your attention will be measured with eye-tracking technology.**

- **Complete post-task questionnaires.**

Total Number of Participants

About 62 individuals will take part in this study.

Alternatives / Voluntary Participation / Withdrawal

You do not have to participate in this research study. You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study, and your decision to not participant will not affect your student status, course grades, or job status.

Benefits

We are unsure if you will receive any benefits by taking part in this research study. However, your participation will help researchers understand how packaging and labeling components influence attention and thought processes.

Risks or Discomfort

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. However, it is possible that you may experience discomfort when viewing some of the images during the eye-tracking task. Please notify study staff if the images are causing any form of discomfort for you.

Compensation

For students recruited through SONA, you will be compensated with 1 credit for each ½ hour or fraction thereof of participation in the study. Therefore, if you complete all parts of your study visit, you will earn up to 3 extra credit points.

For all other participants, you will be paid *$30* if you complete the study. If you are deemed withdraw your participation before you finish your study visit, you will be paid an amount proportional to the time you've committed to the study, with *$5* being the minimum compensation.

Costs

With the exception of any transportation costs associated with getting to and from the study site, there will be no costs to you as a result of being in this study.

What information will be used or disclosed?

We understand that information about you and your health is personal, and we are committed to protecting the privacy of that information. Because of this commitment, we must obtain your written authorization before we use or disclose your information for this study.

Research at the Moffitt Cancer Center may be undertaken jointly with the University of South Florida or other persons or entities under an organized health care arrangement. By signing this form, you are permitting researchers at Moffitt Cancer Center to use personal health information for research purposes within its organized health care arrangements. You are also allowing the Moffitt Cancer Center to disclose your personal health information to outside organizations or individuals that participate in this study. We may publish what we find out from this study. If we do, we will not let anyone know your name. We will not publish anything that would let people know who you are.

If you do not agree to the use and disclosure described above, you cannot be in the study.

Who will disclose, receive, and/or use your information?

Federal law says we must keep your study records private. We will keep the records of this study private by keeping them in a locked area or on a secure computer. To do this research, the following people and/or organization(s) will be allowed to disclose, use, and receive your information, but they may only use and disclose the information to the other parties on this list, to you or your personal representative, or as permitted by law:

- Every research site for this study, including the Moffitt Cancer Center, and each site's study team, research staff and medical staff;
- Any person who provides services or oversight responsibilities in connection with this study;
- Every member of the Moffitt Cancer Center workforce who provides services in connection with this study;
- Any laboratories and other individuals and organizations that use your health information in connection with this study;

- Any federal, state, or local governmental agency that regulates the study (such as the U.S. Department of Health & Human Services (DHHS) and Office for Human Research Protections (OHRP));

- Other government agencies in this or other countries;

- The designated Protocol Review and Monitoring Committees, Institutional Review Boards, Privacy Boards, Data and Safety Monitoring Board and their related staff that have oversight responsibilities for this study;

- and The National Cancer Institute in evaluating the ongoing research of the Moffitt Cancer Center as a Comprehensive Cancer Center.

The organizations and people listed above may employ or pay various consultants and companies to help them understand, analyze and conduct this study. All of these people may not be known now, but if you would like to have more specific information about this at any time during the study, you may ask the study doctor and your questions will be answered.

Moffitt Cancer Center cannot guarantee the privacy of your information, or block further use or distribution, after the information has left the Moffitt Cancer Center. Others listed above may further disclose your information, and may no longer be covered by federal privacy regulations.

If all information that does or can identify you is removed from your records, the remaining information will no longer be subject to this authorization and may be used or shared for other purposes.

You might have the right to see and copy your health records related to this research. You might not be able to see or copy some of your records until after all participants finish the study. If it is necessary for your care, your records will be provided to you or your regular doctor.

What information will be used or disclosed?

By signing below, you authorize the use and disclosure of your entire study record. The purpose for the uses and disclosures you are authorizing is to conduct the study explained to you during the informed consent and research authorization process and to ensure that the information relating to that study is available to all parties who may need it for research purposes.

Your authorization to use your health information will never expire unless and until you expressly revoke it in writing to the investigator on the first page of this form. If you revoke your authorization, you will not be able to continue in the study.

By signing this form, you authorize the use and/or disclosure of your protected health information described above. Your information may also be used as necessary for your research-related treatment, to collect payment for your research-related treatment (when applicable), and to run the business operations of the Moffitt Cancer Center.

Any data collected prior to your letter will continue to be used as necessary to preserve the integrity of the study, however no additional information will be collected after you withdraw your authorization.

You will receive a signed copy of this form.

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What happens if you decide not to take part in this study?

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study, to please the investigator or the research staff. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study, and your decision to participate or not to participate will not affect your student status or any course grade.

Where can you get the answers to your questions, concerns, or complaints?

If you have any questions, concerns or complaints about this study, or experience an adverse event or unanticipated problem, please call John Correa at 813-745-6359 or Thomas Brandon, Ph.D. at 813-745-1750 as soon as possible.

If you have questions about your rights as a research patient at Moffitt Cancer Center, call the Corporate Compliance Department at The Moffitt Cancer Center at (813) 745-1869.

If you have questions about your rights as a participant in this study, or have complaints, concerns or issues you want to discuss with someone outside the research, call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

Anytime during or after your participation in this research you would like information or offer input about your research experience you can call the Division of Research Integrity and Compliance at the number above or you can go to the Division's website at http://www.research.usf.edu/cs/irb_feedback.htm and give us your comments. Either way you do not have to give us your name, if you do not want to.

Consent to Take Part in this Research Study

And Authorization to Collect, Use and Share Your Health Information for Research

It is up to you to decide whether you want to take part in this study. If you want to take part, please sign the form, if the following statements are true. . A representative of the Moffitt Cancer Center must answer your questions completely before providing this form to you. You or your personal representative should read this form and understand it before signing below.

I freely give my consent to take part in this study and authorize that my health information, as agreed above, be collected/disclosed in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.

_____   _____
Signature of Person Taking Part in Study   Date

_____
Printed Name of Person Taking Part in Study

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

_____   _____
Signature of Person Obtaining Informed Consent   Date

_____
Printed Name of Person Obtaining Informed Consent

Table 1

Demographic and baseline characteristics.

	N (%)
Gender	
Male	24 (38.7)
Female	38 (61.3)
Race/Ethnicity	
Caucasian	40 (66.7)
Minority (African-American, Asian American, Pacific Islander, Hispanic)	22 (33.3)
Annual Household Income	
< $30,000	41 (66.1)
≥ $30,000	21 (33.9)
Marital Status	
Single	35 (56.5)
Married/Separated/Divorced/Widowed	27 (43.5)
Education[1]	
< College Degree	41 (67.2)
College/Professional Degree	20 (32.7)

	M (SD)
Age	39.9 (13.1)
Cigarettes Per Day	16.7 (6.2)
# Years of Regular Smoking	20.7 (13.2)
FTND	4.7 (2.4)
HPRS	41.0 (8.3)
Confidence in Quitting Smoking	5.5 (2.9)
Commitment to Quitting Smoking	5.9 (3.2)

Notes: FTND = Fagerström Test of Nicotine Dependence, HPRS = Hong Psychological Reactance Scale. [1]Statistics based on 61 participants.

Table 2

Cronbach's alpha statistics for all multi-item self-report measures.

Measure	Baseline	Text-Only/ Loss-Framed	Text-Only/ Gain-Framed	GWL/ Gain-Framed	GWL/ Loss-Framed
QSU-B	0.89[3]	0.90[3]	0.91	0.92	0.92
RPQ	0.75[3]	0.83[1]	0.80[2]	0.86[3]	0.82[3]
HPRS	0.80[1]	n/a	n/a	n/a	n/a
SRS	n/a	0.90	0.93[3]	0.92	0.94

Notes: QSU-B = Questionnaire on Smoking Urges – Brief, RPQ = Risk Perception Questionnaire, HPRS = Hong Psychological Reactance Scale, SRS = State Reactance Scale. [1]Statistics based on 59 participants. [2]Statistics based on 60 participants. [3]Statistics based on 61 participants.

Table 3

Correlations for measures at baseline and across all experimental conditions.

Baseline Measure	QSU-B	RPQ	HPRS	CL
QSU-B	X	0.14	0.21	-0.17
RPQ	0.14	X	0.15	-0.29*
HPRS	0.15	0.16	X	-0.15
CL	-0.17	-0.29*	-0.15	X

Text-Only/ Loss-Framed Measure	QSU-B	RPQ	SRS	CL
QSU-B	X	0.23	0.36**	-0.09
RPQ	0.23	X	0.41**	-0.05
SRS	0.36**	0.41**	X	0.13
CL	-0.09	-0.05	0.13	X

Text-Only/ Gain-Framed Measure	QSU-B	RPQ	SRS	CL
QSU-B	X	0.16	0.17	-0.13
RPQ	0.16	X	0.39**	-0.09
SRS	0.17	0.39**	X	0.26*
CL	-0.13	-0.09	0.26*	X

GWL/Loss-Framed Measure	QSU-B	RPQ	SRS	CL
QSU-B	X	0.04	0.27*	-0.17
RPQ	0.04	X	0.32*	-0.07
SRS	0.27*	0.32*	X	0.11
CL	-0.17	-0.07	0.11	X

GWL/Gain-Framed Measure	QSU-B	RPQ	SRS	CL
QSU-B	X	0.17	0.16	-0.20
RPQ	0.17	X	0.46***	-0.15
SRS	0.16	0.46***	X	0.23
CL	-0.20	-0.15	0.23	X

Notes: QSU-B = Questionnaire on Smoking Urges – Brief, RPQ = Risk Perception Questionnaire, HPRS = Hong Psychological Reactance Scale, SRS = State Reactance Scale, CL = Contemplation Ladder.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 4

Baseline and post-task scores for all outcome variables.

Measure	Baseline	Text-Only/ Loss-Framed	Text-Only/ Gain-Framed	GWL/ Loss-Framed	GWL/ Gain-Framed
QSU-B	32.85	34.58 (13.70)	32.29 (13.71)	32.16 (14.73)	30.37 (14.31)
RPQ	4.03	4.33 (1.41)	4.25 (1.48)	4.31 (1.60)	4.27 (1.54)
SRS	N/A	2.67 (3.94)	3.31 (4.40)	2.67 (4.07)	3.08 (4.67)
CL	6.00	6.48 (2.69)	6.44 (2.72)	6.63 (2.74)	6.71 (2.66)

Notes: QSU-B = Questionnaire on Smoking Urges – Brief, RPQ = Risk Perception Questionnaire, SRS = State Reactance Scale, CL = Contemplation Ladder. Baseline statistics represent mean scores. Post-task statistics represent mean (standard deviation).

Table 5

2 X 2 within-subjects ANOVAs evaluating primary main and interaction effects.

	Sum of Squares	df	Mean Squares	F	p
Craving (QSU-B)					
Label Type	**291.778**	**1**	**291.778**	**4.056**	**.048**
Error (Label Type)	**4388.472**	**61**	**71.942**		
Label Content	**258.101**	**1**	**258.101**	**4.819**	**.032**
Error (Label Content)	**3267.149**	**61**	**53.560**		
Label Type X Label Content	3.875	1	3.875	0.238	.628
Error (Label Type X Label Content)	994.375	61	16.301		
Cessation Motivation (CL)					
Label Type	**2.726**	**1**	**2.726**	**6.210**	**.015**
Error (Label Type)	**27.774**	**61**	**0.439**		
Label Content	0.016	1	0.016	0.029	.864
Error (Label Content)	33.484	61	0.549		
Label Type X Label Content	0.258	1	0.258	0.969	.329
Error (Label Type X Label Content)	16.242	61	0.266		
State Reactance (SRS)					
Label Type	0.803	1	0.803	0.204	.653
Error (Label Type)	236.697	60	3.945		
Label Content	16.787	1	16.787	2.892	.089
Error (Label Content)	337.713	60	5.629		
Label Type X Label Content	0.803	1	0.803	0.251	.618
Error (Label Type X Label Content)	191.697	60	3.195		
Risk Perceptions (RPQ)					
Label Type	0.000	1	0.000	0.001	.980
Error (Label Type)	23.234	57	0.408		
Label Content	0.259	1	0.259	0.981	.326
Error (Label Content)	15.038	57	0.264		
Label Type X Label Content	0.022	1	0.022	0.074	.786
Error (Label Type X Label Content)	16.775	57	0.294		

Notes: QSU-B = Questionnaire on Smoking Urges – Brief, RPQ = Risk Perception Questionnaire, SRS = State Reactance Scale, CL = Contemplation Ladder. Statistically significant results ($p < .05$) are in **bold**.

Table 6

Summary of significant moderators of label type effects on outcomes.

Moderator	QSU-B	CL	SRS	RPQ
Nicotine Dependence	ns	ns	ns	ns
Cigarettes per Day	ns	ns	ns	ns
Baseline Cessation Motivation	ns	ns	ns	ns
Trait Reactance	ns	ns	ns	.043 (.024)
Baseline Cravings	.004 (.047)	ns	ns	.023 (.029)
Gender	ns	ns	ns	ns
Age	ns	ns	ns	.025 (.029)
Education	ns	ns	ns	ns
Race/Ethnicity	ns	ns	ns	ns
Income	ns	ns	ns	ns

Notes: All values represent p-values (η_p^2 values) for interaction terms between moderator and label type condition; ns = not significant. QSU-B = Questionnaire on Smoking Urges – Brief, RPQ = Risk Perception Questionnaire, SRS = State Reactance Scale, CL = Contemplation Ladder.

Table 7

Summary of significant moderators of label content effects on outcomes.

Moderator	QSU-B	CL	SRS	RPQ
Nicotine Dependence	ns	ns	.004 (.047)	ns
Cigarettes per Day	ns	ns	.028 (.029)	ns
Baseline Cessation Motivation	ns	ns	.045 (.023)	ns
Trait Reactance	ns	ns	ns	ns
Baseline Cravings	ns	ns	.043 (.023)	ns
Gender	.041(.068)	ns	ns	ns
Age	.019 (.030)	ns	ns	ns
Education	ns	ns	ns	ns
Race/Ethnicity	.023 (.083)	ns	ns	ns
Income	ns	ns	ns	ns

Notes: All values represent p-values (η_p^2 values) for interaction between moderator and label content condition; ns = not significant. QSU-B = Questionnaire on Smoking Urges – Brief, RPQ = Risk Perception Questionnaire, SRS = State Reactance Scale, CL = Contemplation Ladder.

Table 8

2 X 2 X 2 mixed ANOVAs evaluating intentions to quit smoking in the next 30 days as a moderator of main and interaction effects.

	Sum of Squares	df	Mean Squares	F	p
Cravings (QSU-B)					
Label Type	707.448	1	707.488	11.200	.001
Error (Label Type)	3726.798	59	63.166		
Label Content	219.194	1	219.194	3.966	.051
Error (Label Content)	3260.445	59	55.262		
Label Type X Label Content	11.440	1	11.440	0.688	.410
Error (Label Type X Label Content)	981.199	59	16.630		
Label Type X Quit Intentions	**661.645**	**1**	**661.645**	**10.475**	**.002**
Error (Label Type)	**3726.798**	**59**	**63.166**		
Label Content X Quit Intentions	2.801	1	2.801	0.051	.823
Error (Label Content)	3260.445	59	55.262		
Label Type X Label Content X Quit Intentions	13.113	1	13.113	0.788	.378
Error (Label Type X Label Content)	981.199	59	16.630		
Cessation Motivation (CL)					
Label Type	1.824	1	1.824	4.042	.049
Error (Label Type)	26.627	59	0.451		
Label Content	0.072	1	0.072	0.128	.722
Error (Label Content)	33.362	59	0.565		
Label Type X Label Content	0.065	1	0.065	0.240	.626
Error (Label Type X Label Content)	16.025	59	0.272		
Label Type X Quit Intentions	0.103	1	0.103	0.228	.635
Error (Label Type)	26.627	59	0.451		
Label Content X Quit Intentions	0.122	1	0.122	0.215	.644
Error (Label Content)	33.362	59	0.565		
Label Type X Label Content X Quit Intentions	0.213	1	0.213	0.783	.380
Error (Label Type X Label Content)	16.025	59	0.272		
State Reactance (SRS)					
Label Type	0.667	1	0.667	0.163	.688
Error (Label Type)	236.683	58	4.081		
Label Content	33.436	14	33.436	6.152	.016
Error (Label Content)	315.247	58	5.435		
Label Type X Label Content	0.667	1	0.667	0.202	.655
Error (Label Type X Label Content)	191.683	58	3.305		
Label Type X Quit Intentions	0.000	1	0.000	0.000	.998
Error (Label Type)	236.683	58	4.081		
Label Content X Quit Intentions	20.103	1	20.103	3.699	.059
Error (Label Content)	315.247	58	5.435		
Label Type X Label Content X Quit Intentions	0.000	1	0.000	0.000	.998
Error (Label Type X Label Content)	191.683	58	3.305		

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Risk Perceptions (RPQ)

Label Type	0.004	1	0.004	0.009	.924
Error (Label Type)	23.197	55	0.422		
Label Content	0.191	1	0.191	0.698	.407
Error (Label Content)	15.027	55	0.273		
Label Type X Label Content	0.020	1	0.020	0.065	.799
Error (Label Type X Label Content)	16.775	55	0.305		
Label Type X Quit Intentions	0.037	1	0.037	0.087	.769
Error (Label Type)	23.197	55	0.422		
Label Content X Quit Intentions	0.007	1	0.007	0.024	.877
Error (Label Content)	15.027	55	0.273		
Label Type X Label Content X Quit Intentions	0.000	1	0.000	0.000	.984
Error (Label Type X Label Content)	16.775	55	0.305		

Notes: QSU-B = Questionnaire on Smoking Urges – Brief, RPQ = Risk Perception Questionnaire, SRS = State Reactance Scale, CL = Contemplation Ladder. Statistically significant moderation results ($p < .05$) are in **bold**.

APPENDIX F:

FIGURES
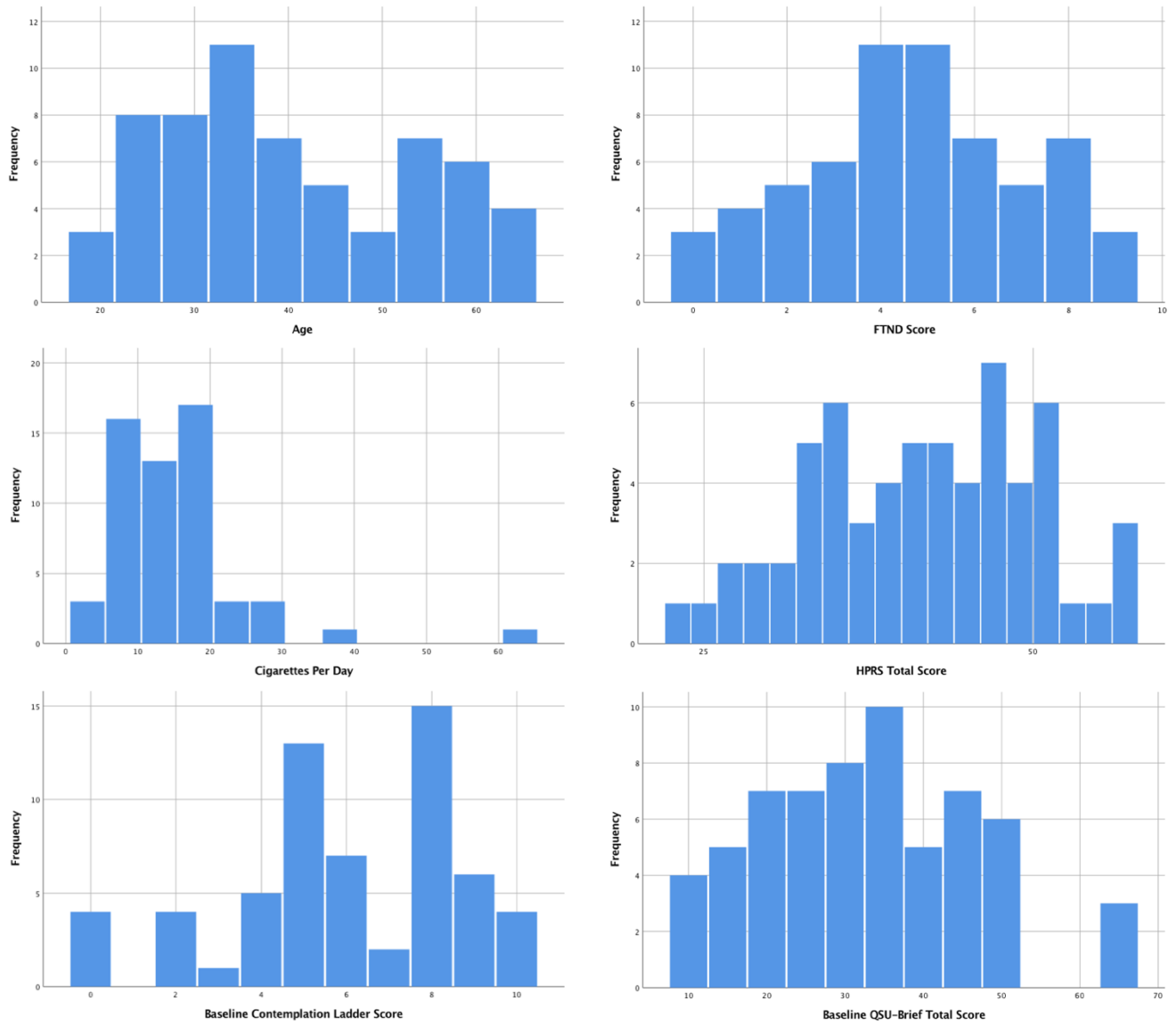
Figure 1. Histograms showing distributions of baseline continuous variables used in analysis.
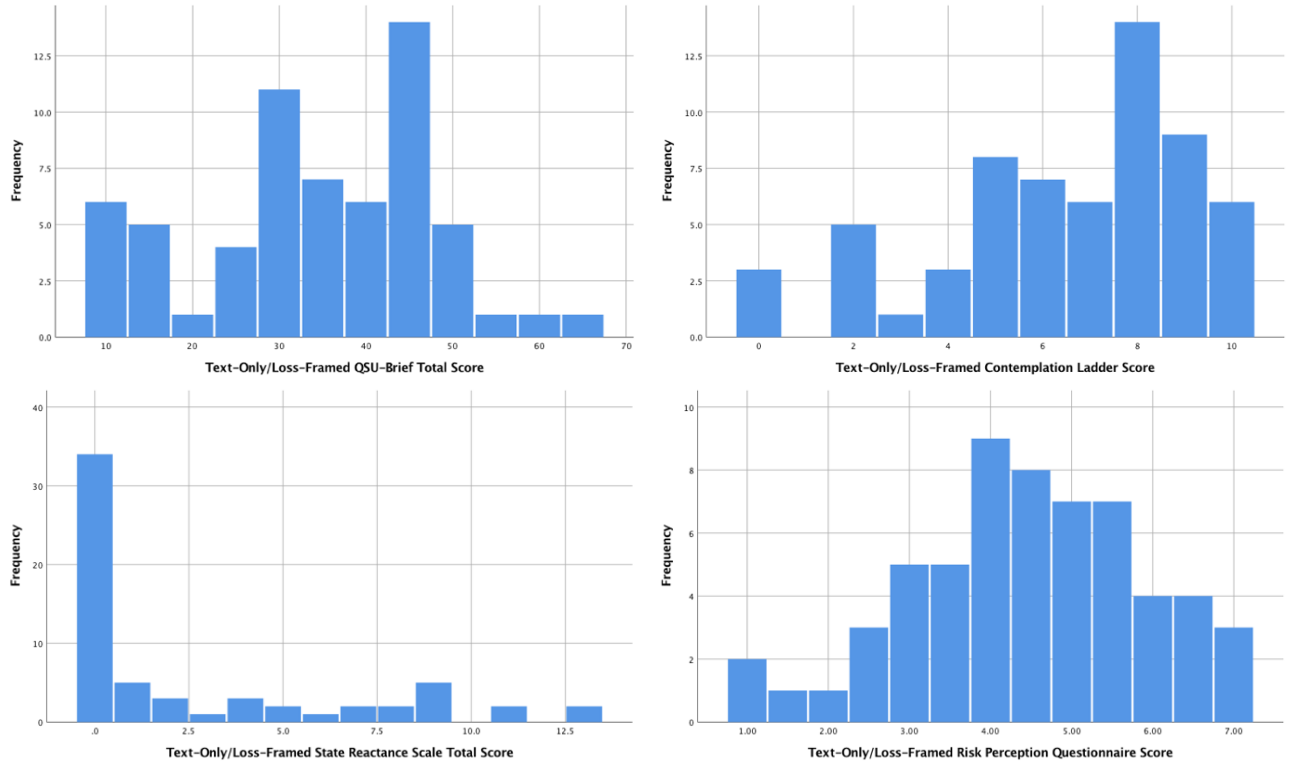
Figure 2. Histograms showing distributions of self-report measures completed after exposure to

text-only, loss-framed warning labels.
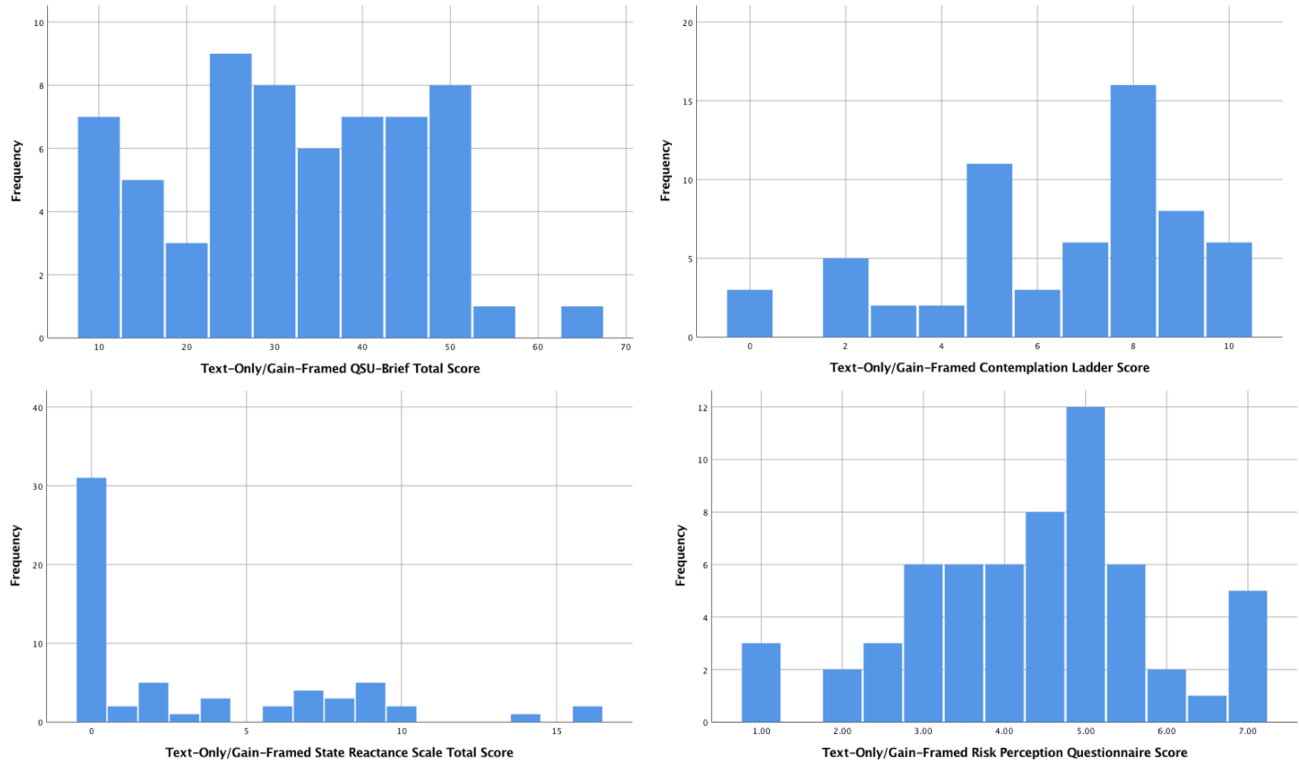
Figure 3. Histograms showing distributions of self-report measures completed after exposure to text-only, gain-framed warning labels.
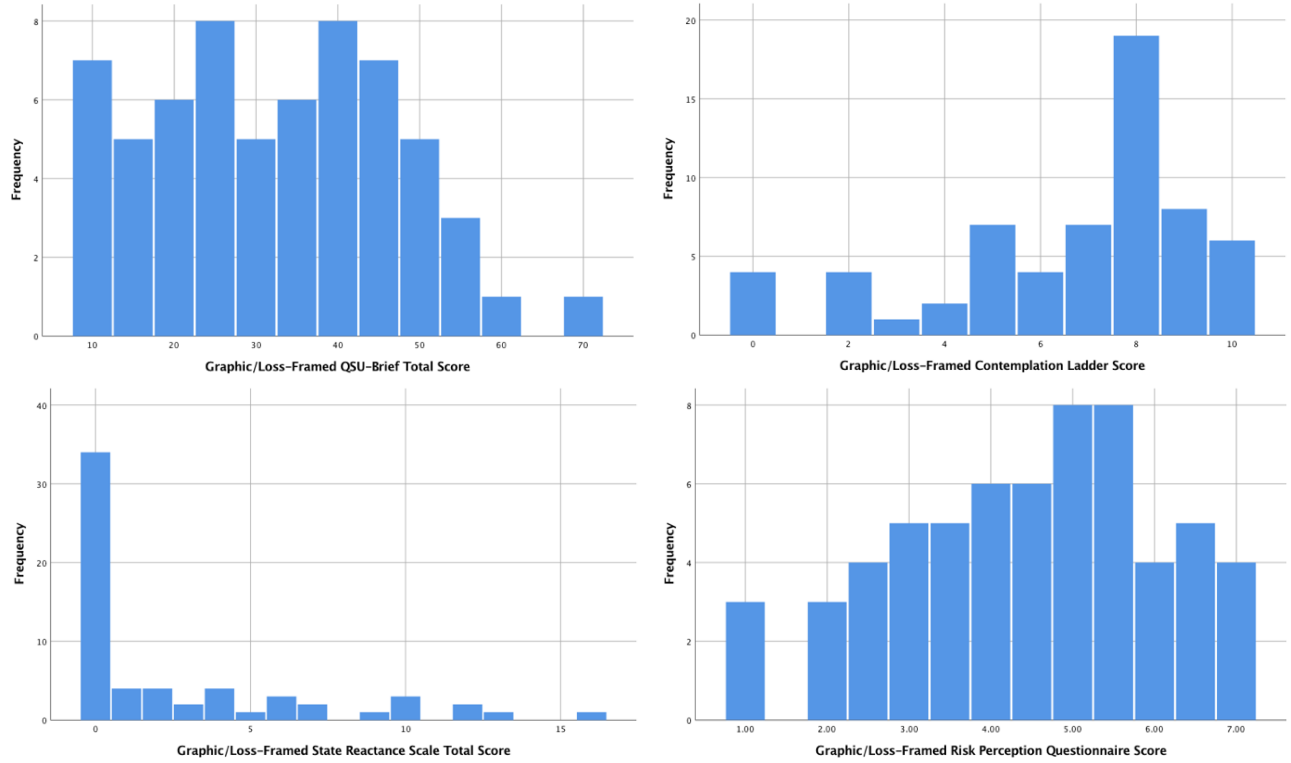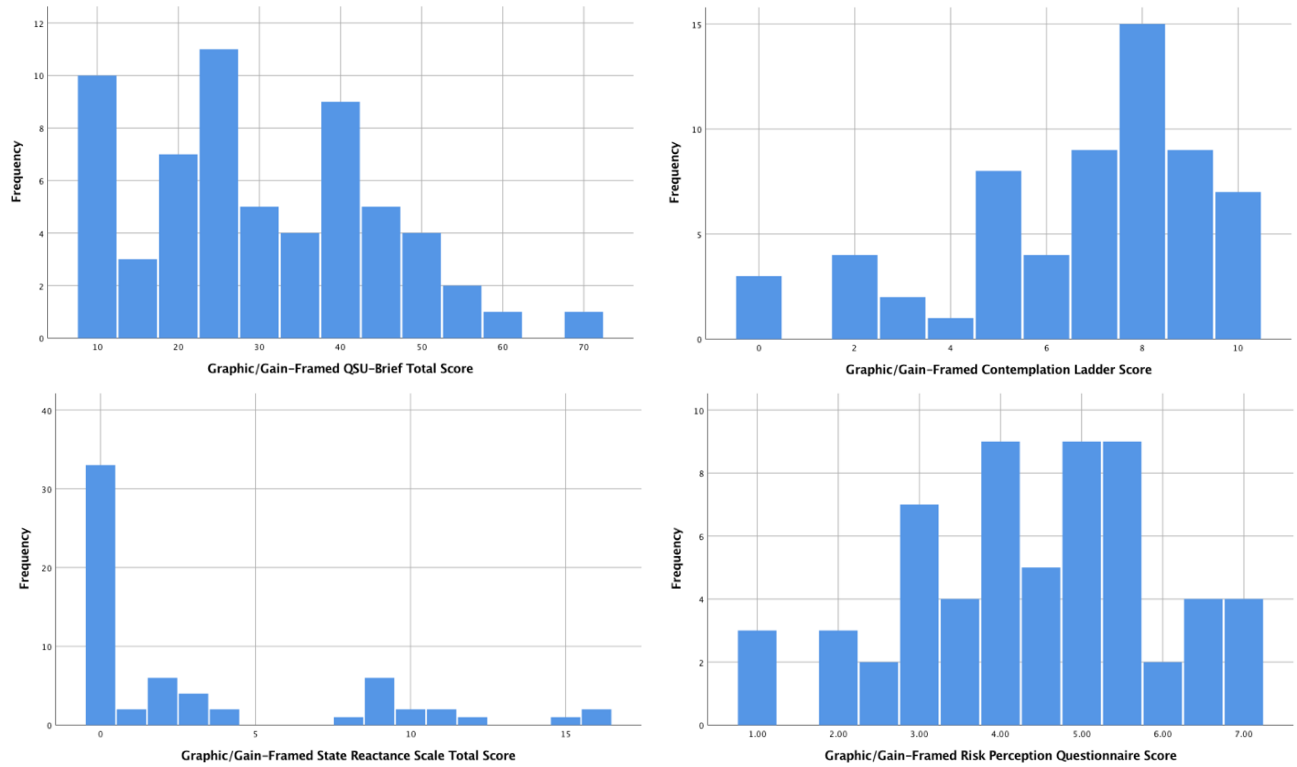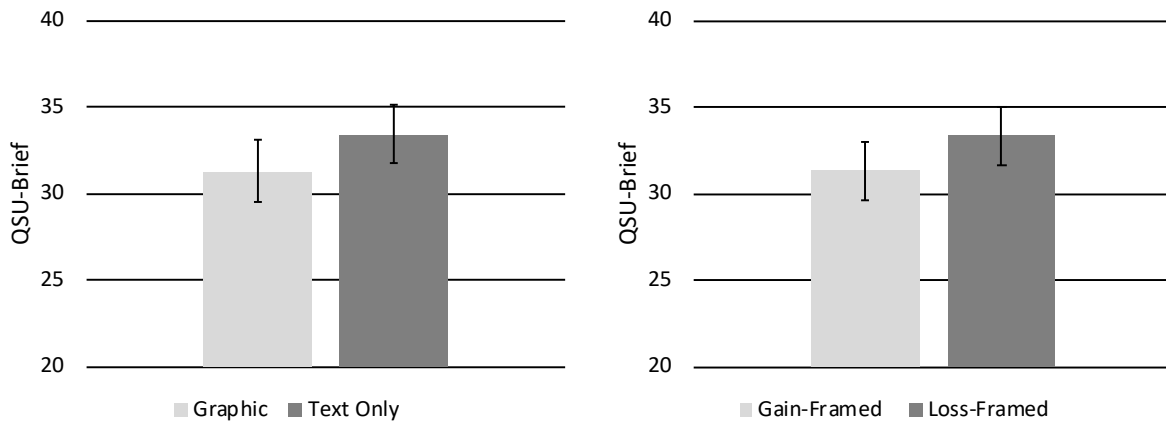
Figure 4. Histograms showing distributions of self-report measures completed after exposure to

graphic, loss-framed warning labels.

Figure 5. Histograms showing distributions of self-report measures completed after exposure to

graphic, gain-framed warning labels.

Figure 6. Significant main effects of label type and label content on post-task measures of cigarette craving. Error bars represent standard errors of the mean.
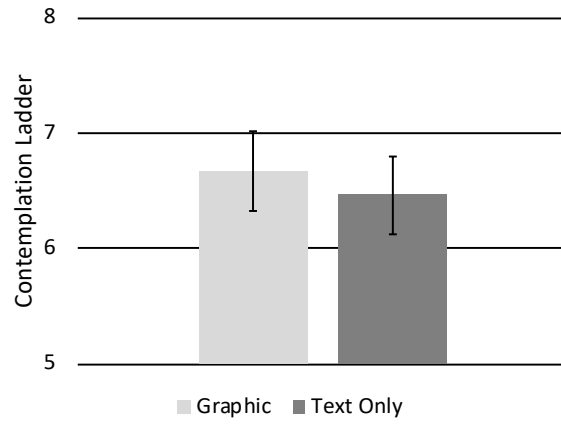
Figure 7. Significant main effect of label type on post-task measures of cessation motivation.
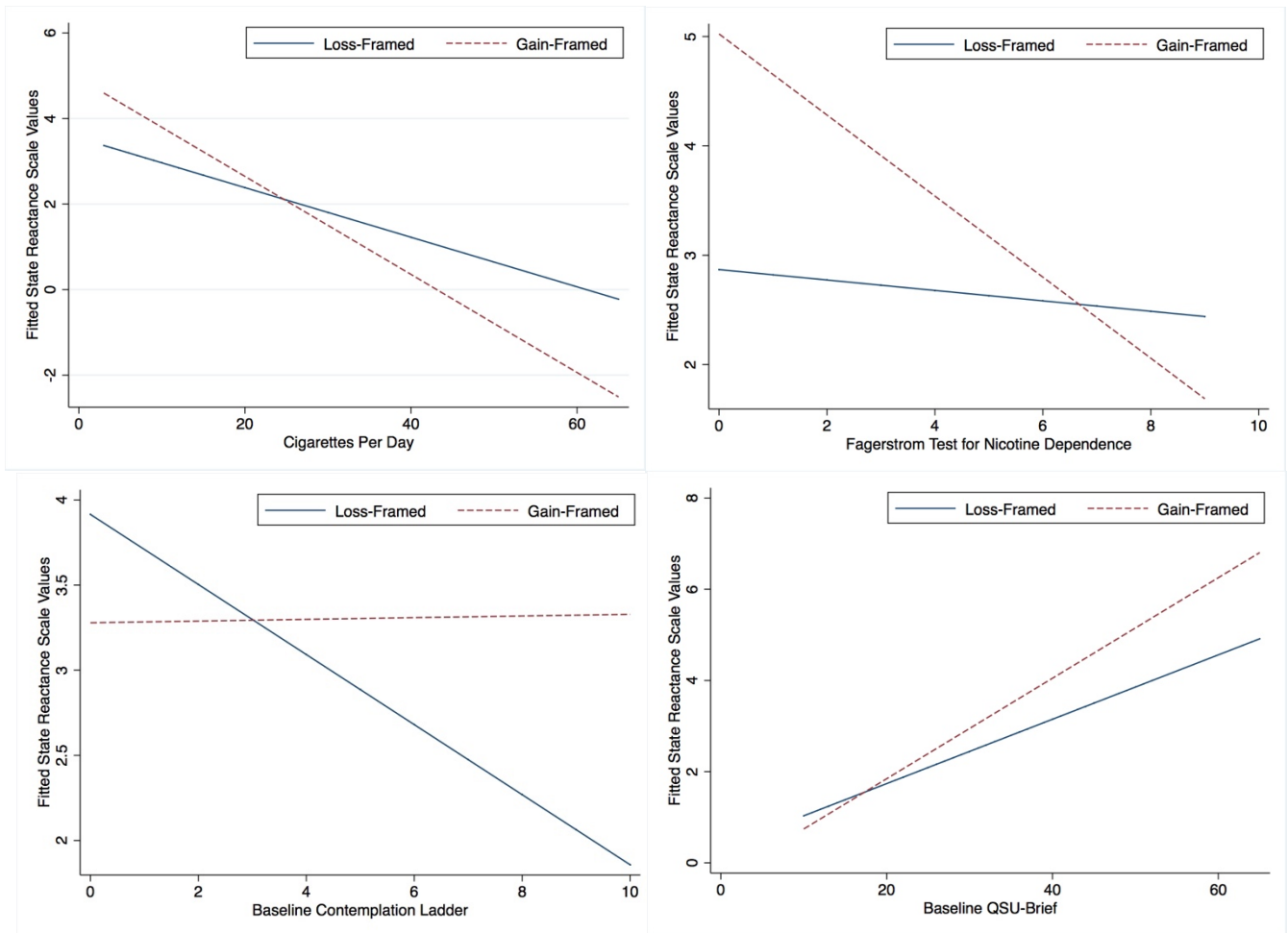
Error bars represent standard errors of the mean.

Figure 8. Construct-related moderators of the main effect of label content on measures of state reactance.
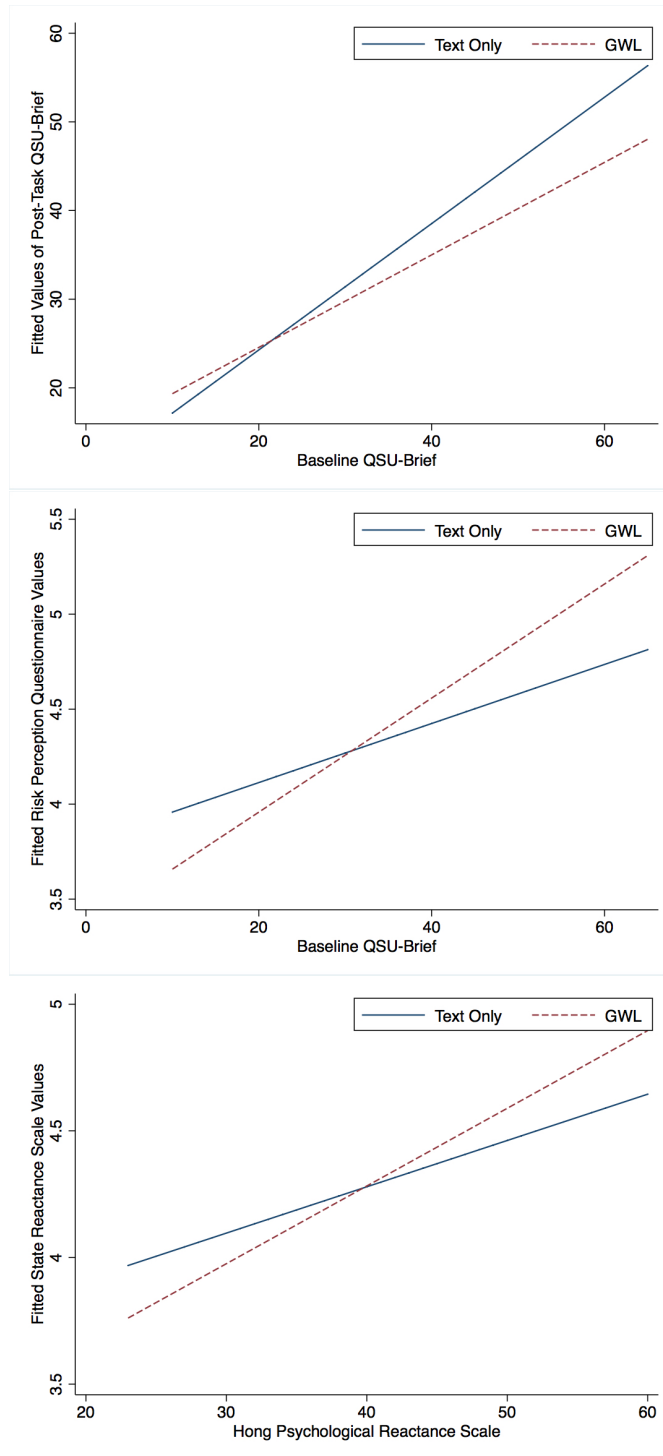
Figure 9. Construct-related moderators of the main effect of label type on post-task measures of craving and state reactance.
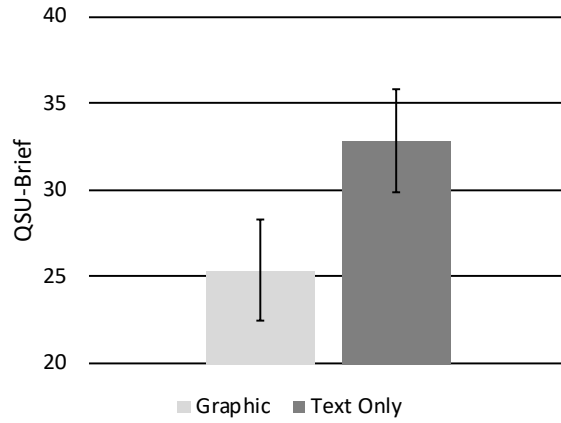
Figure 10. Significant main effects of label type on measures of cigarette craving among smokers intending to quit in the next 30 days. Error bars represent standard errors of the mean.