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Scare' Em or Disgust 'Em: The Effects of Graphic Health Promotion Messages

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This study experimentally tested the effects of 2 types of content commonly found in anti-tobacco television messages—content focused on communicating a health threat about tobacco use (fear) and content containing disgust-related images—on how viewers processed these messages. In a 2×2 within-subjects experiment, participants watched anti-tobacco television ads that varied in the amount of fear and disgust content. The results of this study suggest that both fear and disgust content in anti-tobacco television ads have significant effects on resources allocated to encoding the messages and on recognition memory. Heart-rate data indicated that putting fear- or disgust-related content into anti-tobacco ads led to more resources allocated to encoding compared to messages without either feature. However, participants appeared to allocate fewer resources to encoding during exposure to messages featuring both fear and disgust content. Recognition was most accurate for messages that had either fear or disgust content but was significantly impaired when these 2 message attributes occurred together. The results are discussed in the context of motivated processing and recommendations about message construction are offered to campaign designers.

Fear appeals[1] have received a significant amount of scholarly attention. Despite decades of research, however, understanding of cognitive and emotional processes underlying observed effects of fear appeal–based messages is particularly limited (Roskos-Ewoldsen, Yu, & Rhodes, 2004). Research by Witte (1992) and others (e.g., Dillard & Nabi, 2006) on fear appeals provides insight into elements that appear to increase message effectiveness. Such research can be used to generally guide the effective use of threat and efficacy components in a message to evoke desired attitudinal responses. However, little research has involved the kind of in-depth investigation that would provide insight into how message characteristics engage cognitive and emotional processes during exposure. The purpose of this study is to examine key characteristics of anti-tobacco campaign messages that influence cognitive processes, engaged during message exposure, that may potentially contribute to message effectiveness.

In their review of anti-smoking advertising, Wakefield and colleagues specifically pointed out a need for more research on the effects of anti-tobacco messages that contain graphic images of the consequences of tobacco use (Wakefield, Flay, Nichter, & Giovino, 2003). With that suggestion in mind, this study experimentally tested two types of anti-tobacco television ad content: the identification of a specific health threat tied to tobacco use (fear message) and the presentation of a negative graphic image depicting disgust-related things (disgust message). This study measured the effects of fear and disgust content on viewers' cognitive processing of anti-tobacco ads.

[1]The public service announcements we used in our study are commonly referred to as *fear appeals.* Perhaps a better way to think about them is as a *threat appeal.* The term *fear* expresses an emotion felt by an individual, a reaction from an audience member. *Threat* however, refers to a message attribute, and may or may not result in fear (O'Keefe, 2003; Witte, 1992). We adopt the term *fear appeal* to label our messages in order to be consistent with the bulk of the literature.

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Witte and Allen (2000) acknowledged that understanding the cognitive processes that target audience members engage during exposure to fear appeal messages can help address some of the reliability problems associated with postviewing-only data. A key feature of this study is the use of psychophysiological methods to observe cognitive processing engaged in by young adults while they watch television anti-tobacco public service announcements. Psychophysiology, the systematic study of relationships between psychological and physiological processes, offers methods for observing the dynamic mental processes that unfold over time as individuals perceive and think about all forms of stimuli in the environment. These dynamic mental processes are revealed through slight changes in physiological activity due to a strong connection between the human mind, brain, and body (A. Lang, Potter, & Bolls, 2009). Psychophysiologists have used this connection to identify relationships between psychological concepts, such as attention allocated to a message, and physiological activity, such as change in heart rate (Cacioppo, Tassinary, & Berntson, 2000). Careful application and interpretation of physiological measures can yield the kind of knowledge about fear appeal messages that is currently lacking.

The research question for this study is: when fear- and disgust-related message content are varied in anti-tobacco messages, what are the effects of online viewing and postviewing outcomes? Fear-related content was conceptualized as message content focused on communicating threats to the physical well-being of individuals who use tobacco products. High-fear messages in this experiment contained such content; low-fear messages lacked any physical threat–related content. Disgust-related content was conceptualized as the depiction of items from validated categories of disgusting things (e.g., a dirty urinal or blood and organs). High-disgust messages contained scenes with disgusting things; low-disgust messages did not contain any such scenes.

Fear- and disgust-related content are distinct message components. Televised anti-tobacco ads have been produced that feature fear- and disgust-related content, as well as only one or neither of these forms of message content. Admittedly, both fear and disgust content are theoretically highly negative and arousing; however, the concrete structure of the two are different and this difference could engage distinct patterns of cognitive processing due to variation in the presence of fear and disgust in messages.

For this experiment, heart-rate data were used to examine how fear- and disgust-related content in anti-tobacco messages affect cognitive resources allocated to encoding the message. Message recognition was assessed as a postviewing outcome. This experiment is grounded in the limited capacity model of motivated mediated message processing (LC4MP, A. Lang, 2006). In the following paragraphs, we briefly review literature on fear appeal research. Then we attempt to distinguish between fear and disgust as message attributes. Finally, we review the relevant aspects of LC4MP and attempt to apply the model to our message attributes in order to generate our hypotheses.

FEAR APPEALS

Public health officials have the goal of producing campaign messages that will lead the intended target to accept message recommendations. One way of accomplishing this goal is to produce messages intended to scare the target audience into accepting message recommendations through the effective use of fear. Despite a prolific body of work on the topic (see Witte & Allen, 2000, for a review), significant questions remain about the processes that make a fear-based message effective.

One key to the successful use of fear appeals in health communication campaigns is understanding the nature of fear appeals. Generally, fear appeals in health messages contain a threat component, such as information showing the danger of using tobacco products (Dillard, 1994). Normally, fear-based events are considered negative and are associated with specific consequences such as the onset of disease (Stephenson & Witte, 2001). For fear appeals to be successful, they should also contain material effective at enhancing both response and self-efficacy (Dillard & Anderson, 2004; Witte, 1992).

Protection motivation theory (PMT) provides a theoretical explanation of how fear appeals work (Rogers & Prentice-Dunn, 1997). PMT claims that people process fear appeals by engaging threat appraisal and coping appraisal. Threat appraisal involves evaluating the severity of a threat and how vulnerable one is to the threat. Coping appraisal involves judgments of response efficacy and self-efficacy. For example, when exposed to an anti-smoking message, a person would respond according to judgments of how severe the dangers of smoking are, perceptions of his or her vulnerability to the dangers, the degree to which quitting smoking would seem to provide protection from the dangers (response efficacy), and perceived ability to quit smoking (self-efficacy). If both threat and efficacy judgments are high, one is said to have high protection motivation or is likely to adopt message recommendations to gain protection against the threat.

Building on PMT, Witte (1992) proposed the extended parallel process model (EPPM). According to the EPPM people can be motivated to control either the danger presented (danger control) or their fear related to the danger (fear control) in response to a fear appeal message. The EPPM draws on PMT by proposing a primary role for response efficacy and self-efficacy in determining whether people are likely to engage in danger-control or fear-control processes. When both response efficacy and self-efficacy are high, people are likely to engage in danger-control processes, which, as in PMT, would involve adopting message recommendations to control one's vulnerability to the danger presented in a message. When response efficacy and/or self-efficacy is low, people are likely to engage in fear-control processes, which could take the form of strong defensive processing of message content and include behaviors such as message avoidance in order to control their fear of the threat rather than taking action to avoid the presented danger.

Neither the EPPM nor PMT provides knowledge of how message features engage specific, real-time cognitive and emotional processes that may influence persuasive outcomes of fear appeal messages. It is possible that shifts in attention due to underlying motivational processes occurring during message exposure significantly influence encoding of the message into memory. Fear appeals, as negative arousing message content, are likely to engage varying levels of defensive motivation. M. M. Bradley and Lang (2000) proposed that defensive processing consists of a cascade of cognitive and emotional processes that vary according to how negatively arousing an encountered threat is perceived to be. Responses previously conceived as danger- or fear-control responses could be the result of cognitive processes engaged by individuals in various stages of defensive cascade during exposure to a fear appeal–based message. Thus, insight into cognitive processes evoked during exposure to fear appeal messages could provide basic knowledge currently missing in the EPPM and PMT.

FEAR VERSUS DISGUST

In general, research results indicate that more emotionally intense message content evokes greater fear; messages that evoke higher levels of fear tend to be more persuasive in changing attitudes as well as intentions (Mongeau, 1998), especially when other important message requirements are met, such as high response and self-efficacy. This research broadly explains the success of some emotionally intense fear appeals but does not provide an explanation for fear appeals that backfire.

The failure of some fear-based messages could be due, in part, to emotions evoked by the messages in addition to fear. Some of these additional emotions may have the potential to push individuals further along the defensive cascade to the point that the combination of fear appeal and additional emotional features of the message interferes with message processing. Researchers have recognized that fear appeals commonly elicit additional emotions distinct from fear, and that the interplay of these emotions could help determine message effectiveness (Dillard & Nabi, 2006). One additional emotion that likely results from a negative graphic depiction of threat in a fear appeal is disgust. Disgust has been conceptualized as an emotion characterized by a defensive response to stimuli perceived as revolting or impure (Woody & Teachman, 2000). Psychologists have recognized that fear and disgust interact in threat appraisal and defensive avoidance, in phobias and anxiety disorders (Sawchuk, Meunier, Lohr, & Westendorf, 2002).

An initial challenge in the study of disgust-related content in persuasive messages is the need to establish a clear conceptual definition of disgust that distinguishes it from other basic emotions such as anger or fear. Haidt, McCauley, and Rozin (1994) found that disgust correlates highly with some measures of fearfulness. To help make this distinction, they placed a set of so-called disgust responses in a category of "social-moral violations . . . for example, Nazis, drunk drivers, hypocrites, and lawyers who chase ambulances" (p. 702). Shimp and Stuart (2004) also found some blurring of the lines between disgust and other categories of social unacceptableness: sexist or sexually oriented advertising, for example. Similarly, disgust and fear have often been conflated; indeed, Curtis and Biran (2001, p. 27) suggest that disgust might be conditioned in infants in a way similar to fear.

Despite the conceptual confusion, the two emotions have been distinguished. Like the other discrete emotions, disgust has its own "adaptive functions, appraisal patterns, facial expressions, motivations, action tendencies, and behavioral associations" (Nabi, 2002, p. 696). Disgust, Nabi noted (2002), represents a "unique theoretical concept . . . not well-captured by current general usage of that word" (p. 702) The colloquial "grossed out," she found, more closely captures the theoretical meaning without the confound of anger responses. Specifically, disgust is associated with nausea and avoidance more than with striking out at something. Disgust involves suspension of activity, Curtis and Biran note (2001, p. 17), whereas fear heightens it.

Haidt et al. (1994) developed a reliable measure of disgust elicitors in their work on individual differences in disgust sensitivity. They found seven domains of disgust elicitors: food (e.g., contamination), animals (e.g., rats, insects), body product (e.g., urine, excrement), sex (e.g., certain sexual acts, incest), body envelope violations (e.g., surgery, organs, puncture wounds), death, and hygiene (e.g., dirt, germs). The negative graphic images that most often occur in anti-tobacco disgust messages are animals (e.g., insects), body product (e.g., urine), body envelope violations (e.g., organs), and hygiene (e.g., germs). Therefore, we take disgust-related content in anti-tobacco ads to be an image or direct reference to at least one of these domains. In this experiment we categorized disgust anti-tobacco ads as television messages containing visual scenes depicting stimuli belonging to at least one of the domains of disgust elicitors identified by Haidt and colleagues. In accordance with O'Keefe (2003), the independent variables in this experiment are conceptualized according to concrete features of anti-tobacco ads—fear and/or disgust content—rather than the effects message features may or may not elicit, such as the actual feeling of being afraid or disgusted.

LC4MP

A theoretical model that can provide insight into how fear and disgust message content might be processed is Lang's LC4MP. This model was formally proposed by A. Lang (2000) and was recently updated to reflect the significant role of emotion and motivation in determining how individuals attend to and remember messages (A. Lang, 2006). The LC4MP is not the only theoretical approach to gaining insight into memory effects of health messages. Southwell (2005) demonstrated multilevel modeling, which includes variables beyond those that describe processes occurring within individuals and which provides rich insight into memory for health campaign messages. However, the LC4MP offers the most specific theoretical propositions about mental processes underlying moment-by-moment cognitive processing during message exposure.

The foundational premise of the LC4MP is that humans have a limited amount of cognitive resources to allocate to the mental tasks involved in perceiving, comprehending, and remembering information they encounter in their environment. Mental tasks engaged during information processing can be broadly conceptualized as encoding, storage, and retrieval. These tasks are simultaneously and continuously performed. During exposure to environmental stimuli, such as a media message, the cognitive system selects information to be encoded into working memory and then stored into long-term memory. Information already contained in long-term memory is retrieved in order to more effectively store the incoming information. Cognitive resources are not allocated equally among the tasks but rather can be shifted between encoding, storage, and retrieval, according to the moment-by-moment needs and motivation driving information processing.

Incorporated into the most recent version of the LC4MP is the view that emotional content in media messages automatically activates two fundamental motivational subsystems that underlie human emotion, the appetitive and the aversive. Psychologists have proposed that these systems are the foundation of human emotional response (Berntson & Cacioppo, 2000). Unlike previous conceptualizations of emotional valence used in research on mediated message processing, appetitive and aversive activation do not represent bipolar end points of a single dimension of human emotion. Cacioppo, Gardner, and Berntson (1999) conceptualize the appetitive and aversive systems as independent dimensions of emotional response, and argue that activation of these systems can be independent, reciprocal, or coactive. Coactive processing occurs when activation in both systems is high. M. M. Bradley (2000) proposed that coactive processing is most likely to occur under conditions of moderate arousal and during exposure to complex, multifeatured stimuli.

Appetitive and aversive activation have been found to significantly affect processing of media messages (A. Lang, Shin, & Lee, 2005). A major goal of the appetitive system is information intake, whereas a major goal of the aversive system is protection. Under conditions of low to moderate arousal, the appetitive system is more active than the aversive system. This is known as *positivity offset* and serves the purpose of encouraging an individual to explore the environment (Cacioppo, Gardner, & Berntson, 1999). As stimuli become more negative and arousing, aversive activation increases. Aversive responses are stronger and occur faster than appetitive activation. This pattern of emotional responding has been termed *negativity bias* (Cacioppo, Gardner, & Berntson, 1999). The nature of negativity bias is such that when negative stimuli are initially encountered, automatic activation of the aversive system leads an individual to allocate cognitive resources to encoding information about the stimulus. Resources allocated to encoding increase with higher levels of aversive activation up to a point where a stimulus becomes so aversive that the individual shifts resources to storage and retrieval in order to engage in an appropriate defensive response (A. Lang, 2006). This gradual shifting of resources away from encoding highly arousing and unpleasant messages is theoretically grounded in the previously mentioned defensive cascade.

How might varying levels of fear and disgust content in anti-tobacco advertisements affect appetitive and aversive activation and thus influence message processing? Anti-tobacco ads, as messages that are fundamentally about positioning tobacco as something bad, are unlikely to result in any significant level of appetitive activation. Even ads containing the least negative content (e.g., low fear/low disgust, in this study) would likely not be significantly positive because of the goal of delivering an "anti-tobacco" message. It seems likely that cognitive resources allocated to encoding anti-tobacco advertisements will primarily depend on activation of the aversive motivational system. In general, increasing the presence of negative, arousing content in a televised anti-tobacco message should increase aversive activation within a viewer. This should result in an increase of cognitive resources allocated to encoding. However, aversive activation can increase to the point where some resources are shifted from encoding to retrieval and storage to support defensive responding.

Fear appeals, as content that presents a threat to an individual's well-being, ought to evoke aversive activation, resulting in more cognitive resources allocated to encoding high as compared to low fear appeal anti-tobacco ads. One way of indexing resources allocated to encoding a media message is heart rate (A. Lang, 1994). Previous research has found that heart rate decelerates as more resources are allocated to encoding a mediated message (Bolls, Lang, & Potter, 2001). This leads to

H1: Participants will experience greater cardiac deceleration during exposure to high-fear anti-tobacco ads than to low-fear anti-tobacco ads.

Disgust-related visual scenes in anti-tobacco messages should also increase aversive activation in viewers, leading to a similar increase in resources allocated to encoding the ads. Stark, Walter, Schienle, and Vaitl (2005), for example, found that disgust-eliciting pictures were associated with slower heart rate. Thus,

H2: Participants will experience greater cardiac deceleration during exposure to high-disgust anti-tobacco ads than to low-disgust anti-tobacco ads.

Generally, an increase in cognitive resources allocated to encoding anti-tobacco advertisements should result in better message recognition. Further, visual recognition has been found to be a nearly automatic, easy process that can withstand fairly high levels of structural feature changes, as might be found in anti-tobacco messages (A. Lang, Potter, & Bolls, 1999). Therefore, content in anti-tobacco ads that leads to an increase in cognitive resources allocated to encoding should increase message recognition. This leads to

H3: Visual recognition will be better for high-fear anti-tobacco ads than for low-fear anti-tobacco ads.

H4: Visual recognition will be better for high-disgust anti-tobacco ads than for low-disgust anti-tobacco ads.

However, when several motivationally relevant message items co-occur, one runs the risk of cognitive overload (A. Lang, 2000, 2006). Emotional message content has been theorized to increase message complexity, potentially contributing to cognitive overload; cognitive overload is the point at which recognition is impaired due to inadequate resources allocated to encoding (A. Lang, Park, Sanders-Jackson, Wilson, & Wang, 2007). One reason an individual might not allocate enough resources to encoding is aversive activation leading to a withdrawal of resources from encoding the incoming message. Withdrawal of cognitive resources from encoding due to defensive responding to information results in cardiac acceleration (M. M. Bradley & Lang, 2000). When a message evokes a level of aversive activation at which resources are withdrawn from encoding, and in part, allocated to other subprocesses, then heart rate should accelerate and recognition may deteriorate.

It is possible that the combination of fear and disgust content in the same message activates the aversive motivational system to the point in the defensive cascade that cardiac acceleration is observed during exposure and message recognition is impaired. M. M. Bradley and Lang (2000) reviewed their research on responses to highly arousing, unpleasant pictures and concluded that as an individual advances further along the defensive cascade heart rate begins to accelerate. If fear-appeal and disgust-related content are structurally different enough to evoke differences in aversive activation revealed through the previously predicted main effects on cognitive processing, then they could also have an interaction effect on the same dependent measures. This would be evident in significant differences in heart rate during exposure and message recognition between the four types of ads used in this experiment: low-fear/low-disgust, low-fear/high-disgust, high-fear/low-disgust, and high-fear/high-disgust. One can speculate that combining fear and disgust in the same message pushes individuals far enough into the defensive cascade to observe the resulting cognitive processes. Given the current state of research, however, it is difficult to theorize about specific differences in aversive activation due to different combinations of fear and disgust content, making specific interaction predictions unwise, so we ask:

RQ1: Do fear and disgust message content interact on heart rate?

RQ2: Do fear and disgust message content interact on visual recognition?

METHOD

This study employed a 2 (fear: low/high) × 2 (disgust: low/high) × 6 (message replication) within-subjects experimental design. A high-fear message was taken to be a message that included content focused on communicating information about a direct, severe threat, to which viewers would likely feel vulnerable if they used tobacco. A high-disgust message was taken to be a message that contained a visual representation of stimuli that clearly fall into one of the disgust domains developed by Haidt et al. (1994). Participants were randomly assigned to view the messages in one of four different orders of message presentation. Both condition (Fear × Disgust) and message were randomized across orders. We analyzed the heart-rate data by including a Time factor, which consisted of the 30-sec length of each ad.

Dependent Variables

Attention. Attention is conceptualized as cognitive resources allocated to encoding a message into working memory; this was measured by obtaining participants' heart rate during exposure to anti-tobacco messages. Procedures for using heart rate as a physiological indicator of cognitive resources allocated to processing a stimulus are well established in psychophysiology (Brownley, Hurwitz, & Schneiderman, 2000). Heart rate was measured using a standard three-lead placement for an electrocardiogram. The electrocardiogram signal was amplified at 10K and filtered using a high-pass filter set at 8 Hz and low-pass filter set at 40 Hz. The signal was sampled at 20 Hz. The procedure for obtaining heart rate involved abrading the skin surface with a pumice skin preparation pad and placing three standard AG/AGCL (silver/silver chloride) electrodes on participants' forearms. Interbeat intervals, defined as milliseconds between R spikes in the QRS complex of the cardiac cycles, were recorded for a 5-sec baseline period prior to the onset of each message and time-locked to exposure to the messages. Interbeat intervals were then converted to average heart rate in beats per minute (BPM) for each second of data collection.

Recognition. The visual recognition task consisted of brief video scenes (1 sec) shown to the participants, who were to press one of two keys on a computer keyboard to indicate whether or not they believed the scene was from one of the ads they viewed during the experiment. Two clips without audio were randomly selected from each anti-tobacco ad to construct the targets. One clip came from the first half of the ad; the second clip was selected from the second half. Forty-eight foils were selected in a similar fashion from other anti-tobacco ads in the researchers' collection that were not among the 24 ads that were the focus of this study.

Signal-detection measures. Two parameters of recognition performance were computed for a signal-detection analysis: sensitivity and criterion bias (Macmillan & Creelman, 2005). Sensitivity is a ratio of hits to false alarms and has the advantage over relying solely on accuracy computations in that it takes into account the ability of the viewer to discriminate targets from foils. The second parameter, criterion bias, indicates confidence in the decision of whether or not an item was previously seen. A conservative (higher) criterion means that there will be fewer false alarms (i.e., saying "yes" to a foil), but also there will be more misses (i.e., saying "no" to a target). Conversely, if a person adopts a liberal (lower) criterion, there will be more hits (i.e., saying "yes" to targets), but there will also be more false alarms. Nonparametric measures for sensitivity (A') and criterion bias (B'') were used in this study. Nonparametric measures have the advantage of not requiring assumptions of normality for target and foil distributions (Shapiro, 1994).

Stimulus Materials

Sixty-four anti-tobacco ads were identified as possible candidates from a collection of national and state campaign television ads. Messages were selected based on the presence of content communicating health threats resulting from tobacco use and on the presence of a negative graphic image depicting stimuli from one of the domains of disgust. All messages were 30 sec long.

To help verify our selections, the presence of fear and disgust content in messages was measured in a pretest by having 22 university students rate the 64 ads on how much the content in each ad was described by the following six criteria: scary, fearful, frightening, sickening, repulsive, and gross (scale: 1–5). The first three items indexed fear content (Dillard & Anderson, 2004; Cronbach's α = .985); the latter three items indexed disgust content (Nabi, 2002; Cronbach's α = .960). Participants were instructed to focus on rating the content, not on rating how they felt. A factor analysis was conducted on the six items (PAF (principal axis factoring) extraction; direct oblimin rotation). A clean two-factor solution was confirmed (93% of variance explained). According to both the pattern and structure matrices, the three fear items loaded strongly on one factor, whereas the three disgust items loaded strongly on the other. Participants also rated the arousal and valence components of the message using the Self-Assessment Mannequin (SAM). The SAM has been validated as a self-report measure of arousal and valence underlying emotional response (P.J. Lang, Greenwald, Bradley, & Hamm, 1993). It was important to control for arousal because arousal has been shown to interact with valence on attention and memory (A. Lang, Dhillon, & Dong, 1995). Also, it was important to verify that the messages used for the experiment were not positively valenced.

Based on the students' ratings, 24 messages were selected as the stimuli for the experiment by testing the fear means vs. the disgust means. Ads that scored low on both the fear and disgust items, and whose means were not significantly different were candidates for the low-fear/low-disgust condition. Similarly, ads that scored high on both the fear and disgust items, and whose means were not significantly different, were candidates for the high-fear/high-disgust condition. Ads that scored high on fear but low on disgust, and whose means were significantly different, were candidates for the high-fear/low-disgust condition. Finally, ads that scored low on fear but high on disgust, and whose means were significantly different, were candidates for the low-fear/high-disgust condition. All fear–disgust significance levels were assessed via paired-samples *t* test. Twenty-four ads, six for each of the four experimental conditions, were identified based on this analysis. The mean arousal level of the ads was 3.37, and the mean valence level was 3.40 (both on a 1–5 scale; higher numbers indicate more arousing and more negative, respectively). The ads are listed in the Appendix.

Procedure

Participants were 58 nonsmoking university undergraduate journalism students, all 18 years of age or older (46 women/12 men). Because the messages in this study were prevention public service announcements, nonsmokers were tested. Participants completed the experiment one at a time in a research lab located at a large state university. Informed consent was obtained from each participant, and participants received extra class credit for their participation. Researchers prepped participants for the collection of physiological data. The computer program (MediaLab, Jarvis, 2006). Controlled the presentation of all instructions, stimulus messages, and questionnaire items. Participants watched all 24 anti-tobacco ads on a 32-in. color TV monitor while seated in a comfortable chair that was locked in the recline position. The participant controlled the pace of the experiment by being prompted to strike a computer key to advance to the next message after they had answered questions for the previous message. After all 24 ads were viewed and all questions were answered, participants were given a short distractor task (viewing a comedy video clip for 1:30 min) to clear short-term memory, and then performed the recognition task. Clips in the recognition test were randomized across participants. The entire procedure lasted approximately 45 min for each participant.

RESULTS

Attention

Attention was indexed by measuring participants' heart rate. Equipment failures occurred with four participants, so the heart-rate analyses are based on 54 participants. We analyzed H1 and H2 together. H1 predicted a main effect for fear such that participants would experience greater cardiac deceleration during exposure to high-fear anti-tobacco ads than to low-fear anti-tobacco ads. H2 predicted a main effect for disgust such that participants would experience greater cardiac deceleration during exposure to high-disgust anti-tobacco ads than to low-disgust anti-tobacco ads. Heart-rate change from baseline (change in BPM) was calculated for each second of stimulus exposure, and the data were submitted to a 2 (Fear) × 2 (Disgust) × 30 (Time) repeated-measures analysis of variance (ANOVA). The sphericity assumption was violated for each of the three interaction terms. Therefore, Huynh-Feldt adjustments are cited for these interactions, but the associated adjusted degrees of freedom are presented as nonadjusted values in order to aid interpretation.

First, there was a significant Fear × Time interaction, $F(29, 1{,}537) = 3.54$, $p < .001$, $\eta_p^2 = .063$, on heart rate. Next, there was a significant Disgust × Time interaction, $F(29, 1{,}537) = 3.42$, $p < .001$, $\eta_p^2 = .061$. Finally, there was a significant Fear × Disgust × Time interaction, $F(29, 1{,}537) = 4.77$, $p < .001$, $\eta_p^2 = .083$. The significant three-way interaction is displayed in Figure 1. As H1 predicted, messages high in fear resulted in more cardiac deceleration than messages low in fear. Likewise for H2, messages high in disgust resulted in more cardiac deceleration than messages low in disgust. Heart-rate data indicate that fear and disgust content in anti-smoking ads can independently increase cognitive resources allocated to encoding the message. Therefore, both H1 and H2 were supported.

Regarding RQ1, the three-way interaction shows that for low-fear messages, disgust led to significant cardiac deceleration, indicative of increased cognitive resources allocated to the message. For high-fear messages, disgust did not lead to as much cardiac deceleration from baseline, particularly from the 21-sec point and beyond. A more detailed examination of the heart-rate data suggests that differences in cardiac deceleration from baseline are particularly pronounced in second 19 through second 26 of message exposure. To further examine the heart-rate data, especially where heart rate for disgust messages diverged as a function of fear, additional analyses were conducted. First, high-disgust messages were identified in which the onset of a disgust image appeared between the 20- and 23-sec marks of the ad. Three of the high-disgust messages in the high-fear condition and four of the high-disgust messages in the low-fear condition were identified as candidates for this

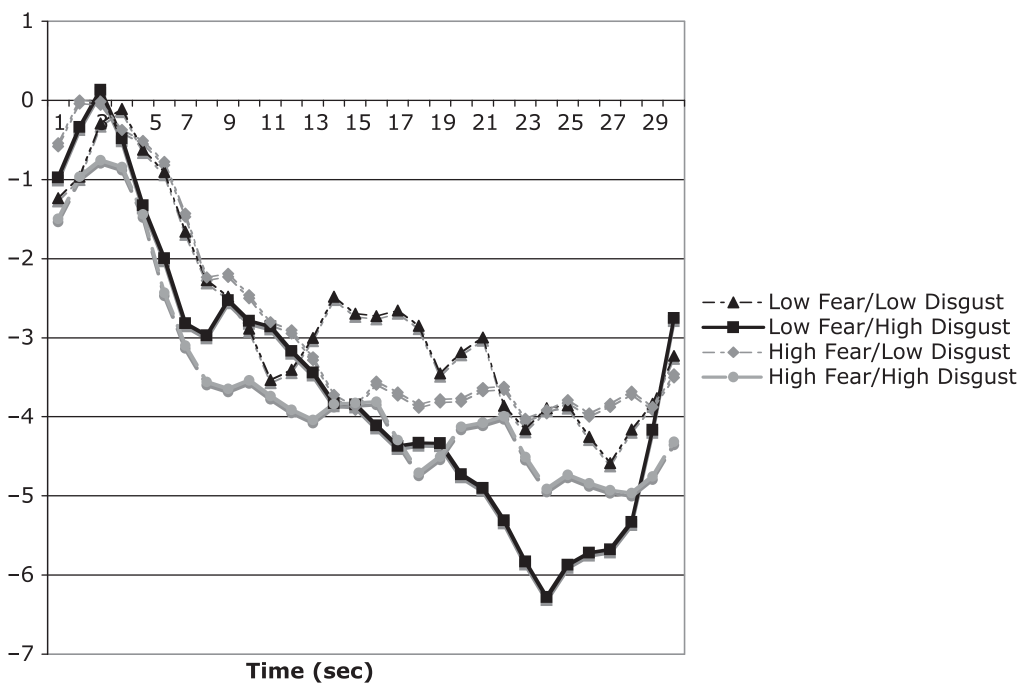

FIGURE 1 Heart rate for fear and disgust ads over time.

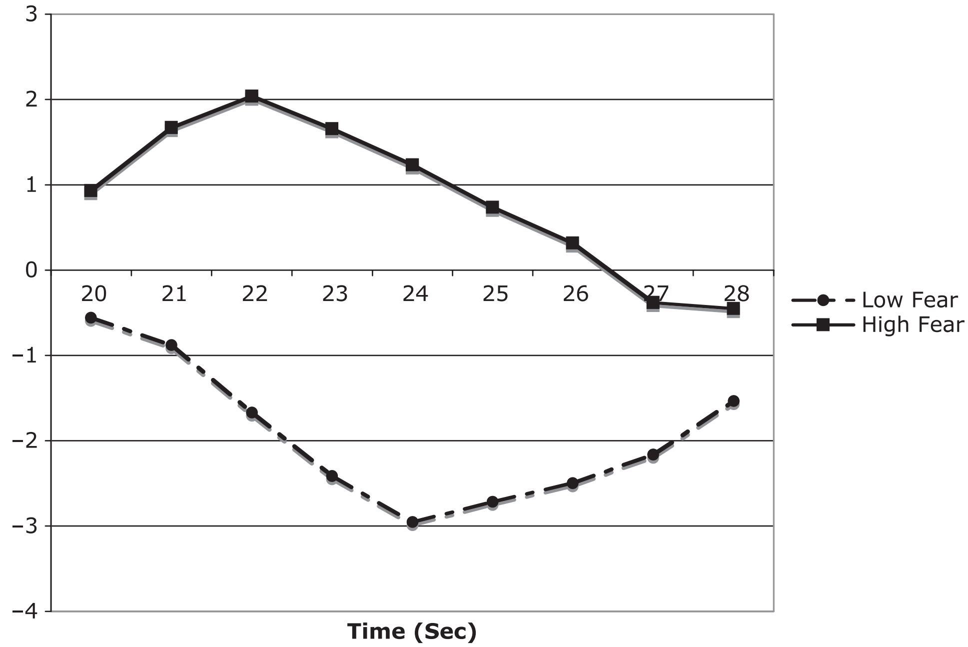

FIGURE 2 Heart rate for high-disgust messages as a function of fear.

analysis. Change in BPM was computed from heart-rate data calculated at the 19th second for each message. A repeated-measures ANOVA was conducted on these messages between second 20 and second 28 of the ads. Specifically, we were looking for a Fear × Time interaction such that heart rate decelerated over time for the low-fear condition but accelerated over time for the high-fear condition. Sphericity was violated, but the associated adjusted degrees of freedom are presented as nonadjusted values to aid interpretation. There was a significant Fear × Time interaction, $F(29, 1{,}537) = 7.23$, $p < .001$, $\eta_p^2 = .120$. As Figure 2 shows, heart rate for the low-fear condition decelerated shortly after the onset of a disgusting image, whereas it accelerated shortly after onset in the high-fear condition. This pattern of cardiac response suggests that participants withdrew cognitive resources from encoding at the point where disgust images occurred in the high-fear messages.

Recognition

Recognition accuracy data were screened for outliers. Three participants were eliminated from the analysis, leaving responses from 55 participants.[2]

H3 predicted that visual recognition would be better for high-fear anti-tobacco ads than for low-fear anti-tobacco ads, and H4 predicted that visual recognition would be better for high-disgust anti-tobacco ads than for low-disgust anti-tobacco ads.

To assess the influence of fear and disgust on recognition accuracy, the data were submitted to a 2 (Fear) × 2 (Disgust) repeated-measures ANOVA. There was a significant main effect for both fear, $F(1, 54) = 5.83$, $p = .019$, $\eta_p^2 = .097$, and for disgust, $F(1, 54) = 18.31$, $p < .001$, $\eta_p^2 = .253$. Images from the high-fear ads were recognized more accurately than images from the low-fear ads, $M_{high} = 92.0\%$, $SE = .008$ vs. $M_{low} = 89.5\%$, $SE = .013$. In addition, images from the high-disgust ads were recognized more accurately than images from the low-disgust ads, $M_{high} = 92.8\%$, $SE = .010$ vs. $M_{low} = 88.7\%$, $SE = .012$. Foils were correctly identified 80.2% of the time. Both H3 and H4 were supported. RQ2 asked about the effect of the interaction between fear and disgust on recognition. The Fear × Disgust interaction was not significant, $F(1, 54) = 2.20$, $p = .144$, $\eta_p^2 = .039$, so RQ2 was answered in the negative for the accuracy analysis. The data for accuracy are shown in Table 1.

TABLE 1
Recognition Accuracy for Fear and Disgust Ads

	Accuracy	
Condition	*Fear*	*Disgust*
Low	88.47 (.099)	88.68 (.091)
High	91.97 (.063)	92.76 (.072)

Note. Accuracy presented as percentage correct. Standard deviations are given in parentheses.

[2]It was discovered that one person pressed the "no" button for all recognition items, except one. The false alarm rate was 0%, but the hit rates were also 0% across all conditions, except for one item. Two other participants had extremely low hit rates across conditions (ranging from 0% to 17%).

Because the heart-rate data suggested a dissociation of resource allocation between high-fear and low-fear messages with disgust content, we conducted an analogous analysis on the recognition accuracy data. Because these were messages in which there was an onset of a disgust image after the 19th second of the ad, we analyzed the recognition trials for the second half of these same messages. Given that resources appeared to be withdrawn for messages high in both fear and disgust content, we expected to see a concomitant reduction in recognition accuracy for this message type. Thus, we expected a Fear × Disgust transverse interaction such that messages high in either fear or disgust content would be the most accurate, and messages either high in both or low in both would be the least accurate. There was a significant Fear × Disgust interaction, $F(1, 54) = 10.20$, $p = .002$, $\eta_p^2 = .159$, which is shown in Figure 3. The mean accuracy score was 94.6% (*SE* = .019) for high-fear/low-disgust messages and 90.8% (*SE* = .011) for low-fear/high-disgust messages. However, the mean for messages low in both fear and disgust content was 88.6% (*SE* = .017) and was 87.3% (*SE* = .025) for messages high in both fear and disgust content. Therefore, the recognition accuracy analyses also indicate less message encoding for messages high in both fear and disgust content.

To further explore the results on recognition memory, a signal-detection analysis of the recognition data was performed. Nonparametric measures for sensitivity (A′) and criterion bias (B″) were computed for each of the four conditions, and are shown in Table 2.

A 2 (Fear) × 2 (Disgust) repeated-measures ANOVA was performed on the sensitivity data (A′). There was a significant main effect for fear, $F(1, 54) = 6.67$, $p = .013$, $\eta_p^2 = .110$, such that participants were more sensitive to ads high in fear (*M* = .921) than ads low in fear (*M* = .911). Further, there was also a main effect for disgust, $F(1, 54) = 16.54$, $p < .001$, $\eta_p^2 = .234$, such that participants were more sensitive to ads high in disgust (*M* = .924) than ads low in disgust (*M* = .907). The Fear × Disgust interaction for A′ was not significant, $F(1, 54) = 1.83$, $p = .182$, $\eta_p^2 = .033$. These findings corroborate the accuracy analysis presented previously.

TABLE 2
Sensitivity and Criterion Bias for Recognition Memory as a Function of Fear and Disgust

	Sensitivity (A′)		*Criterion Bias (B″)*	
Condition	*Fear*	*Disgust*	*Fear*	*Disgust*
Low	.905	.903	–.420	–.347
High	.916	.918	–.448	–.520

A 2 (Fear) × 2 (Disgust) repeated-measures ANOVA was performed on the criterion bias data. There was a significant main effect for disgust, $F(1, 55) = 13.37$, $p = .001$, $\eta_p^2 = .196$, such that participants were more liberal (i.e., more willing to guess) for ads high in disgust (*M* = –.53) than for ads low in disgust (*M* = –.35). Thus, participants were both more sensitive and more confident in their responses for messages high in disgust than those low in disgust. There was no significant main effect for fear on criterion bias, $F(1, 55) = 0.32$, $p = .575$, $\eta_p^2 = .006$, nor was the Fear × Disgust interaction significant, $F(1, 55) = 1.62$, $p = .208$, $\eta_p^2 = .029$.

DISCUSSION

The results of this study suggest that both fear- and disgust-related content in anti-tobacco television ads have significant effects on resources allocated to encoding the message, and on recognition of specific scenes in ads. Generally, it

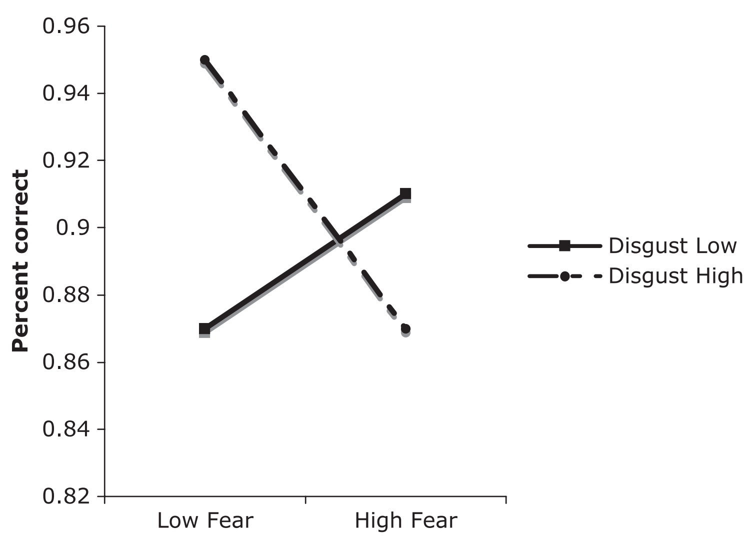

FIGURE 3 Recognition accuracy in the second half of messages for fear and disgust.

appears that these message components increase attention and message recognition. However, a more in-depth look at the results of this experiment uncovers some nuances in how young adults process messages that vary in level of fear and disgust content. The heart-rate data suggest that both fear and disgust message content increases resources allocated to encoding the messages. Anti-tobacco ads that were classified as having either high-fear or high-disgust content led to greater cardiac deceleration during exposure compared with low-fear/low-disgust messages. The significant three-way interaction between Fear, Disgust, and Time (30 sec of viewing the message), suggests that disgust-eliciting images might have different effects on the allocation of cognitive resources during exposure as a function of the presence of fear content. Indeed, further analysis of the heart-rate data revealed that after the onset of a disgusting image, heart rate decelerated during exposure to low-fear messages but accelerated during exposure to high-fear messages (see Figure 2). This pattern of cardiac response suggests that participants may have had a stronger aversive response to disgusting images in high-fear messages, leading them to withdraw some cognitive resources from encoding the message at the point such images appeared. Cardiac acceleration has been demonstrated to be associated with the stimulus rejection that is part of the defensive cascade evoked by highly aversive stimuli (M. M. Bradley, Codispoti, Cuthbert, & Lang, 2001). Future research could directly examine how aversive activation influences cognitive resources allocated to processing anti-tobacco ads by measuring physiological indicators of aversive system activation (e.g., startle response; S.D. Bradley, 2007) at points in high- and low-fear messages where disgusting images occur. The results of this experiment show that trying to increase the intensity of a fear appeal by including a disgust-related graphic image in the ad may backfire, in that it may encourage viewers to withdraw cognitive resources from encoding the message. This could be particularly detrimental to achieving persuasive outcomes if this type of defensive responding is indeed the cognitive underpinnings of what previous research on fear appeal has identified as fear-control responses. Future research could explore this possibility by obtaining self-report measures of beliefs and attitudes indicative of fear-control responses as well as other measures of persuasion in response to high-fear/high-disgust messages.

Analysis of the recognition data in this study corroborated the inference that disgust images had a detrimental effect on encoding high-fear messages. Recognition for scenes in the latter portion of high-fear/high-disgust ads, when heart-rate data indicated a more advanced defensive response, was significantly lower than recognition of scenes in the same portion of low-fear/high-disgust ads. Going into this experiment, it was uncertain whether withdrawing resources as part of defensive responding due to aversive activation would lead to lower recognition. It is especially interesting that this effect occurred on visual recognition, a fairly automatic cognitive process. Future research should include a test of audio recognition, a more effortful cognitive task, to explore possible cross-sensory modality effects, given that most of the detailed information in a televised ad is communicated in the audio track.

A more detailed examination of recognition data through signal-detection analysis showed that memory sensitivity was better for high-fear than for low-fear messages, and also better for high-disgust than for low-disgust messages. Participants had a more liberal criterion bias when messages had disgusting content, meaning that they were more likely to guess in the recognition task for disgust messages.

The criterion shift for high-disgust messages compared to low-disgust messages concomitant with an increase in sensitivity is intriguing. Similar to our findings, Sawchuk et al. (2002) found that participants displayed a conservative bias when judging fear pictures, whereas they showed a liberal bias when evaluating disgust pictures. These researchers theorized that there may be a difference in the level of affective valence between their fear and disgust pictures, but they were unable to test that hypothesis. Further, their study does not inform the case in which participants showed a liberal shift to high-disgust messages as compared to low-disgust messages.

Not much research exists that relates criterion shifts to cognitive resource allocation, but a recent study suggests that negative messages can result in a liberal criterion shift as a function of aversive activation (Fox, Park, & Lang, 2007). However, if criterion bias is an indication of resources available at encoding, whereby a liberal criterion is an indication of depleted resources available at encoding, as these researchers suggest, then we should see a decrease in memory sensitivity from low-disgust to high-disgust messages. Our sensitivity data show just the opposite. In their study on brand awareness and liking, Ye and Van Raaij (2004) found that as attention increased, the criterion bias became more conservative. The application of this finding to our study suggests that low-disgust messages would encourage more attention (resources allocated to encoding) than high-disgust messages. Such a finding would be indicated by a significant main effect for disgust on heart rate, which we did not find, $F(1, 35) = 1.985$, $p = .168$). At present, these studies do not shed a direct light on our criterion-bias shift. Future research needs to determine why there was a decisional shift in the criterion bias for high-disgust messages (and perhaps why there was no shift for fear messages).

Our study speaks to the utility of examining multiple emotional content that may be tapped by health promotion messages. As previously stated, emotional appeals in health promotion are likely to elicit multiple emotions (e.g., anger or guilt). Our study shows how the interactions of different emotional content impact how people cognitively process those messages. Although this study presumed emotional mediating states in participants, it showed that the message combination of threat (fear) and negative graphic image (disgust) content in anti-tobacco messages impeded processing. Thus, our data do not speak directly to distinguishing between the impact of discrete negative emotions and physiological indicators of processing. That is, the effects of the Fear × Disgust interactions in our data can be explained by the LC4MP, which focuses on the extent of activation of the aversive motivational system, not on the experience of multiple, discrete emotions. Further, definitions of discrete emotions generally require at least two components: emotional arousal and cognitive appraisal process (Dillard & Nabi, 2006). Activation of motivational systems happens fast, often within 100 ms of onset of a motivationally relevant stimulus (e.g., S. D. Bradley, 2007), and, at least initially, likely prior to a cognitive appraisal. Communication researchers need to do much more work that examines processes and effects involved with media messages that activate the aversive and appetitive systems in varying intensities. One question could be, for example, what would be the impact on processing of coactive messages, that is, would they activate both motivational systems simultaneously?

The final area we suggest for future research involves the moderating effects of individual-differences variables. One likely candidate directly relevant to the research reported here is sensation seeking. Sensation seeking is conceptualized as a personality trait that is associated with a variety of risky behaviors such as drug use, smoking, and so forth, and that has been show to influence responses to media content (Stephenson et al., 2002). Another individual difference that likely influences how people process anti-tobacco messages is how people differ in activation of their motivational systems. Recent research suggests that people vary in the rate of activation of the two subsystems (A. Lang et al., 2005). That is, some people have a high positivity offset and others have a low positivity offset, and some people have a high negativity bias whereas others have a low negativity bias. Each of these cases impacts the way people's motivational systems respond to their environments, and thus would likely be moderators of how people process anti-tobacco messages (A. Lang, 2006). Other individual difference variables, such as age and smoking behavior, are likely important because they may impact how emotional messages are perceived.

Conclusion

As an initial experiment on the combination of fear and disgust content in anti-tobacco advertisements, this study has provided important insight into how young adults process these messages. In addition to implications for understanding the process of health persuasion and future research on this topic, insight provided by this study offers some practical suggestions for designing effective tobacco-prevention messages. When the goals of messages include awareness and learning, then messages should be created that attract attention, are encoded, and are remembered. In such cases, health campaign producers would be well advised to continue using message strategies that focus on presenting either tobacco-related health threats or presenting disgusting images. Trying to make a message more fearful by including negative graphic images may result in the viewer cognitively withdrawing from encoding the message. If campaign producers choose an appeal that does not focus directly on the health threats from using tobacco (low-fear, in the case of messages in this study) it may be a good idea to include disgusting images. Producers should note that low-fear messages without disgusting images were the least effective at grabbing attention and boosting message recognition in this study.

Ultimately, the practical suggestions offered here for designing anti-tobacco messages need more research to successfully guide strategic campaign decisions. It is hoped that this study has provided knowledge into real-time processing of anti-tobacco messages that will encourage other scholars to engage in more systematic study of the cognitive and emotional processes underlying effective health campaign messages.

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REFERENCES

Berntson, G. G., & Cacioppo, J. T. (2000). Psychobiology and social psychology: Past, present, and future. *Personality and Social Psychology Review*, *4*, 3–15.

Bolls, P. D., Lang, A., & Potter, R. F. (2001). The effects of message valence and listener arousal on attention, memory and facial muscular responses to radio. *Communication Research*, *28*, 627–651.

Bradley, M. M. (2000). Emotion and motivation. In J. T. Cacioppo, L. G. Tassinary & G. G. Berntson, (Eds.), *Handbook of psychophysiology* (2nd ed., pp. 602–642). New York: Cambridge University Press.

Bradley, M. M., Codispoti, M., Cuthbert, B. N., & Lang, P. J. (2001). Emotion and motivation: I. Defensive and appetitive reactions in picture processing. *Emotion*, *1*, 276–298.

Bradley, M. M., & Lang, P. J. (2000). Measuring emotion: Behavior, feeling, and physiology. In R. D. Lane & L. Nadel (Eds.), *Cognitive neuroscience of emotion*, (pp. 242–276). New York: Oxford University Press.

Bradley, S. D. (2007). Examining the eyeblink startle reflex as a measure of emotion and motivation to television programming. *Communication Methods and Measures*, *1*, 7–30.

Brownley, K. A., Hurwitz, B. E., & Schneiderman, N. (2000). Cardiovascular psychophysiology. In J. T. Cacioppo, L. G. Tassinary & G. G. Berntson, (Eds.), *Handbook of psychophysiology* (2nd ed., pp. 224–264). New York: Cambridge University Press.

Cacioppo, J. T., Gardner, W. L., & Berntson, G. G. (1999). The affect system has parallel and integrative processing components: Form follows function. *Journal of Personality and Social Psychology*, *76*, 839–855.

Cacioppo, J. T., Tassinary, L. G., & Berntson, G. G. (2000). Psychophysiological science. In J. T. Cacioppo, L. G. Tassinary & G. G. Berntson, (Eds.), *Handbook of psychophysiology* (2nd ed., pp. 3–26). New York: Cambridge University Press.

Curtis, V., & Biran, A. (2001). Dirt, disgust, and disease: Is hygiene in our genes? *Perspectives in Biology and Medicine, 44*, 17–31.

Dillard, J. (1994). Rethinking the study of fear appeals: An emotional perspective. *Communication Theory*, *4*, 295–323.

Dillard, J. P., & Anderson, J. W. (2004). The role of fear in persuasion. *Psychology & Marketing*, *21*, 909–926.

Dillard, J. P., & Nabi, R. L. (2006). The persuasive influence of emotion in cancer prevention and detection messages. *Journal of Communication*, *56*, S123–S139.

Fox, J. R., Park, B., & Lang, A. (2007). When available resources become negative resources: The effects of cognitive overload on memory sensitivity and criterion bias. *Communication Research*, *34*, 277–296.

Haidt, J., McCauley, C., & Rozin, P. (1994). Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. *Personality and Individual Differences*, *16*, 701–713.

Jarvis, B. G. (2006). MediaLab (Version 2006.1) [Computer Software]. New York: Empirisoft Corporation.

Lang, A. (1994). What can the heart tell us about thinking? In A. Lang (Ed.), *Measuring psychological responses to media messages* (pp. 99–111). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication*, *50*, 25–71.

Lang, A. (2006). Using the limited capacity model of motivated mediated message processing to design effective cancer communication messages. *Journal of Communication*, *56*, S57–S80.

Lang, A., Dhillon, K., & Dong, Q. (1995). The effects of emotional arousal and valence on television viewers' cognitive capacity and memory. *Journal of Broadcasting and Electronic Media*, *39*, 313–327.

Lang, A., Park, B., Sanders-Jackson, A. N., Wilson, B. D., & Wang, Z. (2007). Cognition and emotion in TV message processing: How valence, arousing content, structural complexity, and information density affect the availability of cognitive resources. *Media Psychology*, *10*, 317–338.

Lang, A., Potter, R. F., & Bolls, P. D. (1999). Something for nothing: Is visual encoding automatic? *Media Psychology*, *1*, 145–163.

Lang, A., Potter, R. F., & Bolls, P. (2009). Where psychophysiology meets the media: Taking the effects out of mass communication research. In J. Bryant & M. B. Oliver (Eds.), *Media effects: Advances in theory and research* (3rd ed., pp. 185–206). New York: Routledge/Taylor & Francis.

Lang, A., Shin, M., & Lee, S. (2005). Sensation seeking, motivation, and substance use: A dual system approach. *Media Psychology*, *7*, 1–29.

Lang, P. J., Greenwald, M., Bradley, M. M., & Hamm, A. O. (1993). Looking at pictures: Evaluative, facial, visceral, and behavioral responses. *Psychophysiology*, *30*, 261–273.

Macmillan, N. A., & Creelman, C. D. (2005). *Detection theory: A user's guide*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Mongeau, P. (1998). Another look at fear arousing messages. In M. Allen & R. Preiss (Eds.), *Persuasion: Advances through meta-analysis* (pp. 53–68). Cresskill, NJ: Hampton Press.

Nabi, R. L. (2002). The theoretical versus the lay meaning of disgust: Implications for emotion research. *Cognition and Emotion*, *16*, 695–703.

O'Keefe, D. J. (2003). Message properties, mediating states, and manipulation checks: Claims, evidence, and data analysis in experimental persuasive message effects research. *Communication Theory*, *13*, 251–274.

Rogers, R. W., & Prentice-Dunn, S. (1997). Protection motivation theory. In D. Gochman (Ed.), *Handbook of health behavior research: Vol. 1. Personal and social determinants* (pp. 113–132). New York: Plenum.

Roskos-Ewoldsen, D. R., Yu, H. J., & Rhodes, N. (2004). Fear appeal messages affect accessibility of attitudes toward the threat and adaptive behaviors. *Communication Monographs*, *71*, 49–69.

Sawchuk, C. N., Meunier, S. A., Lohr, J. M., & Westendorf, D. H. (2002). Fear, disgust, and information processing in specific phobia: The application of signal detection theory. *Journal of Anxiety Disorders*, *16*, 495–510.

Shapiro, M. A. (1994). Signal detection measures of recognition memory. In Lang (Ed.), *Measuring psychological responses to media* (pp. 133–148). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Shimp, T. A., & Stuart, E. W. (2004). The role of disgust as an emotional mediator of advertising effects. *Journal of Advertising*, *33*, 43–53.

Southwell, B. (2005). Between messages and people: A multilevel model of memory for television content. *Communication Research*, *32*, 112–140.

Stark, R., Walter, B., Schienle, A., & Vaitl, D. (2005). Psychophysiological correlates of disgust and sensitivity. *Journal of Psychophysiology*, *19*, 50–60.

Stephenson, M. T., Morgan, S. E., Lorch, E. P., Palmgreen, P., Donohew, L., & Hoyle, R. H. (2002). Predictors of exposure from an antimarijuana media campaign: Outcome research assessing sensation seeking targeting. *Health Communication*, *14*, 23–43.

Stephenson, M. T., & Witte, K. (2001). Fear, threat, and perceptions of efficacy from frightening skin cancer messages. *Public Health Reviews*, *26*, 147–174.

Wakefield, M., Flay, B., Nichter, M., & Giovino, G. (2003). Effects of anti-smoking advertising on youth smoking: A review. *Journal of Health Communication*, *8*, 229–247.

Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs*, *59*, 329–349.

Witte, K., & Allen, M. (2000). When do scare tactics work? A meta-analysis of fear appeals. *Health Education and Behavior*, *27*, 608–632.

Woody, S. R., & Teachman, B. A. (2000). Intersection of fear and disgust: Normative and pathological views. *Clinical Psychology: Science and Practice*, *7*, 291–311.

Ye, G., & Van Raaij, W. F. (2004). Brand equity: Extending brand awareness and liking with signal detection theory. *Journal of Marketing Communications*, *10*, 95–114.

APPENDIX

Anti-Tobacco Public Service Announcements Used in the Study

High fear/high disgust	*High fear/low disgust*
Pam Difference	Airplane
Pam Can't Breathe	Breath
Eye	Counter
Surgery	London Suffering
Debi—Addiction	Christy Turlington
Bowl Cleaner	Grapes
Low fear/high disgust	*Low fear/low disgust*
Artery	Carrot
Tar Lung	Face
Smelly, Puking Habit—Theatre Snacks	Real Stories—Gloucester
Bucking Bronco	Urinal
Grasshopper	Rappers
Addicted Ashtray	Que Sera Sera