

Message-Framing Effects on Indian Females’ Mammography-Screening Intentions: Examining Moderating and Mediating Relationships

CHRISTOPHER MCKINLEY
YAM LIMBU
C. JAYACHANDRAN
Montclair State University, USA

This study explored how distinct intervening factors explain the impact of message-framing appeals on Indian females’ mammography-screening intentions. Contrary to prior investigations of early detection behavior, gain-framed messages were more effective at promoting mammography-screening intentions than loss-framed messages. Furthermore, results indicated that varying levels of need for cognition did not impact when gain- or loss-framed appeals were more effective, but rather how framing influenced message responses as well as message judgments. In particular, at high levels of need for cognition, gain-framed messages generated greater message attention and perceived message value than loss-framed appeals. Importantly, the findings from mediation tests revealed distinct pathways whereby both gain- and loss-framed messages indirectly influenced mammography-screening intentions. Specifically, gain-framed messages were perceived as having greater credibility and loss-framed messages induced more personal worry.

Keywords: message framing, need for cognition, message response, message judgment, mammography screening

The abundance of health communication research applying message-framing strategy—presenting nearly identical information in two distinct ways—has produced mixed results (for review, see Gallagher & Updegraff, 2012). In efforts to offer greater predictive validity, researchers have explored intervening factors that may offer a clearer understanding of when gain- or loss-framed appeals are most effective (e.g., Garcia-Retamero & Cokely, 2011; O’Keefe & Jensen, 2009; Rothman & Salovey, 1997). The current study builds on prior research to test both moderating and mediating factors for message-framing effects on the behavioral intentions of Indian women. The majority of message-framing research has primarily been focused on the United States and Westernized nations (for review, see Gallagher & Updegraff, 2012; O’Keefe & Jensen, 2009). Consequently, the current analysis addresses whether

Christopher McKinley: mckinleyc@mail.montclair.edu

Yam Limbu: limbuy@mail.montclair.edu

C. Jayachandran: jayachandrc@mail.montclair.edu

Date submitted: 2017-01-04

Copyright © 2017 (Christopher McKinley, Yam Limbu, and C. Jayachandran). Licensed under the Creative Commons Attribution Non-commercial No Derivatives (by-nc-nd). Available at <http://ijoc.org>.

theoretical arguments and prior empirical results involving message framing may be effectively applied to this population.

First, drawing from literature on high uncertainty/early detection behaviors (Rothman & Salovey, 1997), we examine broad differences in message-framing effects across mammography-screening intentions. This provides insight on whether results from prior mammography-screening research favoring loss-framed persuasive appeals (O’Keefe & Jensen, 2009) can be applied to non-Westernized women. Second, we explore whether need for cognition (NFC), a key individual difference trait involving message-processing style (Petty & Cacioppo, 1986), moderates the effectiveness of message-framing appeals. Prior researchers have argued that variations in message-processing style may be central to understanding message-framing effects (Steward, Schneider, Pizarro, & Salovey, 2003). However, the limited studies examining this relationship have generated inconsistent results (Rothman, Martino, Bedell, Detweiler, & Salovey, 1999; Steward et al., 2003). Furthermore, based on our review of the literature, no study has examined the moderating impact of NFC within the context of mammography screening.

Finally, this article reports mediating processes through which message-framing effects influences behavioral intentions. Few studies have explored how users’ cognitive and emotional responses to messages intervene in the relationship between gain- versus loss-framed messages and behavioral intentions (Updegraff & Rothman, 2013). Based on these concerns, we assess how additional message-processing mechanisms as well as perceived worry contribute to persuasive effects. Identifying the indirect relationship framed messages have on health intentions through these factors is critical to more clearly understanding why one message strategy may be more effective.

Message Framing

Health messages are often framed in two ways. *Gain-framed messages* emphasize benefits tied to either engaging in a health behavior or avoiding an unhealthy action. *Loss-framed messages* focus on the consequences tied to an unhealthy behavior or failing to engage in a healthy action. The basis for message-framing research is tied to prospect theory (Tversky & Kahneman, 1981). Prospect theory argues that people are willing to take risks when faced with potential loss or consequences. Conversely, people aim to avoid risk when considering potential benefits. In this context, when individuals are reminded of potential losses, they are motivated to take risks, whereas messages that promote benefits encourage people to pursue options with certain gains.

Health behaviors can be categorized according to the uncertainty associated with that action. Rothman and Salovey (1997) define *detection behaviors* (e.g., mammography screenings, disease testing) as relatively “uncertain” or “risky” because the outcome may indicate a significant health issue. Alternatively, the researchers posit that *prevention-focused behaviors* (e.g., smoking cessation, sunscreen use) reflect actions that have a more “certain” outcome that lowers one’s chance of developing a health issue. Thus, based on the uncertainty related to the behavior, people are more motivated to engage in prevention behaviors when exposed to gain-framed appeals but are more inclined to engage in early detection behaviors when exposed to loss-framed messages (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Rothman & Salovey, 1997).

In the current study, we explored the influence of message frames on behavioral intentions to obtain a mammography screening (mammography-screening intentions). Given that this action reflects an early detection behavior, loss-framed appeals should be more persuasive than gain-framed appeals. Prior message-framing research examining mammography-screening intentions supports these arguments (Banks et al., 1995; Gallagher, Updegraff, Rothman, & Sims, 2011; Schneider et al., 2001). Recent meta-analysis work (Gallagher & Updegraff, 2012; O'Keefe & Jensen, 2009) has shown that, overall, there appear to be no significant differences in message-framing effects for early detection behaviors, but when looking specifically at mammography screening, findings indicate that loss-framed appeals are modestly, yet consistently, more persuasive than gain-framed appeals. Unfortunately, these results are the product of research limited to the United States and other Westernized nations. To provide more generalizable support for previous research, we investigated message-framing effects in an Indian female population. Drawing from prior theoretical and meta-analysis research, we predicted the following:

H1: Loss-framed messages will lead to significantly greater mammography-screening intentions than gain-framed messages.

The Moderating Influence of Message Processing

In addition to the influence perceived uncertainty regarding health actions may have on message-framing effects, researchers have explored numerous moderating factors to explain when each framing strategy is more effective. One area that has generated substantial interest is whether there are differences in how individuals' critically process gain- versus loss-framed appeals. Drawing from dual processing theories (Chaiken, 1980; Petty & Cacioppo, 1986), central or systematic processing of messages reflects an increase in message scrutiny and a focus on the quality of message arguments. In contrast, peripheral or heuristic processing involves focusing on more superficial aspects of a message, such as the number of message arguments and the credibility of a source.

Maheswaran and Meyers-Levy (1990) argue that gain-framed messages are more effective when little emphasis is placed on detailed message processing, whereas loss-framed messages are more effective when one engages in greater message processing. This idea is linked to multiple theoretical arguments explaining why loss-framed appeals naturally generate greater message processing than gain-framed appeals. First, because loss-framed appeals are more likely to induce fear than gain-framed appeals, loss-framed messages should produce more critical message processing (O'Keefe & Jensen, 2008). Second, individuals have a natural tendency to be more sensitive to negative information, a phenomenon known as a *negativity bias* (Cacioppo, Gardner, & Berntson, 1997). Tied to this inquiry is research showing that the presentation of negative information elicits more extensive processing and more cognitive thoughts than positive information (Cheng & Cameron, 2003). Within this process, participants made to feel that messages are more personally relevant are more persuaded by a loss-framed appeal, whereas those exposed to messages that are less personally relevant are influenced more by gain-framed messages (Maheswaran & Meyers-Levy, 1990). Notably, Salovey and Wegener (2003) argue that this particular relationship between processing mode and message framing may be key to explaining findings tied to early detection and disease-prevention behaviors. Specifically, because early detection behaviors elicit greater perceived threat of illness, people will be motivated to engage in more

systematic processing when presented with content highlighting these actions. In turn, these individuals may be more persuaded by loss-framed messages. Conversely, disease-prevention behaviors promote less risk and uncertainty and, therefore, should drive people to engage in more peripheral processing when presented with material highlighting these actions. In these situations, individuals may be more persuaded by gain-framed appeals.

Need for Cognition

To expand on research exploring the link between message engagement and message-framing effects (Maheswaran & Meyers-Levy, 1990), investigators have examined the influence of individual differences in message processing. Researchers argue that people have a general tendency to process messages more centrally or peripherally (Petty & Cacioppo, 1986). In particular, when measuring one's NFC, those who score high have a greater tendency to expend more mental effort on acquiring information, applying reasoning, and problem solving. Consequently, those high in NFC are more likely to process messages centrally, whereas those low in NFC are more likely to process messages peripherally. Theoretically, loss-framed messages are expected to generate greater message processing; thus, message recipients inclined to central message processing (high NFC) should be influenced more by loss-framed messages, whereas individuals with tendencies to use less effortful processing (low NFC) should be persuaded more by gain-framed appeals (Steward, Schneider, Pizarro, & Salovey, 2003).

Importantly, recent meta-analytic work has failed to show any differences in message engagement across message-framing conditions for early detection behaviors (O'Keefe & Jensen, 2008), as well as greater message engagement for gain-framed messages for disease-prevention actions. Consequently, this challenges the rationale that high-NFC individuals will be more drawn to and/or influenced by loss-framed messages. The researchers of that analysis offer two possible explanations. First, loss-framed appeals may provoke reactance, leading to message rejection. Second, gain-framed messages may generate more positive affect, leading to higher levels of message engagement.

Moreover, empirical research testing the interaction between NFC and message framing has produced mixed results. One investigation (Rothman et al., 1999) involving a hypothetical health issue showed that for early detection behaviors, loss-framed messages were most effective for those high in NFC. Conversely, among these individuals, when presented with a prevention behavior, gain-framed messages were more persuasive. Further research involving smoking cessation showed that those low in NFC had a greater intention to quit smoking following exposure to gain-framed messages, whereas framing had no influence on the influence of health messages among those higher in NFC (Steward et al., 2003). To our knowledge, researchers have yet to explore this particular interaction within the context of mammography-screening intentions. Given the inconsistencies in empirical analyses of NFC and message framing, as well as recent investigations failing to show any clear differences in message processing across framing conditions, it is unclear what impact individual processing mode has on message-framing effects. This led to the following research question:

RQ1: Does NFC moderate the impact of message framing on mammography-screening intentions?

Intervening Factors in Message-Framing Effects

Understanding the process through which persuasive messages influence health intentions is critical to identifying why certain communication formats lead to more effective results. With few exceptions (Garcia-Retamero & Cokely, 2011; Homer & Yoon, 1992; Rothman et al., 1999), the majority of message-framing research has solely explored moderating factors (e.g., Block & Keller, 1995; Covey, 2014; Kim & Park, 2010; Park, 2012; Schneider, Salovey, Apanovitch, et al., 2001; Schneider, Salovey, Pallonen, et al., 2001) to explain effects. Researchers acknowledge that it is relatively unclear what factors intervene in framing processes (Rothman et al., 1999; Rothman & Salovey, 1997). Updegraff and Rothman (2013) stress a need for framing research to explore both cognitive and affective mediational pathways leading to persuasive effects. Drawing from message processing and fear-appeal perspectives, we offer rationale for specific mediating factors that may intervene in the relationship between message framing and health intentions. First, based on the theoretical rationale for relationships between gain-versus loss-framed messages and message processing discussed above, we examine the intervening role of message engagement and message judgments in explaining message-framing effects. Second, we address how perceived worry, an adaptive emotional response to threat-based messaging, may offer clearer insight into how loss-framed appeals motivate health outcomes.

Message Engagement

Individuals' level of involvement to persuasive messages has critical implications for broader health effects, as greater engagement may increase the likelihood that individuals recall key informational appeals within the message (Green & Brock, 2000). As noted, loss-framed appeals should stimulate greater critical message processing by provoking fear (O'Keefe & Jensen, 2008) and/or appealing to a negativity bias (Cacioppo et al., 1997), but recent empirical investigations examining message framing and message engagement have not supported these theoretical arguments (Bassett-Gunter, Latimer-Cheung, Martin Ginis, & Castelhana, 2014; O'Keefe & Jensen, 2008; O'Malley & Latimer-Cheung, 2013). Furthermore, drawing from fear-appeal theories such as the extended parallel process model (Witte, 1992, 1994), loss-framed messages that fail to induce adequate feelings of personal efficacy may lead to defensive avoidance strategies and/or message rejection (O'Keefe & Jensen, 2008; Witte & Allen, 2000). Due to this, certain individuals may become less interested in loss-framed appeals. Overall, this suggests that it remains relatively unclear which message frame produces higher engagement, and how this factors into overall health outcomes. This led to the following research questions:

RQ2: Are there differences in message engagement levels across message-framing conditions (gain vs. loss)?

RQ3: Does message engagement mediate the relationship between message framing (gain vs. loss) and mammography-screening intentions?

Message Judgments

How individuals perceive the persuasive strength of health messages can directly influence health outcomes (Dillard, Shen, & Veil, 2007). Effectiveness can be evaluated through message recipients' perception of how plausibility/believable, logical, compelling, and/or convincing a message is (Dillard et al., 2007). Drawing from these conceptual and operational definitions, we examined effectiveness based on perceptions of message credibility and message value.

Researchers (Dillard & Peck, 2000; Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996) posit that perceiving messages as having greater persuasive effectiveness may precede attitude or behavior change. Dillard and colleagues (2007) recently found that individuals' perceived message effectiveness of public service announcements directly influenced attitude and behavioral intentions. Although loss-framed appeals should have a stronger impact on mammography-screening intentions than gain-framed messages, it is unclear whether individuals perceive loss-framed appeals as more effective. As previously noted, prior fear-appeal research indicates that loss-framed messages may produce various resistance strategies (O'Keefe & Jensen, 2008), particularly among those lacking adequate perceptions of efficacy (Witte, 1992, 1994). Consequently, individuals experiencing high levels of fear following exposure to loss-framed appeals may be more inclined to reject message arguments. This led to the following research question:

RQ4: Which message frame (gain vs. loss) is perceived as more effective?

Finally, we examined whether perception of message effectiveness intervenes in the relationship between message framing and mammography-screening intentions. Although judgments of message effectiveness should directly influence health intentions, it is unclear whether these perceptions carry the influence of message framing on intentions. This led to the following question:

RQ5: Does perceived message effectiveness mediate the relationship between message framing and health intentions?

Perceived Worry

There is substantial theoretical and empirical research showing that perceptions of personal risk to a health issue is a direct, significant factor explaining individual health decisions (e.g., Rosenstock, 1966; Sheeran, Harris, & Epton, 2014) including mammography screening (Katapodi, Lee, Facione, & Dodd, 2004; McCaul, Branstetter, Schroeder, & Glasgow, 1996). Perceived susceptibility is often conceptualized and measured strictly through cognitive appraisal (i.e., perceptions of personal risk), but scholars have also addressed affective components (Moser, McCaul, Peters, Nelson, & Marcus, 2007; Slovic, Finucane, Peters, & MacGregor, 2004). In particular, researchers argue that worry can function as an adaptive response to threats, leading to enhanced problem-solving actions, such as self-protective behavior (Davey, Tallis, & Capuzzo, 1996). Moreover, prior investigations have found that perceived worry independently predicts mammography screening (McCaul, Schroeder, & Reid, 1996; Moser et al., 2007).

Drawing from the broader perceived risk literature, there is theoretical basis to assert that contrasting framing messages will produce different levels of worry. Specifically, based on the original assumptions of message-framing research (Kahneman & Tversky, 1979; Rothman & Salovey, 1997), negatively framed health messages tied to early detection behaviors (i.e., mammography screening) highlighting the severity of a health issue (high threat) should motivate individuals to avoid possible losses. As an adaptive response to this threat, perceived worry should be elevated. Although prior mammography-screening studies (Banks et al., 1995; Meyerowitz & Chaiken, 1987) have shown no differences in perceived risk among those exposed to gain- or loss-framed appeals, those investigations strictly examined cognitive beliefs rather than addressing any affective components of risk. Given its emphasis on negative consequences, loss-framed appeals may be particularly anxiety inducing (O'Keefe & Jensen, 2008). Overall, we predicted that loss-framed appeals would generate greater worry than gain-framed messages:

H2: Loss-framed messages will lead to greater perceived worry than gain-framed messages.

To our knowledge, there are no studies specifically examining perceived worry as a mediator between message framing and health outcomes. Various health behavior change theories, including protection motivation theory (Rogers, 1975), the health belief model (Rosenstock, 1966), and the extended parallel process model (Witte, 1992), identify perceived risk as central to explaining health behavior change. Whereas prior research suggests that exposure to threat-based messaging (i.e., loss-framed messages) could motivate fear-based defensive responses (Witte, 1992), worry represents an adaptive response to threats (Davey et al., 1996) that should motivate responsible health actions. As noted above, more recent research has shown that affective components of risk, such as worry, can directly contribute to health outcomes (McCaul, Schroeder, & Reid, 1996; Moser et al., 2007). Consequently, based on the previous predictions as well as theoretical and empirical research, loss-framed appeals should generate greater perceived worry. Subsequently, elevated levels of worry will then influence health intentions. This led to the following prediction:

H3: Perceived worry will mediate the relationship between message framing and mammography-screening intentions such that loss-framed messages will lead to greater perceived worry that in turn will influence mammography-screening intentions.

Importance of Persuasion and Health Communication Research in India

Recent data show that by 2030 India will be the most populous country in the world (United Nations Department of Economic and Social Affairs/Population Division, 2014). This massive growth will likely place significant burden on the public health community to design effective communication approaches to reach certain target populations. One major public health concern in India is breast cancer. Breast cancer represents the most common cancer in major Indian cities (e.g., Mumbai, Delhi) and the second in many rural areas (National Centre for Disease Informatics and Research—National Cancer Registry Programme, 2016). Further troubling is the trend showing greater incidences among increasingly younger women (National Centre for Disease Informatics and Research—National Cancer Registry Programme, 2016). In 2012 alone, 145,000 Indian women were diagnosed with breast cancer, with

70,000 women dying that year of this illness (Ferlay et al., 2015). Overall, India, China, and the United States collectively represent nearly one third of the world's breast cancer incidences. However, in comparison to China and the United States, the ratio of death to new diagnoses is highest in India (Ferlay et al., 2015).

Although prior research has emphasized the importance of examining message-framing effects in more diverse populations (Gallagher et al., 2011; Kalichman & Coley, 1995; Schneider et al., 2001), to our knowledge, there have been limited cross-cultural investigations. To our knowledge, only one study (Uskul, Sherman, & Fitzgibbon, 2009) specifically examined cultural differences in message-framing effects. Findings from that study showed that East Asian participants (Chinese, Korean, Japanese, Taiwanese, and Filipino) displayed greater intentions to follow following exposure to loss-framed messages than gain-framed messages, whereas British participants were influenced more by gain-framed appeals than loss-framed appeals. Findings of that study also showed that East Asian participants displayed a more prevention-focused orientation (i.e., need for security); in contrast, British participants were more promotion-oriented (i.e., need for nurturance).

Overall, given the significant breast cancer risks facing India, it is critical to examine the effectiveness of framed message appeals. Results supporting previous mammography screening research will provide more generalizable cross-cultural support for the value of loss-framed appeals within this context. Conversely, findings that contradict prior research may suggest distinct cultural differences in how individuals respond to different formats of persuasive messages.

Method

Design and Procedure

Female participants were selected from a pool drawn from women's organizations, universities, and health care institutions throughout the Udaipur, Madurai, and Tirupati regions of India, including a large nongovernmental organization in Udaipur, the women's wing of a Chamber of Commerce and Industry in Madurai, and female employees at a large public university in Tirupati. In keeping with previous mammography-screening investigations (e.g., Banks et al., 1995; Gallagher et al., 2011), participants had never had a breast cancer diagnosis and were aged 40 years or older. The **American College of Obstetricians and Gynecologists recommends** that women aged 40 years and older start having an annual mammogram. Consequently, sample selection is reflective of both previous academic research and medical recommendations. Overall, 218 women were selected for the study.

To facilitate the survey administration, we recruited three field researchers from Udaipur, Madurai, and Tirupati. The original English-language questionnaire containing all study measures and experimental stimuli was translated into Hindi by a bilingual expert. To ensure accuracy, the survey was then back-translated into English. Participants could select to have the survey administered in English or Hindi. Participants received Rupees 50 for participating in the investigation. Subjects were mailed a sealed envelope that contained the study questionnaire and experimental stimuli. Participants were asked to

return the completed questionnaires and consent forms in person to a field researcher or to mail them back in the stamped, addressed envelope provided.

Sixty-eight percent of the participants reported being between 40 and 49 years of age, with an additional 17% reporting being 50–54 years old. Roughly 15% of participants reported being 55 years or older. The majority of participants had completed an undergraduate education (74%). In addition, the majority of participants (60%) had never had a mammogram, and 79% indicated they had no family history of breast cancer.

Experimental Stimuli

Each treatment contained the identical information to encourage mammography screening. This included the headline “Why Should You Get a Mammogram?” and a brief story detailing one person’s experience with breast cancer. The treatments were modified from a previous investigation (Cox & Cox, 2001) to fit the Indian context. The gain-framed treatment briefly described a woman named Poonam with no family history of breast cancer who, nevertheless, follows guidelines for getting annual mammography screenings at age 40. Therefore, doctors are able to detect her cancer at an early stage. The positive consequences are highlighted through emphasizing that she may look forward to seeing her grandson grow up. In the loss-framed condition, Poonam chooses not to follow these guidelines; thus, doctors are unable to detect her breast cancer at a treatable stage. The negative consequences are highlighted by suggesting that she may miss out on seeing her grandson grow up.

Measurement

Need for Cognition

A shortened, three-item version of the NFC scale (Cacioppo, Petty, & Kao, 1984) assessed this concept. The items included “I would rather do something that requires little thought than something that challenges my thinking abilities,” “I don’t like to have the responsibility of handling a situation that requires a lot of thinking,” and “I try to anticipate and avoid situations which require me to think in depth about something.” All items were reverse-coded, with higher scores (1 = *strongly disagree*, 7 = *strongly agree*) indicating higher levels of NFC. Reliability for this scale was acceptable ($\alpha = .77$); thus, all items were summed and then averaged to create the NFC scale ($M = 3.87$, $SD = 1.54$).

Perceived Worry

Perceived worry was measured through two items drawn from previous research (McCaul, Schroeder, & Reid, 1996; Moser et al., 2007). The two items were “I am worried about developing breast cancer late in life” and “The possibility of developing breast cancer worries me.” Both items were assessed on a scale ranging from *strongly disagree* (1) to *strongly agree* (7). Reliability for the scale was adequate ($\alpha = .82$). Consequently, both items were summed and then averaged to create a perceived worry scale ($M = 4.02$, $SD = 1.89$).

Message Engagement

Cognitive processing was evaluated through four items adapted from previous research (Stephenson & Palmgreen, 2001). The participants noted the degree to which the advertisement made them (a) think about arguments for getting a mammography screening, (b) "think" rather than "feel," (c) think about the consequences of not having a mammography screening described in the advertisement, and (d) think about how breast cancer might affect her life. Responses could range from *not at all* (1) to *a great deal* (7). The scale exhibited adequate reliability ($\alpha = .73$). Participants' scores were created by calculating the average of each participant's responses to all items in the scale ($M = 5.12$, $SD = 1.32$).

Message attention was assessed through three semantic differential items addressing attention, involvement, and concentration. All items were measured on a 1–7 scale. A single score was created for each participant by calculating the average of her responses to all items in the scale ($M = 4.94$, $SD = 1.70$). The scale displayed strong reliability ($\alpha = .89$).

Message Judgments

Participant assessment of perceived message effectiveness was assessed through two separate subcategories adapted from prior investigations (Cox & Cox, 2001; Dillard et al., 2007; Kopfman, Smith, Ah Yun, & Hodges, 1998). Perceived message credibility was measured through four items ranging from *strongly disagree* (1) to *strongly agree* (7). An example item is "I believe the claims in the ad." Participants' scores were determined by calculating the average of each participant's responses to all items in the scale ($M = 5.14$, $SD = 1.35$). The scale exhibited acceptable reliability ($\alpha = .76$).

Perceived message value was measured through four semantic differential scales. Participants assessed measure appeals in terms of favorability, usefulness, broader value (bad vs. good idea), and importance. Individual scores were summed and then averaged to create message value scale ($M = 4.81$, $SD = 1.83$). The scale displayed strong reliability ($\alpha = .91$).

Mammography-Screening Intentions

Mammography-screening intentions were measured through two items: "I intend to get my screening mammogram within the next six months" and "I intend to get my screening mammogram within next year." The measures were adapted from previous research (Cox & Cox, 2001). Response options ranged from *strongly disagree* (1) to *strongly agree* (7). The reliability for a combined scale was acceptable ($\alpha = .72$). Both items were summed and then averaged to create an intentions scale ($M = 4.76$, $SD = 1.84$).

Manipulation Check

To determine whether the experimental stimuli led participants to perceive gain-framed and loss-framed appeals consistent with the message design, participants assessed the degree to which they agreed or disagreed with each of two statements measured from *strongly disagree* (1) to *strongly agree*

(7). Participants who read the gain-framed message ($M = 5.55$, $SD = 1.74$) reported a significantly higher mean on the statement "The ad focused on the positive implications of having a mammogram" than participants who read the loss-framed message ($M = 4.66$, $SD = 1.66$), $t(215) = -3.82$, $p < .01$. Similarly, participants who read the loss-framed message ($M = 4.21$, $SD = 1.65$) reported a significantly higher mean on the statement "The ad focused on the negative implications of having a mammogram" than those who read the gain-framed message ($M = 3.61$, $SD = 2.26$), $t(215) = 2.21$, $p < .05$.¹

Results

Preliminary Analyses

Preliminary tests were run to assess whether any of the demographic measures (age, education, prior mammography screening, and family history) correlated with mammography-screening intentions. Pearson correlation analyses showed that only education ($r = -.14$) was significantly associated with mammography-screening intentions. Education was also significantly associated with cognitive processing ($r = -.20$), message attention ($r = -.32$), perceived message credibility ($r = -.21$), and perceived message value ($r = -.42$). Thus, education (measured as 1 = *primary school*, 2 = *middle school*, 3 = *high school*, 4 = *higher secondary*, 5 = *bachelor's degree*, and 6 = *master's degree*) was included as a control measure in all subsequent analyses.

Table 1 provides a breakdown of the intercorrelations across all central study variables (see correlations above the diagonal). These preliminary findings indicate that, with the exception of cognitive processing, statistically significant associations were found between message framing and all outcome measures.

Table 1. Intercorrelations Between Central Study Variables.

Variable	1	2	3	4	5	6	7	8
1. Message frame (gain)		.16*	.05	-.01	.17*	-.16*	.24**	.17*
2. Intentions			-.19	.26**	.31	.22**	.34**	.27**
3. NFC				-.08	-.16*	-.13 [†]	-.03	-.07
4. Cognitive processing					.39**	.22**	.39**	.38**
5. Attention						.13*	.47**	.57**
6. Perceived worry							-.02	.11
7. PMC								.42**
8. PMV								

Note. The numbers reflect Pearson's r coefficients. NFC = need for cognition; PMC = perceived message credibility; PMV = perceived message value. Message framing was coded as 1 = loss-framed, 2 = gain-framed. [†] $p < .10$. * $p < .05$. ** $p < .01$.

Message Framing and Intentions

¹ The t -test results revealed a violation of Levine's test of homogeneity of variances, $F(215) = 24.22$, $p < .01$. However, consistent with the findings reported, these tests similarly indicated significant differences across conditions, $t(204.44) = 2.25$, $p < .05$. For clarity purposes, the results reflect tests assuming equality of variances.

To explore the direct impact of message framing on intentions, as well as the interaction between framing and NFC, we used hierarchical multiple regression. Education was included in Block 1 as a control measure, with message framing and NFC added in Block 2 and the interaction of these terms included in Block 3. Recall that Hypothesis 1 predicted that loss-framed messages would lead to greater mammography-screening intentions than gain-framed messages. Results from Block 2 of the model indicated that, contrary to expectations, gain-framed messages were more effective, $\beta = .14, p < .05$; $\Delta R^2 = .03, \Delta F(2, 211) = 6.00, p < .01$ (see Table 2). Thus, Hypothesis 1 was not supported. It is also noteworthy that NFC negatively associated with mammography-screening intentions ($\beta = -.19, p < .01$), and education no longer predicted this outcome ($\beta = -.09, p > .05$).

Research Question 1 examined whether NFC moderated the relationship between message framing and mammography-screening intentions. Results from Block 3 showed that there was no significant interaction between message framing and NFC on mammography-screening intentions, $\beta = .21, p > .05$; $\Delta R^2 = .003, \Delta F(1, 210) = 0.74, p > .05$ (see Table 2).

Table 2. Summary of Hierarchical Regression Analyses for Variables Predicting Mammography-Screening Intentions.

Model	β	SE	R^2	ΔR^2
1: Control measures			.02*	
Education	-.14*	.12		
2: Predictors				.05**
Message frame (gain)	.14*	.25		
NFC	-.19**	.08		
3: Interaction terms				.003
Message Frame \times NFC	.21	.17		

Note. Regression coefficients are standardized. NFC = need for cognition. Message framing was coded as 1 = loss-framed, 2 = gain-framed.

* $p < .05$. ** $p < .01$.

Influence of Message Framing on Intervening Mechanisms

To examine the impact of message framing on intervening factors (perceived worry, message engagement, perceived message effectiveness), we employed the same hierarchical regression procedure described above. For exploratory purposes, NFC was retained as a predictor variable.

Message Engagement

Research Question 2 examined whether levels of message engagement varied based on message-framing condition. Two separate tests were run to assess differences in cognitive processing and message attention. Results of the first analysis failed to indicate significant differences in cognitive processing across message frames, $\Delta R^2 = .01, \Delta F(2, 211) = 0.88, p > .05$. Results of the second analysis showed that although the model was significant, $\Delta R^2 = .03, \Delta F(2, 211) = 3.18, p < .05$ (see Table 3, Column 1), inspection of individual beta coefficients showed that there were no differences in message

attention across message-framing conditions ($\beta = .10, p > .05$). In contrast, higher levels of NFC were associated with lower attention levels ($\beta = -.14, p < .05$).

Message Judgments

Research Question 4 assessed whether female perceptions of perceived message effectiveness varied based on message-framing condition. Two separate analyses were conducted involving either perceived message credibility or perceived message value as the outcome variable. Results from the first analysis showed that gain-framed messages were perceived as significantly more credible than loss-framed messages, $\beta = .20, p < .01$; $\Delta R^2 = .04, \Delta F(2, 211) = 4.33, p < .05$ (see Table 3, Column 2). Results from the second analysis indicated no significant differences in perceived message value across message-framing conditions, $\beta = .07, p > .05$; $\Delta R^2 = .01, \Delta F(2, 211) = 0.78, p > .05$ (see Table 3, Column 3).

Table 3. Summary of Hierarchical Regression Analyses for Variables Predicting Message Attention/Message Judgment Outcomes.

Model	Message attention		PMC		PMV	
	β	SE	β	SE	β	SE
1: Control items						
Education	-.32**	.10	-.21**	.08	-.42**	.10
R^2	.10**		.04*		.18**	
2: Predictors						
Message frame (gain)	.10	.22	.20*	.18	.07	.23
NFC	-.14*	.07	-.03	.06	-.05	.07
ΔR^2	.03*		.04*		.01	
3: Interactions						
Message Frame \times NFC	.50*	.15	.39	.12	.56*	.15
ΔR^2	.02*		.01		.02*	

Note. Regression coefficients are standardized. NFC = need for cognition; PMC = perceived message credibility; PMV = perceived message value. Message framing was coded as 1 = loss-framed, 2 = gain-framed.

* $p < .05$. ** $p < .01$.

Perceived Worry

Hypothesis 2 predicted that loss-framed messages would generate greater perceived worry than gain-framed messages. Results from Block 2 of this hierarchical regression analysis showed that loss-framed messages led to significantly higher levels of perceived worry, $\beta = -.18, p < .05$; $\Delta R^2 = .04, \Delta F(2, 211) = 4.57, p < .01$ (see Table 4). Thus, Hypothesis 2 was supported.

Table 4. Summary of Hierarchical Regression Analyses for Variables Predicting Perceived Worry.

Model	β	SE	R^2	ΔR^2
1: Control items			<.001	
Education	-.001	.12		
2: Predictors				.04*
Message frame (gain)	-.18*	.26		
NFC	-.10	.08		
3: Interaction terms				.004
Message Frame \times NFC	-.24	.18		

Note. Regression coefficients are standardized. NFC = need for cognition. Message framing was coded as 1 = loss-framed, 2 = gain-framed.

* $p < .05$.

Post Hoc Moderation Analyses

Additional tests were run to assess interactions between message framing and NFC on intervening mechanisms. Significant interactions emerged between these variables to predict message attention, $\beta = .50, p < .05; \Delta R^2 = .02, \Delta F(1, 210) = 4.66, p < .05$ (see Table 3) and perceived message value, $\beta = .56, p < .05; \Delta R^2 = .02, \Delta F(1, 210) = 6.23, p < .05$ (see Table 3, Column 2). To decompose significant interactions, we ran separate regressions at 1 *SD* above and below the mean of the moderator variable (i.e., NFC; Aiken & West, 1991). Results showed that at high levels of NFC, gain-framed messages produced higher levels of message attention than loss-framed messages ($\beta = .25, p = .01$; see Figure 1), whereas there was no significant relationship between message framing and attention at low levels of NFC ($\beta = -.04, p > .05$). Similarly, at high levels of NFC, gain-framed messages were perceived to have greater message value than loss-framed messages ($\beta = .23, p < .05$; see Figure 2). Conversely, at low levels of NFC, no significant association was found between message framing and perceived message value ($\beta = -.09, p > .05$).

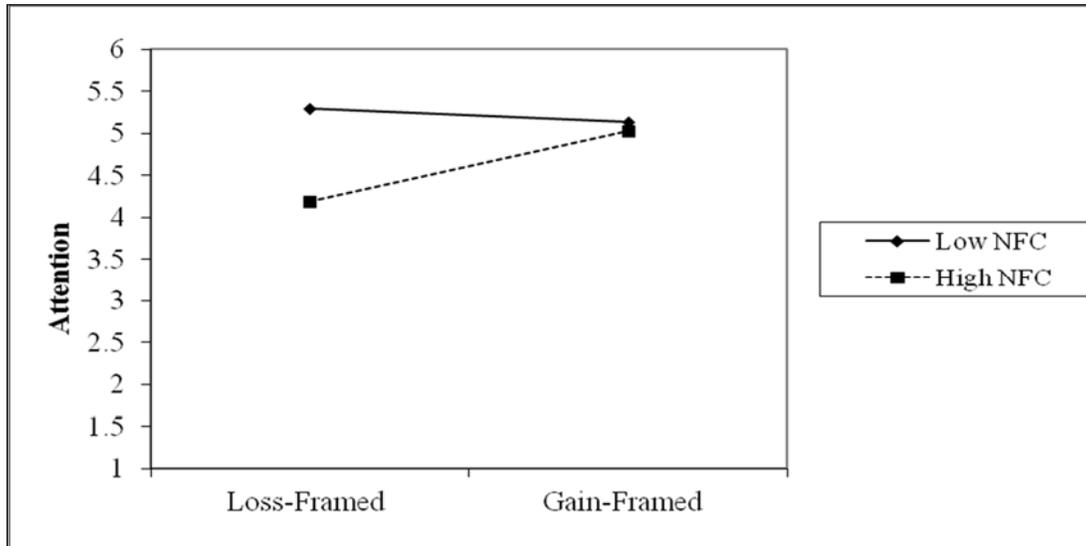


Figure 1. Relationship between message framing and message attention as a function of need for cognition (NFC), indicated by linear regression analysis.

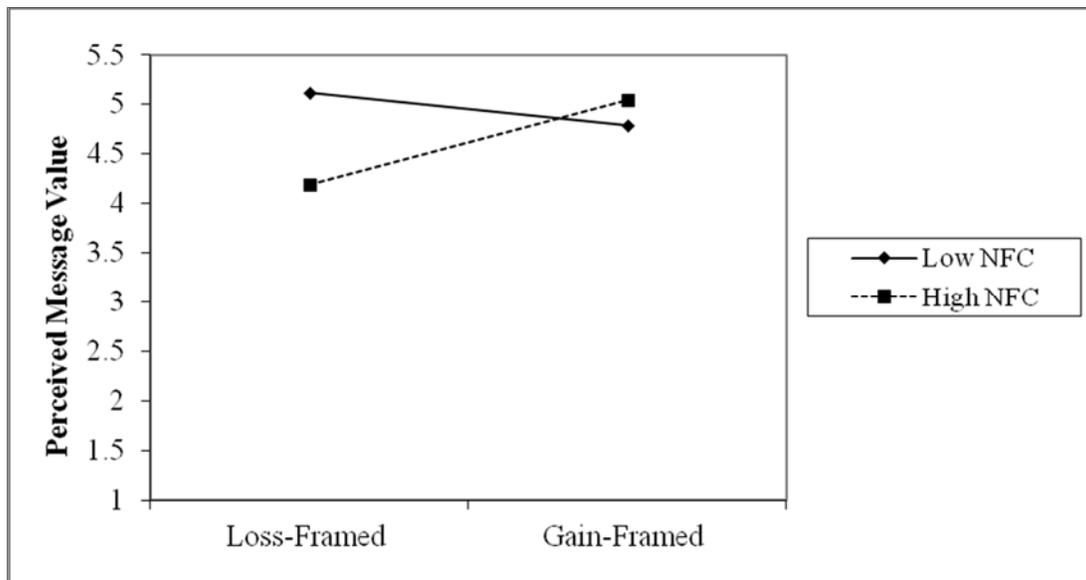


Figure 2. Relationship between message framing and perceived message value as a function of need for cognition (NFC), indicated by linear regression analysis.

Exploratory Moderator–Mediator Analyses

The moderation analyses described earlier indicated that level of NFC influenced the relationship between message framing and both message attention and perceived message value. Thus, depending on one's level of NFC, attention and message value may mediate the relationship between message framing and mammography-screening intentions. Employing Model 7 from the PROCESS macro (Hayes, 2012), we ran two subsequent moderator–mediator analyses to assess conditional indirect effects. Results of the first test showed that at high levels of NFC, message attention significantly carried the indirect effect of message framing on mammography-screening intentions, $B = .25$, $p < .05$, 95% CI [.05, .56].² Conversely, there was no significant indirect effect of message framing on intentions at low levels of NFC, $B = -.04$, $p > .05$, 95% CI [-.26, .15]. Similarly, results of the second test showed that at high levels of NFC, the indirect relationship between message framing and mammography-screening intentions through perceived message value, $B = .21$, $p < .05$, 95% CI [.05, .48], was statistically significant. At low levels of NFC, this relationship was not significant, $B = -.08$, $p > .05$, 95% CI [-.28, .05].

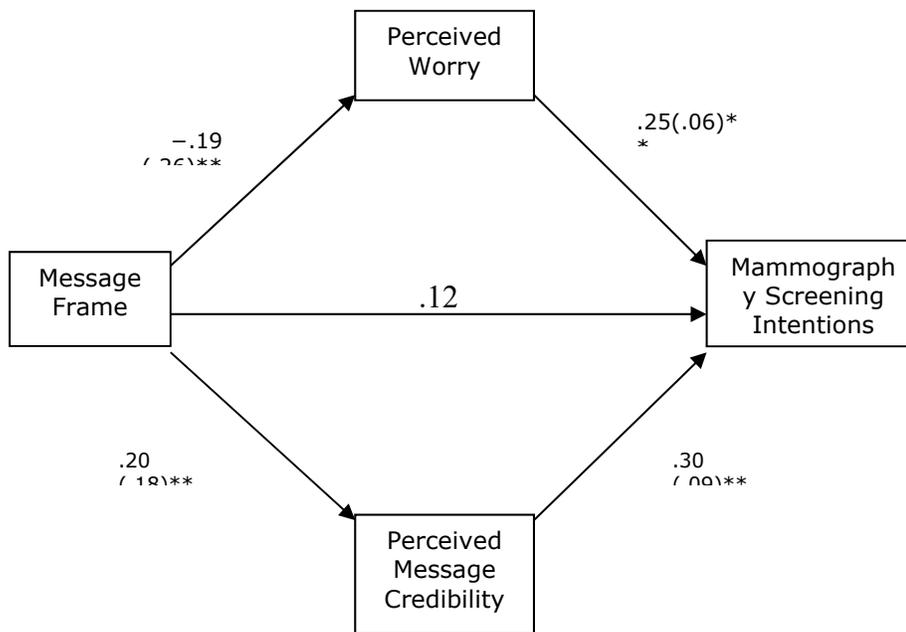


Figure 3. Exploratory multiple mediator model of indirect effects of message frame on mammography-screening intentions. Message frame was coded as 1 = loss-framed, 2 = gain-framed. The numbers reflect standardized regression coefficients obtained through multiple regression analysis controlling for education. For the full model, $R^2 = .18$. Numbers in parentheses denote standard errors. [†] $p < .10$. * $p < .05$. ** $p < .01$.

² Unstandardized regression coefficients are reported for the moderator–mediator tests (see Hayes, 2015).

Discussion

The goal of this study was to explore processes through which message framing influences Indian women's mammography-screening intentions. To expand on prior research, we examined message response and message judgments as mediators in the relationship between message framing and these health outcomes. Contrary to expectations, results indicated that gain-framed appeals were more effective at influencing mammography-screening intentions than loss-framed appeals. Furthermore, varying levels of NFC had no impact on the relationship between message framing and intentions. Rather, NFC moderated the influence of message framing on women's responses and impressions of these appeals. Specifically, at higher levels of NFC, gain-framed messages generated greater attention and were perceived to hold more value.

When examining intervening processes, results showed that loss-framed appeals did generate greater perceived worry than gain-framed messages, which in turn led to increased mammography-screening intentions. Conversely, gain-framed messages were perceived as more effective, a response that also directly impacted intentions. The following sections provide insight into the theoretical implications of these findings.

Theoretical Implications

Although prior meta-analyses have shown that loss-framed appeals are not a more effective message strategy for motivating early detection behaviors, mammography screening appears to be the exception (Gallagher & Updegraff, 2012; O'Keefe & Jensen, 2009). Consequently, the results of the current investigation are anomalous to both theoretical and empirical findings. One rationale is that the impact of persuasive messages may vary across different cultural groups. Unfortunately, there is limited prior research comparing message-framing effects between Westernized and non-Westernized populations. In particular, the only study examining message-framing effects across cultures found that East Asian participants, compared with British participants, were influenced more by loss-framed messages than gain-framed messages (Uskul et al., 2009), a finding that contradicts the results of this investigation. A more nuanced cultural argument may be related to the specific health issue. Specifically, a previous study (Schneider et al., 2001) found that whereas loss-framed messages produced greater mammography-screening intentions among White and Latina women, there were no significant differences among African American women. This at least suggests that with regard to mammography screening, there may be differences across ethnic and/or cultural groups.

It is also conceivable that the weaker persuasive effects resulting from loss-framed appeals are evidence of certain unintended responses to health messages. Research on fear appeals (Witte, 1992, 1994) indicates that when individuals lack adequate perceptions of personal and/or response efficacy, they may respond defensively to threat-based messages. Although the results of this study do not indicate negative responses to loss-framed appeals, the results may be indicative of other unintended consequences, such as desensitization (Cho & Salmon, 2007).

In addition, how this study was performed may offer additional explanation. Specifically, participants completed the study in a natural setting, whereas more traditional message-framing research has been carried out in laboratory settings. Prior mammography-screening research (Finney & Iannotti, 2002) found that the greater persuasiveness of loss-framed appeals over gain-framed appeals may not generalize beyond the laboratory context. Therefore, it is unclear whether the current results would be replicated in a more controlled environment.

Need for Cognition

In contrast to prior research, the results of this study indicate that NFC failed to moderate the relationship between message framing and health intentions. Post hoc analyses did reveal significant interactions between NFC and message framing on certain precursors to health outcomes. Consequently, these results offer a more nuanced examination of how message framing may impact user involvement in health messages and broader judgments of message value. Prior message-framing research found no superiority of loss-framed appeals in generating message engagement for early detection behaviors (O'Keefe & Jensen, 2008). This study extends these findings by showing that varying levels of NFC may impact when gain-framed appeals stimulate enhanced attention over loss-framed appeals. In addition, when individuals possess higher levels of NFC, gain-framed appeals may be perceived as holding more value, a central determinant of persuasive effects (Dillard et al., 2007). Moreover, the significance of NFC in affecting the impact of message framing on overall health intentions was captured via the moderator-mediator results. Specifically, these findings indicate that when individuals possess higher levels of NFC, gain-framed messages can have an indirect impact on mammography-screening intentions through enhanced engagement and perceived message value.

Indirect Effects of Message Framing

The results from this study underscore how both gain- and loss-framed messages can ultimately influence health intentions through cognitive and affective pathways. Overall, loss-framed messages were less persuasive, but they produced greater perceived worry than gain-framed messages. This enhanced concern directly led to higher mammography-screening intentions. Conversely, gain-framed messages were perceived as more credible, with greater perceived credibility also predicting higher mammography-screening intentions. Although greater perceived worry does reflect that loss-framed messages made a noticeable impression on participants, it may be the case that individuals look to other signals and/or preferences to assess the overall message effectiveness. For example, given the feelings of anxiety generated by worry, individuals may prefer alternative appeals that produce more positive emotions. Thus, future message-framing investigations may assess message preferences and ultimately employ more tailored message approaches (see Rimer & Kreuter, 2006). In addition, although loss-framed appeals may generate worry (as evidenced by these findings), which is an adaptive response to threatening appeals, they may also trigger fear response (as noted in extended parallel process model approaches), which may lead to defensive avoidance strategies, including message rejection.

Overall, however, both cognitive and emotional reactions to framed messages produced desired changes in behavioral intentions. Highlighting these intervening mechanisms is critical to ensuring more

powerful health effects. In particular, as opposed to preferring one message-framing strategy over another, researchers may look to strengthening specifically components of gain- and loss-framed appeals to maximize effectiveness. To achieve the most positive health outcomes, message designers may look to create loss-framed messages that stimulate the greatest personal concern (while limiting possible defensive reactions) and gain-framed messages that are perceived as most believable. Drawing from fear-appeal theories such as the extended parallel process model, loss-framed appeals that also induce high levels of efficacy may be highly persuasive within the context of early detection behaviors such as mammography screening. In this regard, loss-framed messages can lead individuals to feel legitimate personal concern, while also ensuring that they fully embrace the message arguments.

Practical Perspectives

Addressing the impact of framing effects on a non-Westernized nation such as India is critical given this country's steady growth (United Nations Department of Economic and Social Affairs/Population Division, 2014) coupled with alarmingly high breast cancer rates (Ferlay et al., 2015). The current study findings suggest that among Indian women, mammography-screening messages stressing the positive consequences related to getting screened (i.e., gain-framed messages) ultimately lead to higher levels of mammography-screening intentions than messages highlighting the negative consequences associated with failing to get screened (i.e., loss-framed messages). Furthermore, gain-framed appeals generate greater attention, and are perceived as more credible and valuable than loss-framed appeals. Consequently, public health campaigns in India should center on more prevention/promotion-focused messaging while minimizing fear-appeal strategies.

In addition, given that message responses, such as message engagement and message impressions, play a critical role in determining persuasive effects, the Indian public health community must continue to explore message design strategies that stimulate interest and result in more favorable judgments toward gain-framed appeals.

Limitations and Areas for Future Research

One limitation of this study was the presentation of strictly narrative-type evidence to participants. This approach was used to focus primarily on the main effect of message framing on Indian women's mammography-screening intentions as well as the moderating role of NFC. However, there is a substantial body of research exploring how both informational/statistical appeals as well as narrative/exemplar appeals aid in persuasive effects and the possible interactions between message framing and evidence format (Allen & Preiss, 1997; Cox & Cox, 2001; Yu, Ahern, Connolly Ahern, & Shen, 2010). Future investigations of similar non-Westernized populations may explore additional relationships between message framing, NFC, and evidence type.

Second, this study was conducted outside a laboratory setting. This limited the ability to control for any confounding variables that may have biased the results. Although it is beneficial to expose participants to health messages in more natural settings, researchers should attempt to replicate these findings in a more controlled environment.

Third, the distinctive features of the study design and population limit the ability to draw larger conclusions from the results. Specifically, this study strictly examined one early detection behavior. To draw broader generalizations from these results, future investigators should address other health issues (e.g., other cancer screenings; sexually transmitted infections [STI/HIV] tests). Similarly, the vast majority of participants reported some level of higher education. Given that education had a surprisingly negative impact on message perceptions (see Table 3), it is critical that future investigators seek to replicate these results among women with a greater diversity in educational attainment.

Conclusion

This study investigated moderating and mediating factors to explain the impact of message-framing appeals on Indian women's mammography-screening intentions. Contrary to prior investigations of early detection behavior, gain-framed messages were broadly more effective at inducing mammography-screening intentions than loss-framed messages. Furthermore, results indicated that NFC did not impact the effect of message framing on intentions, but rather how framing strategy influenced message responses. In particular, at high levels of NFC, gain-framed messages generated greater message attention and perceived message value than loss-framed appeals. Importantly, the findings from mediation tests revealed distinct pathways whereby both gain- and loss-framed messages indirectly influenced mammography-screening intentions. Specifically, whereas gain-framed messages were perceived as having greater credibility, loss-framed messages induced more personal worry.

References

- Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: SAGE Publications.
- Allen, M., & Preiss, R. W. (1997). Comparing the persuasiveness of narrative and statistical evidence using meta-analysis. *Communication Research Reports, 14*, 125–131.
- Banks, S. M., Salovey, P., Greener, S., Rothman, A. J., Moyer, A., Beauvais, J., & Epel, E. (1995). The effects of message framing on mammography utilization. *Health Psychology, 14*, 178–184.
- Bassett-Gunter, R. L., Latimer-Cheung, A. E., Martin Ginis, K. A., & Castelhana, M. (2014). I spy with my little eye: Cognitive processing of framed physical activity messages. *Journal of Health Communication, 19*, 676–691.
- Block, L. G., & Keller, P. A. (1995). When to accentuate the negative: The effects of perceived efficacy and message framing on intentions to perform a health-related behavior. *Journal of Marketing Research, 32*, 192–203.

- Cacioppo, J. T., Gardner, W. L., & Berntson, G. G. (1997). Beyond bipolar conceptualizations and measures: The case of attitudes and evaluative space. *Personality and Social Psychology Review, 1*, 3–25.
- Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment, 48*, 306–307.
- Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology, 37*, 752–766.
- Cheng, I., & Cameron, G. T. (2003, May). *Young smokers' cognitive and affective responses to gain-framed and loss-framed antismoking message: A think aloud protocol study*. Paper presented at the International Communication Association, San Diego, CA.
- Cho, H., & Salmon, C. T. (2007). Unintended effects of health communication campaigns. *Journal of Communication, 57*, 293–317.
- Covey, J. (2014). The role of dispositional factors in moderating message framing effects. *Health Psychology, 33*, 52–65.
- Cox, D. S., & Cox, A. D. (2001). Communicating the consequences of early detection: The role of evidence and framing. *Journal of Marketing, 65*, 91–103.
- Davey, G. C., Tallis, F., & Capuzzo, N. (1996). Beliefs about the consequences of worrying. *Cognitive Therapy and Research, 20*, 499–520.
- Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, E., & Rothman, A. J. (1999). Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychology, 18*, 189–196.
- Dillard, J. P., & Peck, E. (2000). Affect and persuasion emotional responses to public service announcements. *Communication Research, 27*, 461–495.
- Dillard, J. P., Plotnick, C. A., Godbold, L. C., Freimuth, V. S., & Edgar, T. (1996). The multiple affective outcomes of AIDS PSAs fear appeals do more than scare people. *Communication Research, 23*, 44–72.
- Dillard, J. P., Shen, L., & Vail, R. G. (2007). Does perceived message effectiveness cause persuasion or vice versa? 17 consistent answers. *Human Communication Research, 33*, 467–488.
- Ferlay, J., Soerjomataram, I., Dikshit, R., Eser, S., Mathers, C., Rebelo, M., . . . Bray, F. (2015). Cancer incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012. *International Journal of Cancer, 136*, E359–E386.

- Finney, L. J., & Iannotti, R. J. (2002). Message framing and mammography screening: A theory-driven intervention. *Behavioral Medicine, 28*(1), 5–14.
- Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine, 43*, 101–116.
- Gallagher, K. M., Updegraff, J. A., Rothman, A. J., & Sims, L. (2011). Perceived susceptibility to breast cancer moderates the effect of gain- and loss-framed messages on use of screening mammography. *Health Psychology, 30*, 145–152.
- Garcia-Retamero, R., & Cokely, E. T. (2011). Effective communication of risks to young adults: Using message framing and visual aids to increase condom use and STD screening. *Journal of Experimental Psychology: Applied, 17*, 270–287.
- Green, M. C., & Brock, T. C. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology, 79*, 701–721.
- Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from <http://www.afhayes.com/public=process2012.pdf>
- Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research, 50*, 1–22.
- Homer, P. M., & Yoon, S. G. (1992). Message framing and the interrelationships among ad-based feelings, affect, and cognition. *Journal of Advertising, 21*, 19–33.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*, 263–291.
- Kalichman, S. C., & Coley, B. (1995). Context framing to enhance HIV-antibody-testing messages targeted to African American women. *Health Psychology, 14*, 247–254.
- Katapodi, M. C., Lee, K. A., Facione, N. C., & Dodd, M. J. (2004). Predictors of perceived breast cancer risk and the relation between perceived risk and breast cancer screening: A meta-analytic review. *Preventive Medicine, 38*, 388–402.
- Kim, K., & Park, J. S. (2010). Message framing and the effectiveness of DTC advertising: The moderating role of subjective product knowledge. *Journal of Medical Marketing: Device, Diagnostic and Pharmaceutical Marketing, 10*, 165–176.
- Kopfman, J. E., Smith, S. K., Ah Yun, J., & Hodges, A. (1998). Affective and cognitive reactions to narrative versus statistical organ donation messages. *Journal of Applied Communication*

- Research*, 26, 279–300.
- Maheswaran, D., & Meyers-Levy, J. (1990). The influence of message framing and issue involvement. *Journal of Marketing Research*, 27, 361–371.
- McCaul, K. D., Branstetter, A. D., Schroeder, D. M., & Glasgow, R. E. (1996). What is the relationship between breast cancer risk and mammography screening? A meta-analytic review. *Health Psychology*, 15, 423–429.
- McCaul, K. D., Schroeder, D. M., & Reid, P. A. (1996). Breast cancer worry and screening: Some prospective data. *Health Psychology*, 15, 430–433.
- Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions, and behavior. *Journal of Personality and Social Psychology*, 52, 500–510.
- Moser, R. P., McCaul, K., Peters, E., Nelson, W., & Marcus, S. E. (2007). Associations of perceived risk and worry with cancer health-protective actions data from the Health Information National Trends Survey (HINTS). *Journal of Health Psychology*, 12, 53–65.
- National Centre for Disease Informatics and Research—National Cancer Registry Programme. (2016). Three-year report of population-based cancer registries (2012–2014). Retrieved from http://ncrpindia.org/ALL_NCRP_REPORTS/PBCR_REPORT_2012_2014/index.htm
- O’Keefe, D. J., & Jensen, J. D. (2008). Do loss-framed persuasive messages engender greater message processing than do gain-framed messages? A meta-analytic review. *Communication Studies*, 59, 51–67.
- O’Keefe, D. J., & Jensen, J. D. (2009). The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease detection behaviors: A meta-analytic review. *Journal of Communication*, 59, 296–316.
- O’Malley, D. A., & Latimer-Cheung, A. E. (2013). Gaining perspective: The effects of message frame on viewer attention to and recall of osteoporosis prevention print advertisements. *Journal of Health Psychology*, 18, 1400–1410.
- Park, S. Y. (2012). The effects of message framing and risk perceptions for HPV vaccine campaigns: Focus on the role of regulatory fit. *Health Marketing Quarterly*, 29, 283–302.
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 19, pp. 123–205). New York, NY: Academic Press.

- Rimer, B. K., & Kreuter, M. W. (2006). Advancing tailored health communication: A persuasion and message effects perspective. *Journal of Communication, 56*, S184–S201.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology, 91*, 93–114.
- Rosenstock, I. M. (1966). Why people use health services. *The Milbank Quarterly, 44*, 94–127.
- Rothman, A. J., Martino, S. C., Bedell, B. T., Detweiler, J. B., & Salovey, P. (1999). The systematic influence of gain- and loss-framed messages on interest in and use of different types of health behavior. *Personality and Social Psychology Bulletin, 25*, 1355–1369.
- Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin, 121*, 3–19.
- Salovey, P., & Wegener, D. T. (2003). Communicating about health: Message framing, persuasion, and health behavior. In J. Suls & K. Wallston (Eds.), *Social psychology foundations of health and illness* (pp. 54–81). Oxford, UK: Blackwell.
- Schneider, T. R., Salovey, P., Apanovitch, A. M., Pizarro, J., McCarthy, D., Zullo, J., . . . Rothman, A. J. (2001). The effects of message framing and ethnic targeting on mammography use among low-income women. *Health Psychology, 20*, 256–266.
- Schneider, T. R., Salovey, P., Pallonen, U., Mundorf, N., Smith, N. F., & Steward, W. T. (2001). Visual and auditory message framing effects on tobacco smoking. *Journal of Applied Social Psychology, 31*, 667–682.
- Sheeran, P., Harris, P. R., & Epton, T. (2014). Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. *Psychological Bulletin, 140*, 511–543.
- Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis, 24*, 311–322.
- Stephenson, M., & Palmgreen, P. (2001). Sensation seeking, perceived message sensation value, personal involvement, and processing of anti-marijuana PSAs. *Communication Monographs, 68*, 49–71.
- Steward, W. T., Schneider, T. R., Pizarro, J., & Salovey, P. (2003). Need for cognition moderates responses to framed smoking-cessation messages. *Journal of Applied Social Psychology, 33*, 2439–2464.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*, 453–458.

- United Nations Department of Economic and Social Affairs/Population Division. (2014). *World population prospects: The 2012 revision methodology of the United Nations population estimates and projections*. Retrieved from http://esa.un.org/wpp/Documentation/pdf/WPP2012_Methodology.pdf
- Updegraff, J. A., & Rothman, A. J. (2013). Health message framing: Moderators, mediators, and mysteries. *Social and Personality Psychology Compass, 7*, 668–679.
- Uskul, A. K., Sherman, D. K., & Fitzgibbon, J. (2009). The cultural congruency effect: Culture, regulatory focus, and the effectiveness of gain- vs. loss-framed health messages. *Journal of Experimental Social Psychology, 45*, 535–541.
- Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communications Monographs, 59*, 329–349.
- Witte, K. (1994). Fear control and danger control: A test of the extended parallel process model (EPPM). *Communications Monographs, 61*, 113–134.
- Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior, 27*, 591–615.
- Yu, N., Ahern, L. A., Connolly Ahern, C., & Shen, F. (2010). Communicating the risks of fetal alcohol spectrum disorder: Effects of message framing and exemplification. *Health Communication, 25*, 692–699.