Food Messages and Freedom of Choice

by

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ABSTRACT

This dissertation explores conditions under which food messages backfire among consumers leading them to engage in behaviors that are opposite to what was intended by the messages. The first essay shows when and how food-related warnings can backfire by putting consumers in a state of reactance. Across three studies, I demonstrate that dieters (but not nondieters) who see a one-sided message focusing on the negative aspects of unhealthy food (vs. a one-sided positive or neutral message) increase their desire for and consumption of unhealthy foods. In contrast, dieters who see a two-sided message (focusing on both the negative and positive aspects of unhealthy food) are more likely to comply with the message, thereby choosing fewer unhealthy foods. My research suggests that negatively-worded food warnings (such as PSAs) are unlikely to work – nondieters ignore them, and dieters do the opposite. Although preliminary, the findings also suggest that two-sided messages may offer a better solution. The second essay shows how certain messages advocating for genetically modified organisms (GMOs) can backfire by activating consumers' thoughts about risk of GMOs. Across four studies, I demonstrate that strong anti-GMO (but not weak anti-GMO) consumers who see a pro-GMO message claiming that GMOs are safe for human consumption (vs. a neutral message) perceive higher risk from GMOs, resulting in more unfavorable attitudes toward GMOs and lower intentions to consume GMOs. My research also suggests that a pro-GMO message claiming that GMOs are beneficial will be more effective in persuading both strong and weak anti-GMO consumers.

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INTRODUCTION

Government regulators around the world use different strategies to influence consumer food choices to reduce the massive cost of health care tied to unhealthy lifestyle choices, such as smoking cigarettes, eating junk food, or drinking alcohol (Pianin 2015). They also try to change consumer attitudes toward controversial social issues, such as vaccinations or GMOs. Public service announcement (PSAs) are messages disseminated with the purpose of increasing consumer awareness and changing consumer attitudes toward social issues. However, unlike marketing strategies targeting different audience segments, PSAs are not tailored to a specific group of consumers. Rather, they are a single message trying to reach as many consumers as possible.

The present research suggests that consumers with divergent attitudes or habits (e.g., dieters vs. nondieters or anti-GMO vs. pro-GMO consumers) react to such a message very differently. Some comply with the message, while others just ignore it. It is noteworthy that the message even backfires among certain consumers, leading them to engage in behavior that is opposite to the intended message (i.e., message-opposing behavior). Prior research suggests that the more relevant the message is to an individual, the more the individual uses his/her cognitive resources to evaluate the message and thus will be more likely to carefully and extensively evaluate the message (Petty, Cacioppo, and Schumann 1983). However, more recent research suggests the opposite. Specifically, under highly relevant conditions, consumers are more likely to engage in subjective and biased evaluative processes. For example, defensive processing suggests that when a consumer encounters information threatening his/her emotional state, if the message is highly relevant to him/her, s/he will defensively process the information to reduce the

threat. Consequently, s/he will discredit the message (Liberman and Chaiken 1992), downplay the seriousness of the risk (Kunda 1987), suppress concepts related to the threat, and avoid the message (Nielsen and Shapiro 2009).

In light of this literature, I propose that if consumers are emotionally and cognitively engaged with a persuasive message, they will be more likely to engage in message-opposing behavior. Two essays of my dissertation suggest two distinct cognitive processes that both lead to backfiring effects among consumers who are highly engaged with the issues discussed in the messages. More specifically, the first essay, entitled "Messages from the Food Police: How Food-related Warnings Backfire among Dieters," shows that dieters who have strong emotional relationships with unhealthy food will be more likely to interpret one-sided negative messages about unhealthy food (e.g., "All dessert is bad") as a threat to their freedom. They eventually engage in message-opposing behavior, such as having more positive thoughts about or eating more unhealthy food, as a means to regain the freedom.

The second essay, entitled "Consumers' Reactions to Pro-GMO Messages: The Role of Memory Accessibility and Attitude Strength," explores how consumers with different levels of attitude strength respond to pro-GMO messages. To strong anti-GMO consumers, the issue of GMOs is very important to them and they have knowledge about it. A safety message claiming that GMOs are safe for human health will activate thoughts about the risks of GMOs in strong anti-GMO consumers' memory, leading to an increase in perceived risk. Consequently, these consumers will engage in message-opposing behavior, such as having a less favorable attitude toward GMOs and paying more to avoid GMOs.

This research has important implications for government agencies and policy makers by suggesting conditions under which food messages purposely designed to positively influence consumer behavior can backfire. Although this research is in the domain of food consumption, the proposed cognitive processes can be used to explain consumer behavior in other domains. For example, "Don't text and drive" PSAs or anti-alcohol PSAs may backfire among certain consumers who perceive them as freedom constraining. My proposed second theoretical framework about memory accessibility may also explain consumer reactions to other issues that are a source of considerable controversy. One such example is vaccinations. Just like GMOs, there are pro-vaccination and anti-vaccination groups of parents. Some of them have knowledge and strong attitudes toward vaccinations, while others have very limited knowledge and hold weak attitudes toward this issue. According to my second framework, when anti-vaccination parents encounter a pro-vaccination advertisement, they will perceive a higher risk from vaccinations, making them even more likely to refuse vaccinations for their children.

ESSAY 1

MESSAGES FROM THE FOOD POLICE:

HOW FOOD-RELATED WARNINGS BACKFIRE AMONG DIETERS

Concerned about the rising rates and costs of obesity, the U.S. government and its agencies are using various strategies, including regulation and public service announcements (PSAs), to attempt to reverse the health crisis. For example, New York City mayor Michael Bloomberg attempted to ban the sale of large-sized sugary sodas (Grynbaum 2014). Many consumers, politicians, journalists and economists have dismissed the proposers of these new measures as the "food police" (e.g., Lusk 2013; Stossel 2012). In fact, New York's highest court recently rejected the proposed New York City soda ban because it represented "interference with personal autonomy" (Grynbaum 2014). Such strong negative reactions suggest that at least for some consumers, receiving a message from the "food police" to eat healthier is unlikely to work, and may even backfire. Consistent with this notion, a recent study found that when several elementary schools eliminated chocolate milk from the lunch menu, school children did not switch to healthier unflavored milk. Instead, the ban led to a backlash in terms of decreased milk sales and increased food and milk waste (Hanks, Just, and Wansink 2014).

Advertisements such as PSAs may also backfire, particularly if consumers perceive them as direct commands that restrict their freedom. For example, a recent advertisement attracted controversy and the "food police" label for claiming that drinking too much soda could cause one to develop diabetes and lose a limb to amputation (May 2012). The literature categorizes this type of ad as a one-sided advertisement because it only focuses on the positives or negatives of a product or service (in this case, the

negatives of drinking soda), rather than both the positives and negatives (Kamins and Assael 1987).

In this research, I examine the conditions under which such one-sided food messages can backfire among consumers, causing them to engage in behavior that is opposite of the message (a boomerang effect; Clee and Wicklund 1980). Even though such messages do not explicitly tell consumers not to eat certain foods, I show that dieters nevertheless respond to such messages as if they do. Building on the literature on reactance (Brehm 1966), I hypothesize and show that dieters (but not nondieters) exhibit message-opposing behavior when they feel that their freedom is restricted. More specifically, I show that dieters (but not nondieters) interpret one-sided negative messages about unhealthy foods (e.g., "All dessert is bad") as a threat to their freedom, leading to an increased interest in and consumption of unhealthy foods. Moreover, I examine the effect of two-sided messages (e.g., "All dessert tastes good, but is bad for your health") on consumers' perceived freedom. In contrast to one-sided messages, dieters do not interpret two-sided messages about unhealthy foods as a threat to their freedom: instead, they view these messages as providing even more freedom of choice than positive messages (e.g., "All dessert is good"). As a result, two-sided messages lead dieters (but not nondieters) to comply more with the messages and choose fewer unhealthy snacks.

This work builds on the reactance literature in several important ways. Although the phenomenon of reactance is well-established in the psychology and consumer literature, I hone in on the "who, when, why, and how" of reactance in the context of food decision-making. In contrast to past research suggesting that reactance is triggered

when consumers receive direct commands (Brehm 1966) or explicit recommendations (Fitzsimons and Lehmann 2004), I demonstrate that simple exposure to one-sided messages focusing on the negative aspects of unhealthy food can be enough to evoke reactance among dieters. It is noteworthy that such messages do not tell consumers what they should or should not do, but are instead framed as informational appeals (e.g., PSAs) that provide useful facts to consumers. In the context of food, this rationale leads to the prediction that negative messages about unhealthy food will backfire among dieters (but not among nondieters), who feel that their freedom to make food choices is constrained. Further, I shed light on how consumers respond to two-sided messages, showing that dieters view two-sided messages as increasing their freedom to choose, thereby increasing compliance with the messages.

My research also contributes to the growing literature on food decision-making. Specifically, I demonstrate that since dieters are more reliant on external cues to guide their decision-making when it comes to food, they are more reactant to messages highlighting the negative aspects of unhealthy (but highly desirable) foods. This finding is somewhat counterintuitive, given that dieters are already trying to restrict their consumption of unhealthy food. Our findings also carry important implications for both consumers and public policy makers, which I address in the general discussion.

THEORETICAL BACKGROUND

Constraining a person's freedom can backfire

Freedom is an important aspect of human life. Despite knowing that they can make mistakes, most of the time people feel a need to make their own decisions. In this

paper, I focus on freedom of choice, defined as the autonomy to make choices to satisfy one's preferences within the limits of one's resources (Markus and Schwartz 2010). Reactance theory (Brehm 1966) postulates that when individuals feel that someone else is constraining their freedom to choose or act, they will enter a motivational state of reactance to regain that freedom, manifested in adversarial behaviors. The reactance produced by a threat to an individual's freedom can result in direct reestablishment of freedom by engaging in the behavior threatened by constraints. Past studies have documented a wide range of reactance effects, including reactions to physical barriers (Brehm and Weintraub 1977) or acting counter to persuasive messages (Brehm and Sensenig 1966). For example, Fitzsimons (2000) demonstrated that when consumers became personally committed to an option, they reacted negatively to stock outs that removed that option. Fitzsimons and Lehmann (2004) showed that expert recommendations resulted in a behavioral backlash, in which consumers not only ignored the recommendations but intentionally contradicted them. Moreover, Levav and Zhu (2009) observed that when participants did their shopping in a narrow (vs. wide) aisle, they felt more confined, and thus showed more variety-seeking in their choices as a means to regain their freedom. In a conceptual review, Stewart and Martin (1994) proposed that consumers might respond negatively to warning labels if they think these warnings restrict their freedom to choose, and they recommended further empirical research to confirm this prediction. Consistent with this idea, in one recent study, researchers demonstrated that death-related anti-smoking warning labels increased consumers' attitudes toward smoking (Hansen et al. 2010). However, these researchers did not measure actual smoking behavior.

In previous studies, researchers have typically treated reactance as a trait variable. However, more recent work on reactance has raised concerns about the validity of the trait reactance construct, showing it is not able to reliably predict how people will react to certain situations. For example, Silvia (2006) found that when a threat to attitudinal freedom was high, participants higher in trait reactance agreed more than participants lower in trait reactance to persuasive statements suggesting making changes to their university. This finding is inconsistent with the trait reactance literature, which suggests that people who score higher in trait reactance should not be more easily persuaded. Consistent with this premise, Shoham, Trost, and Rohrbaugh (2004) suggested that reactance is not a stable trait and that the methods currently used to measure trait reactance may not accurately reflect the construct of reactance. For example, since smoking is a behavior that is highly restricted by societal norms, one may argue that change-resistant smokers who continuously engage in such behavior must score high on the trait reactance scale. However, in their study, Rohrbaugh et al. (2001) found that the trait reactance scores of change-resistant smokers were not actually higher than those of the general population.

In light of these new findings, recent studies have begun to explore reactance as a state variable. For example, Wellman and Geers (2009) showed that reactance can be primed nonconsciously, and Wendlandt and Schrader (2007) developed a scale to measure situational reactance in a loyalty program setting. In addition, Erceg-Hurn and Steed (2011) studied the effects of situational reactance triggered by cigarette health warnings. While similar in its focus on situational reactance, my paper significantly differs from this previous work. First, Erceg-Hurn and Steed (2011) explored the role of

graphic cigarette warnings on smokers' reactance levels but not on their actual smoking behavior, whereas I investigate how warnings about unhealthy food can reduce actual choice and consumption of such foods. Second, while Erceg and Steed measured situational reactance using Dillard and Shen's (2005) self-reported anger scale (i.e., how irritated, angry, annoyed, and aggravated the warnings made them), thereby focusing more on the affective components of reactance, in my studies, I used a modified version of the Hong psychological reactance scale to measure the more cognitive components of reactance that assess restrictions of freedom and choice.

In the current work, I define situational reactance as a state of motivational arousal to react negatively toward a specific threat to one's ability to reassert freedom. Specifically, I propose that exposure to one-sided messages that present only the negative aspects of consuming unhealthy food can trigger situational reactance among consumers, but only if they feel their freedom is being restricted. Consumers are aware of both the positive and negative consequences of eating unhealthy food and they expect to have the freedom to choose the food they prefer. I propose that under certain conditions, consumers will view a one-sided message such as "All dessert is bad," as a persuasive tactic to convince them to eat fewer desserts. Therefore, they will encode such messages as a threat to their freedom to choose, leading them to attempt to reassert their freedom.

The role of dietary restraint

Dietary restraint refers to the chronic effort to restrict food intake. In this research, I refer to nondieters as those who score low on measures of dietary restraint (Herman and Polivy 1980). Nondieters begin to eat when they feel hungry and stop eating when they feel satiated (Herman and Polivy 1984). In other words, they make their food choices

based on internal, physiological cues. Therefore, I predict that food messages such as the ones in my experiments should have no effect on what or how much nondieters choose to eat.

In contrast, dieters (i.e., those who score high on measures of dietary restraint) tend to have a strong concern for their weight and exhibit a strong desire to be fit (Herman and Polivy 1980). Unlike nondieters, dieters attempt to inhibit eating before the normal satiety process occurs with the purpose of losing weight or at least not gaining weight (Herman and Polivy 1984). Whereas nondieters rely on internal cues (hunger and satiation) to guide their food decision-making (Gal forthcoming), dieters tend to use their cognitive resources to monitor their intake, leading them to chronic self-regulatory depletion (Hofmann, Rauch, and Gawronski 2007; Vohs and Heatherton 2000). Consequently, they rely on external cues in the environment (i.e. heuristic information processing) when evaluating food. For example, dieters (vs. nondieters) rely on food names to determine whether the food is healthy or unhealthy (Irmak, Vallen, and Robinson 2011), or they dichotomize foods into either good or bad for one's health (Rozin, Ashmore, and Markwith 1996). As a result, dieters believe that a meal combining a virtue and a vice (i.e., healthy vs. unhealthy food) contains fewer calories than the vice alone (Chernev 2011). In addition, Scott and colleagues (2008) found that dieters are more likely than nondieters to overeat foods in small packages such as 100-calorie packs, which they wrongly perceive as diet foods.

In summary, dieters are less sensitive to internal cues than are nondieters, and they instead rely heavily on external cues to make decisions about what and how much they should eat. As a result, a message focusing on negative aspects of unhealthy food

consumption (an external cue) will have a stronger impact on dieters than on nondieters. Moreover, according to the goal conflict model of eating, dieters' eating behavior represents two conflicting goals: the goal of eating enjoyment and the goal of weight control (Stroebe et al. 2013). Compared to nondieters, dieters are more sensitive to anticipating the enjoyment they would have from consuming tasty but unhealthy food (Vohs and Heatherton 2000). They want to consume low-calorie foods to be thin, while actually preferring foods high in fat and sugar, which they consider taboo or forbidden (Haws and Lamberton 2008). In other words, dieters are highly involved in and very emotional about issues of unhealthy food consumption.

As a result of their highly involved and emotional relationship with food, as well as their strong reliance on external cues to govern their eating decisions, I propose that when dieters encounter a negative one-sided message that highlights the negative aspects of unhealthy foods (vs. a one-sided positive message or a neutral message), they are likely to feel that their freedom to choose has been limited, thereby evoking a reactant state. In contrast, because nondieters eat when they are hungry and stop when they are finished, they should be immune to negative food messages, and thus should not exhibit reactance. I further propose that the situational reactance produced by the one-sided negative message will lead dieters to engage in behaviors opposite to those intended by the message (e.g., having more positive thoughts about unhealthy food, choosing more unhealthy food in a hypothetical choice task, and/or consuming more unhealthy food). Importantly, given that my predictions are based specifically on how dieters and nondieters react to one-sided negative messages about food, I do not expect trait reactance to be a factor in how dieters (vs. nondieters) respond to such messages.

H1: When encountering a message about unhealthy food, dieters will exhibit a higher level of reactance to a one-sided negative message than to a one-sided positive message or a neutral message. Nondieters will exhibit an equal level of reactance to negative, positive, and neutral messages.

H2: When encountering a message about unhealthy food, dieters will have more positive thoughts about and consume more unhealthy food following a one-sided negative message versus a one-sided positive message or a neutral message. Nondieters will show no difference in positive thoughts and unhealthy food consumption following exposure to the different messages.

In contrast to the reactance evoked by one-sided messages, I propose that when dieters encounter two-sided messages that emphasize both the negative and positive aspects of unhealthy food consumption, they will not feel that their freedom to choose has been limited. As a result, two-sided messages should not trigger reactance among dieters. I further suggest that dieters are more likely to comply with (vs. react to) the two-sided (vs. one-sided negative) messages. In fact, dieters may even be more likely to comply with two-sided messages than with positive messages, for two reasons. First, since two-sided messages present both the negative and positive aspects of unhealthy food consumption, dieters view them as providing more freedom (to either eat or not eat unhealthy food) than a message presenting only the negative or only the positive aspects, thereby resulting in higher message compliance. This notion is consistent with past research demonstrating that allowing consumers the freedom to allocate their payments across budgets (leaving payment amounts unchanged) increases satisfaction with paying taxes (Lamberton 2013).

Second, the advertising literature has suggested that two-sided (vs. one-sided) messages significantly increase consumer ratings of ad credibility and effectiveness, overall quality of service, and purchase intentions (Etgar and Goodwin 1982; Kamins and Assael 1981; Kamins et al. 1989; Golden and Alpert 1978). In line with this literature, I suggest that in addition to feeling more freedom from two-sided messages, dieters are also more likely to trust two-sided messages, thereby increasing compliance (Meredith 2007). Conversely, since nondieters are relatively unaffected by all food-related messages, they will neither react to nor comply with the two-sided messages.

H3: When encountering a message about unhealthy food, dieters will choose fewer unhealthy snacks following a two-sided message versus a one-sided positive message or a one-sided negative message. Nondieters will show no difference in number of unhealthy snacks chosen following exposure to these different messages.

I test my hypotheses across three experiments. In study 1a, I provide support for the proposed process by investigating the effect of a one-sided negative message about unhealthy food on reactance (H1) and food perceptions (H2) among dieters versus nondieters. In study 1b, I demonstrate that a one-sided negative message also influences dieters' actual consumption of unhealthy food (H2). In study 2, I demonstrate the effects of these messages on a simultaneous snack choice task and provide evidence that two-sided messages can lead to increased compliance for dieters (H3).

STUDY 1A

The purpose of study 1a was to provide evidence for my proposed reactance-based backfiring process. To do so, I examined dieters' and nondieters' perceptions of

unhealthy foods after they encountered a one-sided negative message about unhealthy food (vs. a one-sided positive message or a neutral message about unhealthy food). To do this, I first presented participants with one of three food messages, and then measured the number of positive thoughts they had about unhealthy foods.

Pretest.

To ensure that the messages used in my studies were effective, I conducted a pretest on Mturk. After reading one of the randomly presented messages (i.e., “All dessert is bad,” “All dessert is good,” and “All dessert is food”), participants indicated the extent to which they agreed/disagreed on 1-5 point Likert scales that the message they saw was freedom-constraining, credible, and self-relevant (I also tested for a number of potential confounds; see Appendix A for the full list of questions). I measured participants' dietary restraint using the Restraint Scale (Herman and Polivy 1980).

Freedom-constraining. Consistent with my theorizing, dieters rated the message "All dessert is bad" as more freedom-constraining than the message “All dessert is good” ($b = –.70$, $t(393) = –2.75$, $p < .01$) or “All dessert is food” ($b = –.89$, $t(393) = –3.45$, $p < .01$). There was no difference in the feeling of freedom constraint among nondieters as a function of message ($p > .20$).

Self-relevance. Again, consistent with my theorizing that the freedom to choose food is more important to dieters than nondieters, the message "All dessert is bad" was more self-relevant to dieters than did nondieters ($b = 1.11$, $t(393) = 2.80$ $p < .01$). There was no difference between dieters and nondieters in their ratings of self-relevance of the

following messages: "All dessert is good," "All dessert is food," "All dessert tastes good but is bad for your health." ($p > .22$)

I also tested for other potential alternative explanations, such as persuasion knowledge, ambiguousness, and bias; consistent with my predictions, dieters and nondieters did not differ in their perceptions of the messages on these measures.

Method

Participants and design

Undergraduate business students (N = 380) participated in this study in exchange for course extra credit. Study 1a was a 3 (message: one-sided positive vs. one-sided negative vs. neutral) x dietary restraint (continuous) between-subjects design.

Procedure

Participants first read instructions stating that the researchers were interested in the relationship between students' handwriting and their personalities, and thus they should write down a sentence chosen randomly (by the computer) on paper. I adapted this task from Karl et al. (2009) to ensure that participants actually read and processed the message. Depending on experimental condition, participants received a negative message ("All dessert is bad."), a positive message ("All dessert is good."), or a neutral message ("All dessert is food."). I then asked participants questions about their personalities to make my cover study more believable. Next, in what was purportedly an unrelated study, participants indicated whether they had positive or negative thoughts about a series of words, including 20 healthy food, 20 unhealthy food, and 20 non-food words (e.g.,

broccoli, cookies, puppy, respectively; see appendix B for a full list of words). Participants pressed the “F” and “J” keys (labeled “pos” and “neg” on the keyboard) as quickly as they could to indicate whether they thought the word was positive or negative.

In the second task, I measured participants’ situational reactance, using the Hong Psychological Reactance Scale (HPRS; Hong and Faedda 1996). Sample items from this scale are “I become angry when my freedom of choice is restricted,” and “I feel frustrated when I am unable to make free and independent decisions.” Since my theory is based on participants’ situational (or state) reactance, I added words such as: “at present,” or “right now” to the original scale items. Examples are: "Right now I feel frustrated that I am unable to make free and independent decisions," or "At present I think when someone forces me to do something, I feel like doing the opposite." Participants then completed the restraint scale and other demographic questions. Sample items on the restraint scale are “How often do you diet?” and “In a typical week, how much does your weight fluctuate?”

Results

Because I predicted that participants who saw the positive and neutral messages would behave similarly to each other and differently from those who saw the negative message, I used the negative message as a baseline measure. I therefore created two dummy variables, representing the neutral message and positive message. Next, I mean-centered dietary restraint and performed a multiple-regression on situational reactance, reaction time to unhealthy food words, and number of positive thoughts with five independent variables: (i) two dummy variables to represent the positive and neutral

message, (ii) mean-centered dietary restraint, and (iii) the interactions of dietary restraint and each dummy variable.

Situational reactance. The simple effect of dietary restraint was significant (b = .48, $t(375) = 3.20$, $p < .001$), indicating that dieters exhibited higher reactance than nondieters. The effects of the positive and neutral message did not differ from the negative message ($p > .59$). However, the interaction of dietary restraint with the positive and neutral message significantly predicted situational reactance ($b = –.49$, $t(375) = –2.37$, $p < .05$ for positive and $b = –.52$, $t(375) = 2.36$, $p < .05$ for neutral). To probe this interaction, I conducted spotlight analyses for dieters (1 SD above the mean) and nondieters (1 SD below the mean; Fitzsimons 2008). Consistent with H1, dieters who saw the negative message scored higher on reactance than dieters who saw the positive message ($b = –.36$, $t(375) = –2.12$, $p < .05$) or the neutral message ($b = –.33$, $t(375) = –2.06$, $p < .05$). In contrast, there was no difference in reactance between nondieters who saw the positive or the neutral message and nondieters who saw the negative message ($ps > .19$). Further, I tested the slope of the dietary restraint effect in each message condition (Aiken and West 1991). The slope was significant in the negative message condition (b = .48, $t(375) = 3.20$, $p < .001$), but nonsignificant in the neutral and positive message condition ($ps > .77$). These results indicated that among those who saw the negative message, dieters scored higher on reactance than nondieters, and there was no difference in reactance among dieters and nondieters who received the neutral or positive message. Additionally, to identify the range of dietary restraint for which the simple effect of message condition was significant, I used the Johnson-Neyman technique (i.e., floodlight analysis; Spiller et al. 2013). The results showed that individuals with dietary restraint

scores greater than 2.73 (out of 4.5)[1] who saw the negative message scored higher on reactance than those who saw the positive message (b = –.29, t(375) = –1.94, p = .05). Moreover, individuals with dietary restraint scores greater than 2.70 who saw the negative message scored higher on reactance than those who saw the neutral message (b = –.31, t(375) = –1.96, p = .05).

Number of positive thoughts. The simple effect of dietary restraint was significant (b = 1.73, t(375) = 3.83, p < .001), indicating that dieters had more positive thoughts about unhealthy food than non-dieters. The effect of the negative message differed significantly from the positive and neutral message, indicating that participants who saw the negative message had more positive thoughts about unhealthy food than participants who saw the positive message (b = –1.21, t(375) = –3.33, p < .001) or the neutral message (b = –1.31, t(375) = –3.51, p < .001). More importantly, the interaction of dietary restraint with the positive and neutral message significantly predicted participants' number of positive thoughts (b = –1.99, t(375) = –3.19, p < .01 (for positive vs. negative); b = –1.42, t(375) = –2.11, p < .05 (for neutral vs. negative)). Consistent with H2 and as depicted in figure 1, dieters who saw the negative message had more positive thoughts about unhealthy foods than dieters who saw the positive message (b = –2.35, t(375) = –4.77, p < .001 (positive vs. negative)) or the neutral message (b = –2.12, t(375) = 4.05, p < .001 (neutral vs. negative)). These effects were nonsignificant among nondieters (ps > .37). Furthermore, simple slope analysis showed that the dietary restraint slope was significant in the negative message condition (b = 1.73, t(375) = 3.84, p

[1] The Dietary Restraint Scale includes 10 items, five of which are 5-point Likert scales and the other five of which are 4-point Likert scales. We calculated dietary restraint scores by averaging these items.

< .001), and nonsignificant in the neutral and positive message conditions (*ps* > .53). These results indicated that dieters who saw the negative message had more positive thoughts than nondieters who received the same message, and there was no difference in the number of positive thoughts between dieters and nondieters who saw the positive or neutral message. There was also no difference in the number of positive thoughts about healthy foods or the number of positive thoughts about neutral words across conditions (*ps* > .46). Furthermore, I did not find any significant effects of message condition or dietary restraint on reaction times (*ps* > .20). Additionally, to identify the range of dietary restraint for which the simple effect of message condition was significant, I again used the Johnson-Neyman technique. The results showed that individuals with dietary restraint scores greater than 2.05 who saw the negative message had more positive thoughts about unhealthy food than those who saw the positive message ($b = –.82$, $t(375) = –2.11$, $p = .04$). Moreover, individuals with dietary restraint scores greater than 1.99 who saw the negative message had more positive thoughts about unhealthy food than those who saw the neutral message ($b = –.87$, $t(375) = –1.98$, $p = .05$).

Insert figure 1 about here

Conditional process analysis. I conducted a test of moderated mediation using Hayes' (2013) model 7 with 10,000 bootstrapped samples. I used two dummy variables, representing the positive message and neutral message, with the negative condition as a baseline variable. As recommended by Hayes and Preacher (2014) and Spiller (2013), I followed the procedure to conduct a mediation analysis with a three-level categorical independent variable.

Negative message versus positive message condition. Although message condition had a significant impact on the number of positive thoughts, reactance did not mediate the effect of message condition on the number of positive thoughts for dieters when comparing the negative message to the positive message condition (est. coefficient of the indirect effect is .006 with a 95% CI inclusive of 0 [–.06, .13]), or when comparing the negative message to the neutral message condition (est. coefficient of the indirect effect is .007 with a 95% CI inclusive of 0 [–.07, .13]). However, as expected, reactance also did not mediate the number of positive thoughts for nondieters when comparing the negative message to the positive message condition (est. coefficient of the indirect effect is –.0025 with a 95% CI inclusive of 0 [–.10, .04]), or when comparing the negative message to the neutral message condition (est. coefficient of the indirect effect is –.0024 with a 95% CI inclusive of 0 [–.09, .04]).

Discussion

In this study, I found that one-sided negative food-related messages increased dieters' (vs. nondieters') situational reactance. These messages also led dieters to engage in message-opposing behavior. More specifically, the results showed that dieters (vs. nondieters) generated more positive thoughts about unhealthy food after viewing a one-sided negative (vs. positive or neutral) message. However, reactance did not mediate the effect of message condition on the number of positive thoughts among dieters, suggesting that other mediators are likely also involved in the process. I will discuss this issue in more detail in study 2.

STUDY 1B

The main purpose of study 1b was to demonstrate that one-sided negative messages can also influence dieters' actual food consumption. Additionally, study 1b increases the generalizability of my findings by using a different message manipulation. Because study 1a showed that there was no difference in reactance or number of positive thoughts about unhealthy food between participants in the one-sided positive and neutral message condition, I dropped the neutral message condition for this study.

Method

Participants and design

Undergraduate business students (N = 397) participated in this study in exchange for extra course credit. The design of this study was a 2 (message: one-sided negative vs. one-sided positive) x dietary restraint (continuous) between-subjects design.

Procedure

All participants wrote down their assigned message as part of a "handwriting task" as in study 1a. Participants received one of the following pretested messages: "All sugary snacks are bad" (one-sided negative) or "All sugary snacks are good" (one-sided positive). They then took part in an ostensibly unrelated study called "Snack and Movie Study," in which they watched a 3-minute movie clip about white-tailed deer, while eating Famous Amos mini-cookies in individual 58-gram packages. After watching the video clip, participants indicated how hungry they felt at the time of the experiment. Finally, they completed the situational reactance scale and answered several demographic

questions. Participants completed the restraint scale in a presurvey several weeks before the main study. Lab assistants collected the remaining cookies at the end of the study and weighed them inconspicuously in another room after each lab session.

Results

I created a dummy variable, representing the positive message versus the negative message. Next, I mean-centered dietary restraint and performed a multiple-regression on situational reactance and grams of cookies consumed with three independent variables: (i) a dummy variable to represent the positive and negative message, (ii) mean-centered dietary restraint, and (iii) the interactions of dietary restraint and the dummy variable.

Situational reactance. The simple effect of dietary restraint was nonsignificant. The simple effect of message condition was significant ($b = .20$, $t(393) = 2.11$, $p < .05$), indicating that participants who saw the negative message scored higher on situational reactance than those who saw the positive message. More importantly, the interaction of dietary restraint and message condition was significant ($b = .44$, $t(393) = 2.41$, $p < .05$). Consistent with H1, a spotlight analysis for dieters (+1SD above the mean) and nondieters (-1SD below the mean) found that dieters who saw the negative message scored higher on situational reactance than dieters who saw the positive message ($b = .44$, $t(393) = 3.21$, $p < .01$). This effect was nonsignificant among nondieters ($b = –.03$, $t(393) = –.22$, $p = .83$). Further, the slope of dietary restraint was significant in the negative message condition ($b = .33$, $t(393) = 2.46$, $p < .01$) and nonsignificant in the positive message condition ($b = –.10$, $t(393) = –.87$, $p = .39$). I conducted floodlight analysis as in study 1a. Individuals with dietary restraint scores greater than 2.24 who saw the

negative message scored higher on the situational reactance scale than those who saw the positive message (b = .19, t(393) = 1.96, p = .05).

Quantity consumed. I regressed grams of cookies consumed on dietary restraint, message condition, and their interaction. I included hunger as a covariate because past research suggested that hunger might influence the amount of food consumed in a taste test (e.g., Krishna, Morrin, and Sayin 2014). The covariate was significant (b = 3.99, t(392) = 4.04, p < .01), indicating that participants ate more cookies if they were hungrier, but it did not interact with the other variables. There was a simple effect of message condition (b = 4.98, t(392) = 2.42, p < .05), indicating that participants who saw the negative message consumed more cookies than those who saw the positive message. The simple effect of dietary restraint was nonsignificant (p = .51). More importantly, the interaction between message condition and dietary restraint was significant (b = 7.66, t(392) = 1.97, p = .05). Consistent with H2 and as depicted in figure 2, among dieters, those who saw the negative message consumed more cookies than those who saw the positive message (b = 9.05, t(392) = 3.11, p < .01). This effect was nonsignificant among nondieters (b = .90, t(392) = .30, p = .76). Furthermore, the dietary restraint slope was significant in the negative message condition (b = 5.94, t(392) = 2.05, p < .05), but not in the positive message condition (p = .51). Results from a floodlight analysis revealed that individuals with dietary restraint scores greater than 2.16 who saw the negative message consumed more grams of cookies than those who saw the positive message (b = 4.11, t(392) = 1.96, p = .05).

Insert figure 2 about here

Discussion

Consistent with my predictions, studies 1a and 1b demonstrated that how exposure to a one-sided negative message about unhealthy food can lead to a backfire effect among dieters. Not only did viewing such messages increase the number of positive thoughts dieters had about unhealthy food (study 1a), but it also increased the quantity consumed (study 1b). Nondieters, however, were unaffected by the one-sided negative messages.

STUDY 2

In study 2, I examine the effect of one-sided negative food messages on a new dependent variable: the simultaneous choice of snacks for the next fourteen days. In addition, I investigate the effects of two-sided messages, featuring both the negative and positive aspects of unhealthy food, on compliance. According to my pretest, dieters do not interpret the two-sided message as freedom constraining, and consistent with my predictions, they should therefore not exhibit backfire effects in response to it. Therefore, I expect dieters to be more likely to comply with two-sided messages than one-sided messages (H3).

Method

Participants and design

Undergraduate business students (N = 324) participated in this study, a 3 (message: one-sided negative vs. one-sided positive vs. two-sided) x dietary restraint (continuous) between-subjects design, for course credit.

Procedure

Similar to study 1a, participants received and wrote down one of three messages: "All dessert is bad," "All dessert is good," or "All dessert tastes good but is bad for your health." Participants then took part in an ostensibly unrelated study called "Snack Choice," in which they chose a snack for every day in the next two weeks from a list of five healthy snacks (e.g., whole wheat crackers) and five unhealthy snacks (e.g., Oreo cookies). In a pretest, participants from the same pool of undergraduate business students rated the healthy snacks as significantly healthier than the unhealthy snacks (M = 4.22 vs. M = 1.73, $t(19) = 12.50$, $p < .001$). Finally, participants completed the situational reactance scale, indicated how hungry they felt at the time of the experiment, and answered several demographic questions. Participants completed the restraint scale in a presurvey several weeks before the main study.

Results

As in study 1a, I used the negative message as a baseline variable and created two dummy variables, representing the positive message and two-sided message. I also mean-centered dietary restraint and performed a multiple-regression on situational reactance and number of unhealthy snack choices with five independent variables: (i) two dummy variables to represent the positive and two-sided message, (ii) mean-centered dietary restraint, and (iii) interactions of dietary restraint and each dummy variable.

Situational reactance. The simple effect of dietary restraint was significant (b = .65, $t(318) = 4.17$, $p < .001$), indicating that dieters scored higher on reactance than nondieters. The effect of the negative message significantly differed from the positive

message (b = –.30, t(318) = 2.44, p < .01), but did not differ from the two-sided message (p = .21), indicating that participants who saw the negative message scored higher on reactance than those who saw the positive message. More importantly, the interaction of dietary restraint with the positive and two-sided message significantly predicted reactance (b = –.55, t(318) = –2.30, p < .05 (positive vs. negative); b = –.65, t(318) = –2.88, p < .01 (two-sided vs. negative)). As depicted in figure 3 and consistent with H1, dieters who saw the negative message scored higher on reactance than those who saw the positive message (b = –.58, t(318) = –3.30, p < .01 (positive vs. negative)) or the two-sided message (b = –.50, t(318) = –2.91, p < .01 (two-sided vs. negative)). These effects were nonsignificant among nondieters (ps > .27). Further, the slopes were significant in the negative message condition (b = .65, t(318) = 4.17, p < .001), and nonsignificant in the two-sided and positive message conditions (ps > .57), indicating that among those who saw the negative message, dieters scored higher on reactance than nondieters. Moreover, there was no difference in reactance among dieters and nondieters who received the two-sided or positive message. These results suggest that individuals respond in similar (non-reactant) ways to the positive and two-sided messages because they are both perceived as non-freedom-constraining. I next conducted a floodlight analysis to identify the range of dietary restraint for which the simple effect of message condition was significant. The results showed that individuals with dietary restraint scores greater than 2.16 who saw the negative message scored higher on the situational reactance scale than those who saw the two-sided message (b = –.25 , t(318) = –1.93, p = .05). Moreover, those with dietary restraint scores greater than 2.39 who saw the negative message scored higher on the

situational reactance scale than those who saw the positive message (b = –.25, t(318) = –1.94, p = .05).

Insert figure 3 about here

Number of unhealthy snacks. I also included hunger as a covariate. The effect of the covariate was significant (b = .36, t(317) = 2.11, p < .05), indicating that hungrier participants chose more unhealthy snacks. The simple effect of dietary restraint was significant (b = 2.41, t(317) = 3.36, p < .01), indicating that dieters chose more unhealthy snacks than nondieters. Additionally, participants who saw the negative message chose marginally more unhealthy snacks than those who saw the positive message (b = –.94, t(317) = 1.61, p = .11) and chose significantly more unhealthy snacks than those who saw the two-sided message (b = –1.31, t(317) = –2.31, p < .05). More importantly, the interaction of dietary restraint with the positive and two-sided message significantly predicted number of unhealthy snacks chosen (b = –2.61, t(317) = –2.37, p < .05 and b = –4.37, t(317) = –4.17, p < .001). As depicted in figure 4 and consistent with H2, dieters who saw the negative message chose more unhealthy snacks than dieters who saw the positive message (b = –2.32, t(317) = –2.82, p < .01 (positive vs. negative)). Moreover, in support of H3, dieters who saw the two-sided message chose fewer unhealthy snacks than dieters who saw the negative message (b = –3.62, t(317) = –4.55, p < .001). These effects were nonsignificant among nondieters (ps > .20). Results from a floodlight analysis showed that individuals with dietary restraint scores greater than 2.33 who saw the negative message chose more number of unhealthy snacks than those who saw the positive (b = –1.14, t(317) = –1.95, p =.05). Moreover, individuals with dietary restraint

scores greater than 2.12 who saw the negative message chose more number of unhealthy snacks than those who saw the two-sided message ($b = –.09$, $t(317) = –1.98$, $p = .05$).

Consistent with my results in studies 1a and 1b, the dietary restraint slope was significant in the negative message condition ($b = 2.41$, $t(317) = 3.36$, $p < .01$), and nonsignificant in the positive message ($p = .81$). The dietary restraint slope was significant and negative in the two-sided message condition ($b = –1.96$, $t(317) = –2.57$, $p < .05$), indicating that among those who saw the two-sided message, dieters chose fewer unhealthy snacks than nondieters, suggesting that dieters are more likely to comply (rather than react) to a message that characterizes both the positive and negative aspects of unhealthy food consumption. Additionally, consistent with the other studies, there was no difference in the number of unhealthy snacks chosen by dieters and nondieters who saw the positive message.

Insert figure 4 about here

Conditional process analysis. I conducted a test of moderated mediation using Hayes' (2013) model 7 with 10,000 bootstrapped samples as I did in study 1a. I again used two dummy variables, representing the positive message and two-sided message, with the negative condition as a baseline variable. In support of my prediction, reactance mediated the effect of a one-sided negative message on unhealthy food behaviors among dieters (but not among nondieters).

Negative message versus positive message condition. Based on 10,000 bootstrap samples, for dieters, reactance mediated the effect of message condition on unhealthy

choices (est. coefficient of the indirect effect is –.26) with a 95% confidence interval (CI) exclusive of 0 [–.67, –.04]. For nondieters, however, reactance did not mediate the effect of message condition on unhealthy choices (est. coefficient of the indirect effect is –.10 with a 95% CI inclusive of 0 [–.48, .08]).

Negative message versus two-sided message condition. Based on 10,000 bootstrap samples for dieters, reactance mediated the effect of message conditions on unhealthy choices (est. coefficient of the indirect effect is –.23) with a 95% CI, exclusive of 0 [–.65, –.02]. For nondieters, however, reactance did not mediate the effect of message condition on unhealthy choices (est. coefficient of the indirect effect is .04 with a 95% CI, inclusive of 0 [–.16, .33]. In other words, the negative message affected unhealthy snack choices only among dieters.

Discussion

Although I conducted mediation analyses in all three studies, I could only establish mediation for study 2. According to Zhao, Lynch and Chen (2010), these mixed findings suggest that another mediator is likely involved in the process. It may be the case that additional mediators are at work in driving the more automatic responses measured as dependent variables in Studies 1a and 1b (i.e., number of positive thoughts and grams of cookies consumed), but that reactance is the only mediator underlying the more deliberate measure of simultaneous snack choice in Study 2, where participants consciously planned their eating behavior for the next two weeks. I leave it to future research to investigate this issue more closely to see if the role of reactance may be stronger for some behavioral responses versus others.

GENERAL DISCUSSION

This paper builds on research on reactance (Brehm 1961) to demonstrate the conditions under which one-sided messages about unhealthy food, like those put forth by the food police, can backfire. Across three studies, I demonstrate that whereas nondieters rely on internal cues such as hunger to guide their food decision making, dieters are insensitive to such cues. Rather, to control their weight, dieters rely on external cues to make decisions on what and how much they should eat. As a result, a one-sided negative message about unhealthy food results in message-opposing behavior among dieters. When dieters see such a message, they feel their food choices are being constrained, thereby activating the motivation to reassert their freedom of choice by consuming more (rather than less) unhealthy food. Nondieters showed no difference in reactance across conditions, suggesting that nondieters are insensitive to external food cues and do not respond to such cues.

This work also contributes to the existing literature on the impact of mindlessness on eating decisions (Van Ittersum and Wansink 2016) by showing that in the food domain, dietary restraint is an important factor that determines how consumers will process food-related messages. Whereas dieters perceive one-sided, negative messages about unhealthy food as freedom-constraining, nondieters do not exhibit the same response. Instead, nondieters perceive negative, positive and even two-sided messages as all being informative rather than freedom-constraining, and yet they do not allow these messages to affect their food choices. This finding is important, for as my work demonstrates, when consumers feel their freedom to choose is being restricted, they will react against the message and engage in message-opposing behavior.

Implications for advertisers and public policy makers

These findings also have implications from a public policy perspective. One-sided messages are used widely to disseminate information that raise public awareness in an effort to change public attitudes and behaviors toward unhealthy food consumption. Given the rising rates and costs of obesity in the U.S., it is important for public policy makers to understand how consumers view and process information disseminated by public agencies and/or the food police. It is clear that policy makers cannot assume that all anti-unhealthy food PSAs will work effectively. Instead they should pay careful attention to the content of the message. This research illustrates the conditions under which one-sided messages about food, which are supposed to help consumers make better food decisions, can backfire, especially among the most vulnerable populations.

Specifically, the current work shows that when consumers view messages as freedom-constraining, they will engage in message-opposing behavior. This is particularly problematic, as it is often unclear which messages will be interpreted as such. While my work demonstrates that dieters are more inclined to perceive negative, one-sided messages about unhealthy foods as constraining their freedom of choice, it is less clear whether there might also be cases where even nondieters feel that a message is trying to constrain their freedom. Additionally, the results of Study 2 indicate that dieters do not perceive two-sided messages to be as freedom-constraining as one-sided messages, but it seems possible that if the negative aspects of the message were stronger than the positives, that even a two-sided message might lead dieters to feel restricted. Regardless, testing focal messages to see if the intended audience feels constrained would be highly beneficial before launching a new campaign.

My paper shares both similarities and differences with Hansen et al.'s (2010) study of smokers. Specifically, Hansen et al. (2010) found that among people for whom smoking is a source of self-esteem, death-related warnings on cigarette labels increase positive attitudes toward smoking (through a mortality salience process). In my paper, I found that among people who restrain their diet, a one-sided negative message about unhealthy food increases liking and consumption of such food (through a psychological reactance process). On one hand, both heavy smokers and dieters are highly involved with and emotional about the studied products. On the other hand, the psychological processes underlying these results are quite different.

Limitations and future research

My research also has several limitations. First, the restraint scale might not be capturing all dimensions of the participants' dieting behaviors, such as whether they are long-term or short-term dieters, whether they attempt to track and/or moderate their overall consumption quantities without regard to food quality (e.g., calorie counting), or whether they attempt to avoid certain food groups (e.g., low fat or low carb). For example, Papies, Stroebe, and Aarts (2008) demonstrated that there are two types of dieters: successful ones and unsuccessful ones. One of the differences between the two types of restrained eaters is that food cues activate the dieting goal in successful restrained eaters but inhibit the dieting goal in unsuccessful restrained eaters. Therefore, it is likely that our message-opposing findings will be stronger for unsuccessful restrained eaters than for successful ones. In addition, it is possible that manipulating dietary restraint (Holden and Zlatevska, 2015) rather than measuring it might produce the same (or an even stronger) effect than I found in our studies.

Future research should also explore whether one-sided negative messages or two-sided messages can exert an influence on certain types of nondieters. Some nondieters are highly involved with and emotional about eating (e.g., foodies), but they may not restrict their intake because they do not need to lose weight. While many nondieters do not respond to one-sided messages because they make their eating choices based on hunger rather than external cues (e.g., Gal, forthcoming), it is possible that people who love food but do not need to lose weight might exhibit reactance to such messages.

Second, my findings say nothing about how consumers will react to food messages from different sources. Future research should explore how varying sources of one-sided messages influences the dual-processes of reactance and attitude certainty. For instance, how will individuals react to one-sided negative food messages from friends or family members, from the government, or from advertisers? Will the perceived similarity between the message receiver and the communicator be sufficient to reduce backfire effects? Will the backfire effects be stronger when the message comes from liked versus disliked communicators?

Third, there are other types of message content that might influence my findings. For example, I found preliminary evidence (in study 2) that two-sided messages might be more effective than either negative or positive one-sided messages in curbing unhealthy eating among dieters. Future research should further investigate this phenomenon. It is also possible that other types of messages that are not so specifically limiting, such as "Do the right thing" may produce less backlash.

Fourth, future research may aim to better understand whether the effects presented in this paper are different across cultures. For example, Markus and Schwartz (2010) postulated that to American people, personal freedom and choice are very important aspects of daily life. However, for non-Westerners or working-class Westerners, freedom and choice do not have the same meaning and importance as they do for educated people. Consistent with this idea, studies show that people from an individualistic cultural background demonstrate more reactance to a threat to their individual freedom, while people from a collectivistic cultural background feel more reactance to a threat to their collective freedom (Jonas et al 2009). A one-sided negative message about unhealthy food is more likely to threaten individual freedom rather than collective freedom. Furthermore, all of my participants were undergraduate university students, for whom establishing an independent identity is important (Peterson 2001), and it is possible that older individuals would be less susceptible to threats to freedom of choice. In other words, it is possible that the reactance effect of one-sided negative messages would only hold true for residents of Western, educated, industrialized, rich and democratic (WEIRD) societies (Henrich, Heine, and Norenzayan, 2010).

Fifth, self-affirmation (Aronson, Cohen, and Nail 1999; Steele 1988) might play a role in how consumers respond to one-sided negative messages. The act of self-affirmation can help individuals to cope with threat or stress. Hence, it is possible that dieters who have an opportunity to self-affirm (e.g., by reflecting on values that are important to them) prior to exposure to one-sided negative messages may be less likely to perceive that their freedom to choose is limited, reducing their likelihood to engage in message-opposing behaviors. Future research should explore this possibility.

Finally, there might be additional individual differences (e.g., self-efficacy, self-esteem) that moderate the effectiveness of one-sided messages. For example, consumers who have high self-esteem may perceive these types of messages as more freedom-constraining than those who have low self-esteem. I encourage future research to identify other individual differences that might impact feelings of freedom constraint.

ESSAY 2

CONSUMER REACTIONS TO PRO-GMO MESSAGES: THE ROLE OF MEMORY ACCESSIBILITY AND ATTITUDE STRENGTH

INTRODUCTION

GMOs are the result of a laboratory process where genes are taken from one species and inserted into another in an attempt to obtain a desired trait or characteristic. In the second essay, I explore how pro-GMO messages claiming that GMOs are safe for human health (safety claims) backfire among strong anti-GMO consumers. Currently in the U.S., a huge proportion of the most commonly grown commodity crops, such as soybeans, sugar beets, and corn, are genetically engineered. A lot of processed foods on supermarket shelves – from pizza to salad dressing, chips to soda – contain GMO ingredients. GMO safety remains hotly debated throughout the world. Many consumers believe that GMOs are bad for their health, or even poisonous, in spite of overwhelming scientific evidence suggesting that GMOs are safe to eat. The U.S. government currently has no laws requiring labeling of GMOs, although many consumers prefer GMO labeling according to Consumer Reports (2015). The major arguments for mandatory GMO retail food labeling are that consumers have the right to know what ingredients are in their processed foods so they can decide whether or not they want to consume foods containing GMOs (Cohen 2013 and Kimbrell 2013). On the other hand, the major argument against mandatory labeling is that labeling can mislead and falsely alarm consumers (Pinholster 2012). Public agencies (e.g., the Food and Drug Administration) and institutions (e.g., the American Medical Association) have concluded that GMOs are as safe as those foods produced through traditional breeding (Fox 2015 and Bailey 2013). Government and public agencies strive to communicate positive information about GMOs, hoping that they can change consumer perceptions of GMOs. However, to the

best of my knowledge, there is little research looking at the effectiveness of these pro-GMO messages.

In this research, I explore how anti-GMO consumers process and respond to pro-GMO messages. Specifically, I examine conditions under which safety messages claiming that GMOs pose no threat to human health backfire among certain anti-GMO consumers, causing them to engage in behaviors that are opposite of the message. Even though such messages present positive information about GMOs (e.g., GMOs are safe), I show that anti-GMO consumers who have a strong attitude toward GMO issues respond to such messages negatively. Drawing on the attitude strength and memory accessibility literatures, I hypothesize that when a strong anti-GMO consumer encounters a safety message claiming that GMOs are safe, this message will actually activate consumer thoughts about the risks of GMOs, leading to an increase in risk perception. Consequently, the consumer has a more unfavorable attitude toward GMOs and s/he will be more likely to try to avoid GMOs. In contrast, when a strong anti-GMO consumer encounters a benefit message claiming that GMOs are beneficial (e.g., GMOs contain better nutritional value), this message will make the consumer's thoughts about the benefits of GMOs more accessible, leading him/her to perceive lower risk from consuming GMOs. As a result, the consumer will have a more favorable attitude toward GMOs and will be less likely to avoid GMOs. I also hypothesize that a weak anti-GMO consumer does not have a strong association between GMOs and risk of GMOs stored in his/her memory. As such, s/he will form evaluative judgments about GMOs based on the content of the message s/he receives. Therefore, s/he will respond positively to either a safety claim or a benefit claim.

It is noteworthy that in this research I focus exclusively on how anti-GMO consumers respond to pro-GMO messages (vs. how pro-GMO consumers respond to anti-GMO messages) for two reasons. First, my research aims to provide researchers and policy makers insight into how anti-GMO consumers change their attitudes after encountering different pro-GMO messages. Currently, the only GMO-related PSAs produced by policy-makers are pro-GMO. Moreover, according to a recent survey, nearly two-thirds of Americans are anti-GMO (Funk and Rainie 2015). Thus, it is important to explore how this group of consumers process and evaluate pro-GMO messages.

The current work also contributes to the attitude and memory accessibility literatures in several important ways. My research sheds light on how attitude strength plays a key role in the determination of how consumers respond to pro-GMO messages. Weak anti-GMO consumers are more likely to comply with pro-GMO messages regardless of whether the contain safety claims or benefit claims. In contrast, strong anti-GMO consumers only comply with the benefit claims and do the opposite to what is suggested by the safety claims. Previous research suggests that when consumers encounter negative information telling them not to engage in an unhealthy behavior (e.g., smoking, unhealthy eating), they do the opposite. This lack of compliance is due to defensive processing (Liberman and Chaiken 1992) or psychological reactance (Pham, Mandel, and Morales 2016). In this study, I propose another process through which backfiring effects can occur: attitude accessibility. More specifically, I propose and demonstrate that strong anti-GMO consumers engage in message-opposing behaviors

after seeing safety claims because they make the risk of GMOs more accessible in consumer minds, resulting in higher perceived risk.

Last but not least, my research carries important implications for government and public agencies. It is important for public policy makers to understand how consumers view and process information disseminated by public agencies and/or the food police. It is clear that policy makers cannot assume that all pro-GMO PSAs will work effectively. Instead they should pay careful attention to the content of the message. It actually may be more effective if public agencies make use of benefit claims because my research shows that they work well with both weak and strong anti-GMO consumers.

THEORETICAL BACKGROUND

Memory accessibility and attitude strength

The accessibility-diagnosticity framework by Feldman and Lynch (1988) suggested that consumers use the information that is accessible in memory to make judgments and decisions. In particular, the researchers demonstrated that memory accessibility affects how consumers use prior cognition as an input to a later related judgment. The more accessible the information is, the more easily it can come to mind. Memory accessibility is a function of the frequency and recency of activation of information (Higgins 1989), and incoming information may serve as a cue to activate thoughts that have been processed earlier. For example, Raghubir and Menon (1998) showed that advertisements increasing the accessibility of a cause of AIDS can positively influence the perceived risk of contracting AIDS. More specifically, they demonstrated

that when participants recalled different ways in which HIV is transmitted, they perceived a higher risk of AIDS and had more favorable attitudes and intentions toward practicing safe sex. In another example, Tybout, Calder, Sternthal (1981) found that when consumers were exposed to a rumor linking an object (McDonald's) to an attribute (worm meat), they stored this association in their memory. When they processed new information arguing that McDonald's does not use worm meat, they first needed to retrieve their thoughts from memory about McDonald's and worm meat. This process activated the stored information and made it more accessible in consumers' minds. While the purpose of the new information was to weaken the link between McDonald's and worm meat, in this case it actually strengthened the link by reinforcing the association. In light of the memory accessibility literature, Maio and Olson's (1998) research on dissimulation suggests that expressing attitudes that are opposite to one's attitudes will make his/her own attitudes more accessible, influencing subsequent judgments and behaviors. According to the authors, since lying involves a conscious intention, dissimulating about one's attitude will first need to activate his/her true attitude. A repeated activation of one's attitude results in increased accessibility of that attitude. In summary, this stream of research supports the notion that when information stored in consumers' memories is activated and made more accessible, it can influence consumers' related attitudes, perceptions, and behaviors.

Researchers have demonstrated that consumer attitudes are cognitively represented in memory and may be directly or automatically activated in the presence of an attitudinal cue (Bargh, Chaiken, Govender, and Pratto 1992). When compared to those who hold weak attitudes, consumers who hold a strong attitude toward an issue have a

strong link between their attitude and the issue. Thus they can easily retrieve this association from their memory. They also have better knowledge about the issue and perceive the issue as very important to them personally. Early research posits that during an attitude response process, consumers retrieve and use stored evaluations from long-term memory (Achen 1975; Hyman and Sheatsley 1947). Thus, this view suggests that attitudes are quite stable over long periods of time. Yet more recent research has cast doubt on this notion. Ample evidence suggests that consumer attitudes at a given time are constructed based on the information that is most accessible at that time. In other words, consumers do not store evaluative judgments but relevant information and feelings about an issue in their memory. During an attitude response process, they combine their stored thoughts/feelings together with the momentarily accessible information to form judgments (Feldman and Lynch 1988; Lavine et al. 1998; Wilson, Hodges, and LaFleur 1992). An implication of this perspective is that the process underlying consumer attitudinal response involves both introspection processes (i.e., informally examining one's own internal thoughts and feelings) and the external context within which the attitude is expressed (Lavine et al. 1998).

In light of this literature, I posit that when anti-GMO consumers are exposed to a pro-GMO message, they will reflect on their knowledge about GMOs and will integrate it with contextual factors, such as message content, to form evaluative judgments toward GMOs. The newly formed attitude may be similar to or different from the existing attitude. I further propose that a consumer's attitude strength will determine how s/he respond to pro-GMO messages. Past studies have shown that when consumers hold strong attitudes, they are more resistant to persuasive attack (Krosnick and Abelson 1992;

Swann, Pelham, and Chidester 1988) and will be more persistent over time (Bassili 1996; Bizer et al. 2006). Moreover, attitude strength helps keep behaviors associated with that attitude more stable (Fishbein and Ajzen 1975). In addition, numerous studies have shown that a higher degree of attitude strength increases behavioral intentions that are consistent with the attitude (Clarkson, Tormala, and Rucker 2008; Fazio and Zanna 1978; Tormala and Petty 2002). Strong attitudes also lead to effortful cognitive processing (Cacioppo, and Schumann 1983; Anand and Sternthal 1990). In contrast, weak attitudes are not persistent over time and lead to nonthoughtful inference processes (Petty, Cacioppo, and Schumann 1983). Additionally, as discussed earlier, when consumers have to indicate their attitude toward an issue at a specific time, they use their stored thoughts and feelings as well as momentarily accessible information to form their responses. Thus, I propose that when receiving a pro-GMO message, consumers will process the message differently depending on their attitude strength. In particular, since weak anti-GMO consumers do not care deeply about GMOs and do not have solid knowledge about this issue, they tend to rely on the information presented in the message to form their judgments about GMOs. In contrast, since strong anti-GMO consumers care deeply about GMOs and have a lot of knowledge about this issue, they tend to rely both on their stored thoughts and feelings as well as on the information presented in the message. Therefore, the content of a pro-GMO message also plays an important role in determining how consumers respond to such a message.

Generally speaking, there are two broad types of pro-GMO messages: safety claims and benefit claims. Safety claims are messages that highlight the safety of GMOs, such as messages that claim GMO foods are safe for consumption. Benefit claims, on the

other hand, are messages that emphasize some of the benefits of GMOs, such as GMOs contain higher nutritional value. I further propose that these two message types will have a differential impact on strong anti-GMO versus weak anti-GMO consumers. Specifically, since weak anti-GMO consumers are more likely to rely on message content to form evaluative judgments, both a safety claim and a benefit claim presenting positive information about GMOs will positively influence their attitudes toward GMOs. Conversely, strong anti-GMO consumer responses to a pro-GMO message are a function of their existing thoughts/feelings about GMOs and the message content. On the one hand, a safety claim may activate risk perceptions from strong anti-GMO consumers, leading them to form more unfavorable attitudes toward GMOs. On the other hand, a benefit claim may make thoughts about the benefits of GMOs more accessible, leading strong anti-GMO consumers to have more positive attitudes toward GMOs. In the next section, I will discuss in more detail why different types of pro-GMO messages can activate different thoughts and feelings among strong anti-GMO consumers.

Consumers' perceptions of GMOs

The GMO debate has been extremely polarized with two distinct groups: anti-GMO and pro-GMO groups. Research has shown that health risks are one of the top reasons why consumers avoid GMOs. People in the anti-GMO group believe that GMOs could pose serious risks to human health, including cancer, organ damage, and allergies (e.g., Peeples 2012). Consumer perception of risks is complicated and driven by the personality characteristics of risk. The more unknown the risk is (i.e., the extent to which a risk is unknown, unfamiliar, and has delayed consequences), the more consumers try to avoid it. Since GMOs and DNA technologies are relatively new, many consumers believe

that scientists fail to estimate the risk accurately. Therefore, they perceive they have higher risk. Moreover, past research has shown that whether exposure to a risk is voluntary is also an important factor influencing consumer risk perception. Starr (1969) posits that individuals are willing to accept risks from voluntary activities (e.g., skiing) that are much greater than they would accept from involuntary risks (e.g., food additives). Because GMOs are not labeled, GMOs are characterized by many consumers as an involuntary risk, leading such consumers to be less likely to accept the risk.

On the other hand, people in the pro-GMO group believe that GMOs are safe to eat because research has not shown any evidence of harmful health effects resulting from the consumption of GMOs. They also point out that GMOs are beneficial because they help solve important problems, such as keeping food prices affordable, feeding a growing population, and producing healthier and tastier fruits and vegetables. The government and public agencies have been trying to improve consumer perceptions about GMOs by presenting scientific evidence that GMO technology is as safe as traditional breeding methods. Alternatively, they highlight the benefits of GMOs to human lives (e.g., the Golden Rice project), hoping such messages will results in anti-GMO consumers having more favorable attitudes toward GMOs. Through everyday interactions with others, anti-GMO consumers, especially those who have strong attitudes toward GMOs have stored in their memory both information about the risks and benefits of GMOs. However, to anti-GMO consumers, the benefits still outweigh the risks, thus resulting in negative perceptions that cause them to avoid GMOs.

When consumers see a message about GMOs, in order to evaluate it, they first need to retrieve their thoughts and feelings about GMOs which are stored in their

memory. I propose that since weak anti-GMO consumers do not store a lot information in about GMOs in their memory, when they encounter a pro-GMO message, they are not able to retrieve their existing thoughts and feelings about GMOs. Instead, they depend on the contents of the pro-GMO message to form evaluative judgments about GMOs. Thus, a safety or benefit claim presenting positive information about GMOs will be evaluated favorably by a weak anti-GMO consumer, leading him/her to perceive lower risk from GMOs. As a result, the weak anti-GMO consumers will have more favorable attitudes toward GMOs and will be less likely to avoid GMOs. For instance, s/he also has higher intentions to consume GMOs or is willing to pay more for products made with non-GMO ingredients.

H1a: Weak anti-GMO consumers will have lower risk perceptions about GMOs when they encounter a safety claim or a benefit claim versus a neutral message.

H1b: Weak anti-GMO consumers will evaluate GMOs more positively and will be less likely to avoid GMOs when they encounter a safety claim or a benefit claim versus a neutral message.

In contrast, when strong anti-GMO consumers, who have previously stored information about GMOs in memory, encounter a pro-GMO message, they will depend not only on the existing information in memory but also on the contents of the pro-GMO message to form their judgments. I further propose that a safety message claiming that GMOs pose no risk to human health can actually activate strong anti-GMO consumers' thoughts of the risk of GMOs, thereby strengthening their belief that GMOs are not safe. Even though the purpose of the safety claim is to lower consumer risk perception, it

actually backfires by heightening the association between GMOs and risk for strong anti-GMO consumers. As a result of an increase in risk perceptions, the consumer will have a less favorable attitude toward GMOs and will be more likely to avoid GMOs. For example, s/he will have a lower intention to consume GMOs or be willing to pay more for products made with non-GMO ingredients.

H2a: Strong anti-GMO consumers will have higher risk perceptions about GMOs when they encounter a safety claim versus a neutral message.

H2b: Strong anti-GMO consumers will evaluate GMOs more positively and will be more likely to avoid GMOs when they encounter a safety claim versus a neutral message.

Further, I posit that a benefit claim will be more effective than a safety claim in persuading strong anti-GMO consumers. The reason is that a benefit claim activates their thoughts and feelings about the benefits of GMOs, making them more accessible in their memories. As a result, the strong anti-GMO consumers will have lower risk perceptions about GMOs when s/he receives a benefit claim. Moreover, s/he will have more favorable attitudes toward GMOs and will be less likely to avoid GMOs.

H3a: Strong anti-GMO consumers will have lower risk perceptions about GMOs when they encounter a benefit claim versus a neutral message.

H3b: Strong anti-GMO consumers will evaluate GMOs more positively and will be less likely to avoid GMOs when they encounter a benefit claim versus a neutral message.

I tested my hypotheses across four experiments. In study 1a and 1b, I explore the effect of a safety claim on anti-GMO participants' intentions to purchase GMOs and their willingness to pay more for products made with non-GMO ingredients (H1b and 2b). In study 2, I demonstrate that a safety claim can reduce perceived risk among weak anti-GMO consumers but increase perceived risk among strong anti-GMO consumers (hypothesis 1a and 2a). Finally, in study 3, I show that a benefit claim is more effective than a safety claim because it can help reduce risk perceptions among both weak anti-GMO and strong anti-GMO consumers, leading them to evaluate GMOs more positively and making them less willing to pay for products made with non-GMO ingredients (hypothesis 3a and 3b).

STUDY 1A

The purpose of study 1a was to explore how anti-GMO consumers respond to a safety claim. Specifically, I tested whether a safety claim increased intentions to consume GMOs among weak anti-GMO participants but reduced this intention among strong anti-GMO participants. To do so, I first presented participants with either a safety claim or a neutral message. The safety claim indicated that foods derived from GMO plants are safe to eat, while the neutral message discussed the world's demand for food (see appendix C). I then measured participants' intention to consume GMOs in the next week.

Method

Participants and design

Participants on Amazon Mechanical Turk (N = 108) were compensated $1 to complete the study online. The design of this study was a 2 (message: safety claim vs. neutral message) x attitude strength (strong vs. weak) between-subjects design.

Procedure

I recruited participants via Amazon Mechanical Turk. First, I screened participants by asking them whether they were pro-GMO or anti-GMO. Since my research only focused on how anti-GMO consumers responded to pro-GMO messages, only those who indicated that they were anti-GMO could continue to the next task of the study. I then measured participants' attitude strength by asking them to indicate "Whether or not the issue of GMOs is important to you personally" (0 = No, it's not important at all and 1 = Yes, it's very important). Next, I showed participants either the safety claim or the neutral message, depending on their condition. I then asked them to summarize the message they received to ensure that they actual read and processed the message. At the end of the experiment, I asked participants some other questions, including "What is the likelihood that you will consume GMO foods in the next week?" (1 = Very unlikely to 7 = Very likely).

Results

I conducted an analysis of variance (ANOVA) using participants' intention to purchase GMOs in the next week as the dependent variable. Using the message condition and attitude strength as the between-subject factors, the analysis revealed a main effect of attitude strength ($F(1, 104) = 29.23$, $p < .001$). Strong anti-GMO participants had a lower intention to purchase GMOs than weak anti-GMO participants ($M_{strong} = 4.09$ vs. $M_{weak} =$

2.79). The main effect of the message condition was nonsignificant (p = .98). More importantly, there was a significant interaction between the message condition and attitude strength on intention to consume GMOs ($F(1, 104) = 8.88$, $p < .01$). As depicted in figure 5, strong anti-GMO participants had lower intent to consume GMOs when they saw the safety claim than when they saw the neutral message ($M_{safety\text{-}claim}$= 2.44 vs. $M_{neutral}$ = 3.14, $F(1, 104) = 4.17$, $p < .05$). In contrast, weak anti-GMO participants had a higher intention to purchase GMOs when they saw the safety claim than when they saw the neutral message ($M_{safety\text{-}claim}$= 4.45 vs. $M_{neutral}$ = 3.72, $F(1, 104) = 4.78$, $p < .05$).

Insert figure 5 about here

Discussion

In this study, I found that when strong anti-GMO participants received a safety claim, they reacted to the message by doing the opposite of the intended message. Particularly, they had a lower intention to consume GMOs as compared to strong anti-GMO participants who received a neutral message. In contrast, weak anti-GMO participants were more likely to comply with the message. Particularly, weak anti-GMO participants who received the safety claim (vs. the neutral message) increased their intentions to consume GMOs. In summary, the results of this study provides preliminary support for my hypothesis 1b and 2b.

STUDY 1B

The purpose of study 1b was to explore how anti-GMO consumers responded to a safety claim with a different dependent variable: participants' willingness to pay more for products made with non-GMO ingredients. I also added a risk claim condition in this study, in which participants received a message claiming that GMOs are not safe for human health. Moreover, I measured participants' attitude strength as a continuous variable instead of using a dichotomous variable as I did in study 1a. I first presented participants with one of three messages: a safety claim, a risk claim, and a neutral message. I then measured participants' willingness to pay more for products that do not contain GMO ingredients (vs. the same counterparts that do contain GMO ingredients).

Method

Participants and design

Participants on Amazon Mechanical Turk (N = 395) were compensated $1 to complete the study online. The design of this study was a 3 (message: safety claim vs. risk claim vs. neutral) x attitude strength (continuous) between-subjects design.

Procedure

At the beginning of the study, I told participants that I was interested in people's attitudes toward GMOs. Participants then read a short description of GMOs: "Genetically modified foods or GMO foods are foods produced from organisms that have had specific changes introduced into their DNA using the methods of genetic engineering." In the first task, I asked participants to indicate whether they had a favorable or unfavorable attitude

toward GMOs. Participants then completed a subjective measure of their attitude strength toward GMOs. This measure includes six items capturing three dimensions: accessibility, importance, and knowledge (see appendix D). Sample items from this scale are: "How easily does your attitude come to mind when you encounter issues about GMO foods?", "How much do you personally care about the issues related to GMO foods?", and "How well informed are you about GMO food issues?" In the second task, depending on the experimental condition, I randomly assigned participants to receive one of three messages: a safety claim, a risk claim, or a neutral message (see appendix E). Those who were in the safety claim condition received a message saying that independent researchers and international scientific agencies have suggested that GMO foods do not pose any risks to our health and that they are as safe as those foods produced through traditional breeding. Those who were in the risk claim condition received a message saying that animal studies and human studies have shown that GMOs can cause long-term problems and various diseases. Those who were in the neutral message condition received a message about the process of insect pollination.

I asked participants to type the message down word for word in a box provided in order to ensure that participants actually read and processed the message. Finally, I showed participants different consumer products and their prices (e.g., pizza, ice cream, mixed nuts, etc.) and then asked them to indicate how much more they were willing to pay for the same products made with non-GMO ingredients. As my key dependent variable, participants could choose to pay from 0% to 100% more.

Results

Since I am only interested in anti-GMO participants, I dropped 132 participants who indicated that they had a favorable attitude toward GMOs. There were 263 participants included in my data analysis. I used the neutral message as a baseline variable and created two dummy variables, representing the pro-GMO message and anti-GMO message. I mean-centered attitude strength and performed a multiple-regression on participants' willingness to pay more for products made with non-GMO ingredients with five independent variables: (i) two dummy variables to represent the safety claim and the risk claim, (ii) mean-centered attitude strength, and (iii) interactions of attitude strength and each dummy variable.

Willingness to pay more for products made with non-GMO ingredients. The main effect of attitude strength was significant (b = .04, $t(257)$ = 2.36, p < .05), indicating that strong anti-GMO participants are willing to pay more for products made with non-GMO ingredients. More importantly, the interaction of attitude strength with the risk claim significantly predicted participants' willingness to pay more for products made with non-GMO ingredients (b = .08, $t(257)$ = 3.22, p < .01). To probe this interaction, I conducted spotlight analyses for strong anti-GMO participants (1 SD above the mean) and weak anti-GMO participants (1 SD below the mean; Fitzsimons 2008). As depicted in figure 6, when strong anti-GMO participants saw the safety claim (vs. a neutral message), they were willing to pay more to avoid GMOs (b = .08, $t(257)$ = 2.33, p < .05). In contrast, when weak anti-GMO participants saw the safety claim (vs. a neutral message), they were less willing to pay to avoid GMOs (b = – .08, $t(257)$ = –2.47, p < .05), indicating message compliance.

Moreover, there was no difference in the willingness to pay more to avoid GMOs among strong anti-GMO participants who received the risk claim versus the safety claim. My proposed theoretical framework can explain this nonsignificant effect. The risk message claiming that GMOs are not safe to eat activates strong anti-GMO participants' thoughts about the risks of GMOs exactly the same way as the safety claim does. Therefore, strong anti-GMO participants who receive the risk claim are willing to pay just as much more to avoid GMOs as those who receive the safety claim.

Insert figure 6 about here

Discussion

Consistent with my predictions, study 1b demonstrated that exposure to a safety claim can backfire among strong anti-GMO participants, but lead to message compliance among weak anti-GMO participants. More specifically, when encountering a safety claim, strong anti-GMO participants were more likely to pay more to avoid GMOs, but weak anti-GMO participants were less likely to pay more to avoid GMOs. Consistent with study 1a, this study provides support for my hypothesis 1b and 2b.

STUDY 2

The purpose of study 2 was to explore the mechanism of the effect I found in studies 1a and 1b. I predicted that a safety claim (vs. a neutral message) would activate thoughts about the risks of GMOs among strong anti-GMO participants, leading them to perceive higher risk of developing various diseases from consuming GMOs. I also

expected that a safety claim (vs. a neutral message) would successfully persuade weak anti-GMO participants, leading them to perceive lower risk of developing the diseases. Because study 1b showed that there was no difference in the willingness to pay more to avoid GMOs between participants in the risk claim and neutral message condition, I dropped the risk claim condition for this study.

Method

Participants and design

Undergraduate business students (N = 210) participated in this study in exchange for extra course credit. The design of this study was 2 (message: safety claim vs. neutral) x attitude strength (continuous) between-subjects design.

Procedure

The procedure of this study was similar to that of study 1b, except for the following changes. First, I dropped the risk claim message condition. Second, I measured participants' perceived risk by asking them to rate the likelihood that they thought consuming GMOs regularly would cause them to develop cancer, heart disease, reproductive difficulties, liver damage, kidney damage, allergies, and digestive problems (1 = very unlikely to 6 = very likely).

Results

Since I was only interested in anti-GMO participants, I dropped all participants who indicated that they had a favorable attitude toward GMOs, yielding 142 participants in my data analysis. I created a dummy variable, representing the safety claim versus the

neutral message. Next, I mean-centered attitude strength and performed a multiple-regression on the willingness to pay more for products made with non-GMO ingredients and risk perceptions with three independent variables: (i) a dummy variable to represent the safety claim and neutral message, (ii) mean-centered attitude strength, and (iii) the interactions of attitude strength and the dummy variable.

Willingness to pay more for products made with non-GMO ingredients. The simple effect of message condition was nonsignificant ($p = .90$). As depicted in figure 7, there was a simple effect of attitude strength ($b = .04$, $t(138) = 1.92$, $p = .06$), indicating that strong anti-GMO participants were willing to pay more for products made with non-GMO ingredients. More importantly, the interaction between message condition and attitude strength was also significant ($b = .08$, $t(138) = 3.12$, $p < .01$). Among strong anti-GMO participants, those who saw the safety claim were willing to pay more for products made with non-GMO ingredients than those who saw the neutral message ($b = .07$, $t(138) = 2.30$, $p < .05$), suggesting message-opposing behavior. In contrast, among weak anti-GMO participants, those who saw the safety claim were less willing to pay more for products made with non-GMO ingredients ($b = –.07$, $t(138) = –2.13$, $p < .05$), suggesting message compliance behavior. The attitude strength slope was significant in the safety claim message condition ($b = .11$, $t(138) = 7.12$, $p < .001$), indicating among those who received the safety claim, strong anti-GMO participants were less willing to pay to avoid GMO products than were weak anti-GMO participants.

Insert figure 7 about here

Perceived risk. The simple effect of message condition was nonsignificant (p = .97). As depicted in figure 8, there was a simple effect of attitude strength (b = .44, $t(138) = 3.76$, $p < .001$), indicating that strong anti-GMO participants were more likely to perceive higher risk of consuming GMOs than weak anti-GMO participants. More importantly, the interaction between message condition and attitude strength was significant (b = .43, $t(138) = 2.80$, $p < .01$). Among strong anti-GMO participants, those who saw the safety claim were more likely to perceive higher risk than those who saw the neutral message (b = .38, $t(138) = 1.96$, $p < .05$), suggesting message-opposing behavior. In contrast, among weak anti-GMO participants, those who saw the safety claim perceived lower risk than those who saw a neutral message (b = –.40, $t(138) = –2.03$, $p < .05$), suggesting message compliance behavior. Furthermore, the attitude strength slope was significant in the safety claim condition (b = .44, $t(138) = 3.77$, $p < .001$), indicating that among those who received the safety claim, strong anti-GMO participants perceived higher risk from consuming GMOs than do weak anti-GMO participants.

Insert figure 8 about here

Conditional process analysis. I conducted a test of moderated mediation using Hayes' (2013) model 7. Based on 10,000 bootstrap samples, perceived risk mediated the effect of message condition on willingness to pay more for products made with non-GMO ingredients for both strong and weak anti-GMO participants (est. coefficient of the indirect effect is .92 with a 95% CI exclusive of 0 [.002, .05] and est. coefficient of the indirect effect is –.92 with 95% CI exclusive of 0 [–.049, –.003], respectively). These results support my hypothesis that participants' risk perceptions drive their willingness to

pay for products made with non-GMO ingredients in the opposite way for strong and weak anti-GMO consumers.

Discussion

In this study, I found that risk perception mediated the effect of message condition on willingness to pay more to avoid GMOs. More specifically, a safety claim (vs. a neutral message) increases risk perceptions among strong anti-GMO consumers, leading them to be more willing to pay for non-GMO foods. In contrast, the safety claim (vs. neutral message) reduces risk perceptions among weak anti-GMO consumers, leading them to be less willing to pay for non-GMO foods.

STUDY 3

The purpose of study 3 was to test my hypothesis that a benefit claim would reduce perceived risk among strong anti-GMO participants, leading them to have more favorable evaluations of GMOs. Moreover, prior research showed that material in the form of pictures or specific examples is more persuasive than text-only messages (Block and Keller 1997). Thus, I used an infographic in this study to increase the external validity of this study. Additionally, in this study I measured participants' attitude strength in a pre-survey which took place several weeks before the main study to ensure that these questions did not interfere with my dependent variables. I also measured participants' perceived risk of GMOs in the presurvey,

Method

Participants and design

Undergraduate business students (N = 222) participated in this study in exchange for extra course credit. The design of this study was 3 (message: safety claim vs. benefit claim vs. neutral message) x attitude strength (continuous) between-subjects design.

Procedure

I randomly assigned participants in one of three message conditions. Those who were in the safety claim condition received an infographic saying that GMOs are safe for human consumption (i.e., "GMO foods do not lead to cancer, organ damage, infertility, or allergies"; "GMO foods do not pose any human health concern"; and "The technology behind the creation of GMOs does not make it unsafe"). Those who were in the benefit claim condition received an infographic saying that GMO foods are beneficial (i.e., "GMO foods contain better nutritional value"; "GMO foods have better texture"; and "GMO foods are more affordable"). Those who were in the neutral message condition received an infographic about the process of plant pollination by insects (see appendix F). After participants saw the infographic, I asked them several questions, including their perceived risk as in study 2 and their evaluations of GMOs (i.e., Negative-Positive, Bad-Good, and Unfavorable-Favorable using six-point semantic differential items). In this study, I also recorded participants' perceived risks of GMOs several weeks before the main study, so that I could explore participants' change in risk perceptions before and after they saw different messages. A positive (vs. negative) change indicated that participants perceived higher (vs. lower) risk from GMOs after they saw the messages.

Results

Since I was only interested in anti-GMO participants. I dropped 80 participants who indicated in the pre-survey that they were pro-GMO. There were 142 participants included in my data analysis. As in study 1b, I used the neutral message as a baseline variable and created two dummy variables, representing the safety infographic and the benefit infographic. I also mean-centered attitude strength and performed a multiple-regression on participants' ratings of perceived risk and evaluation GMOs with the following independent variables: (i) two dummy variables to represent safety infographic and benefit infographic, (ii) mean-centered attitude strength, and (iii) interactions of attitude strength and each dummy variable.

GMO evaluation. The simple effect of the benefit infographic significantly differed from the safety infographic (b = .54, $t(137)$ =2.22, $p < .05$), indicating that participants who saw the benefit infographic evaluated GMOs more positively than those who saw the safety infographic. More importantly, the interactions of attitude strength with the safety infographic significantly predicted participants' attitudes toward GMOs (b = –.56, $t(137) = 2.18$, $p < .05$). As depicted in figure 9, strong anti-GMO participants who saw the benefit infographic evaluated GMO more positively than those who saw the safety message (b = 1.10, $t(137) = 3.29$, $p < .001$). Likewise, weak anti-GMO participants evaluated GMOs more positively after they saw the benefit infographic or a safety infographic than after they saw the neutral message (b = .49, $t(137) = 1.54$, p = .13 and b = .52, $t(137) = 1.45$, p = .15, respectively). Additionally, there was no difference in GMO evaluations between weak anti-GMO participants who received the benefit infographic and those who received the safety infographic (p = .92).

Insert figure 9 about here

Change in risk perceptions toward consuming GMOs. This dependent variable was calculated by subtracting participants' risk perception score from the presurvey by their risk perception score in the main study. The simple effect of the benefit infographic significantly differed from the neutral infographic ($b = –.61$, $t(137) = –2.87$, $p < .001$), indicating that the benefit infographic reduced participants' risk perceptions as compared to the neutral message. More importantly, the interaction of attitude strength with safety infographic significantly predicted participants' change of perceived risk ($b = .77$, $t(137) = 3.30$ $p < .001$). Consistent with the results of study 2, the safety claim (as compared to the neutral message) increased perceived risk among strong anti-GMO participants ($b = .89$, $t(137) = 3.03$ $p < .01$). Moreover, the benefit infographic (as compared to the safety infographic) reduced risk perceptions among strong anti-GMO participants, as expected ($b = –.78$, $t(137) = –3.63$, $p < .001$). Both benefit infographic and safety infographic (vs. neutral infographic) marginally reduced weak anti-GMO participants' risk perceptions ($b = –.49$, $t(137) = –1.72$, $p = .09$ and $b = –.54$, $t(137) = 1.69$, $p = .09$, respectively).

Conditional process analysis. I conducted a test of moderated mediation using Hayes' (2013) model 7. Although message condition had a significant impact on GMO evaluations, participants' change in risk perceptions did not mediate the effect of message condition on GMO evaluations for strong anti-GMO participants when comparing the benefit infographic condition to the safety infographic condition (est. coefficient of the indirect effect is .04 with a 95% CI inclusive of 0 [–.28, .36]), or when comparing the

safety infographic condition to the neutral message condition (est. coefficient of the indirect effect is .03 with a 95% CI inclusive of 0 [–.24, .30]). Moreover, change in risk perceptions also did not mediate GMO evaluations for weak anti-GMO participants when comparing the benefit infographic condition to the safety infographic condition (est. coefficient of the indirect effect is .01 with a 95% CI inclusive of 0 [–.08, .15]), or when comparing the safety infographic condition to the neutral message condition (est. coefficient of the indirect effect is –.004 with a 95% CI inclusive of 0 [–.04, .11]).

Discussion

The results of this study replicated the results of study 2 that showed when strong anti-GMO participants encounter a safety claim (vs. a neutral message), they will perceive higher risk from GMOs and have less favorable attitudes toward GMOs. More importantly, the results also support my hypothesis that when strong anti-GMO participants encounter a benefit claim (vs. a safety message), they will perceive lower risks from GMOs and have more favorable evaluations of GMOs. However, even though I found mediation in study 2, the conditional process in this study suggested that participants' change in risk perceptions did not mediate the effect of message conditions on GMO evaluations. One possibility for why I did not find mediation is because my dependent variable in this study was attitudes (i.e., participants' evaluations of GMOs), while the DV is the previous study was intention (i.e., participants' willingness to pay more to avoid GMOs). It is also possible that there is more than one process underlying GMO evaluations as suggested by Zhao, Lynch, and Chen (2010). Future research should investigate this issue more closely.

GENERAL DISCUSSION

This paper builds on the attitude strength and memory accessibility research to demonstrate conditions under which pro-GMO messages claiming that GMOs are safe for human consumption (like those designed by public agencies) can backfire. Across four studies, I demonstrate that when seeing a pro-GMO message, consumers will retrieve their thoughts/feelings about GMOs which are stored in memory. Since weak anti-GMO consumers have limited knowledge and do not care deeply about GMOs, the association between GMOs and their risk or GMOs and their benefits are very weak. Therefore, when weak anti-GMO consumers see a pro-GMO message, they are not able to retrieve their thoughts and feelings about GMOs from their memory. Consequently, they have to depend on the information in the pro-GMO message to form evaluative judgments toward GMOs. Because both the safety claim and the benefit claim present positive information about GMOs, they will positively influence weak anti-GMO participants' evaluation of GMOs. They also perceive that they would be less likely to develop diseases related to GMO consumption. In contrast, strong anti-GMOs are those who have knowledge and care deeply about GMO issues. Strong anti-GMOs have strong associations between GMOs and their risk as well as between GMOs and their benefits. Therefore, when they encounter a benefit claim, the association between GMOs and their benefits will be strengthened, leading them to perceive lower risks from GMOs. More interestingly, even though a safety claim suggests that GMOs are safe, it still activates strong anti-GMO consumers' thoughts about the risks of GMOs. In other words, a safety claim will strengthen the association between GMOs and their corresponding risk, leading to an increase in risk perceptions among strong anti-GMO consumers. Although

the focus of this research is on how anti-GMO consumers process and respond to different pro-GMO messages, the underlying process can be used to explain how consumers respond to any issue which attracts a lot of controversy and about which consumers hold strong attitudes (e.g., vaccination).

Implications for public policy makers

This research has important implications for public policy makers. First, I demonstrate the role attitude strength plays in determining how strong and weak anti-GMO consumers process pro-GMO messages. Weak anti-GMO consumers are dependent on the content of the message to decide whether they should or should not accept the message. Among strong anti-GMO consumers, the success of a pro-GMO message depends on whether the message activates a negative association between GMOs and their health risk or a positive association between GMOs and their benefits. The results of this study suggest that policy makers should carefully test pro-GMO messages before using them. The purpose of a safety claim is to provide consumers more positive information about GMOs, hoping that they can elicit more favorable attitudes toward GMOs. However, my findings suggest that this type of message is only effective among weak anti-GMO consumers and actually backfires among strong anti-GMO consumers. In fact, results from study 3 suggest a benefit claim may be more effective. Last but not least, public agencies should pay careful attention to the content of the message and should carry out research to explore how their targeted consumers might respond to the message before launching a pro-GMO message.

REFERENCES

Achen, Christopher H. (1975), "Mass political attitudes and the survey response," *American Political Science Review*, 69, 1218-1231.

Aiken, Leona. S., and Steven G. West (1991), "Multiple Regression: Testing and Interpreting Interactions," Newbury Park: Sage.

Anand, Punam, and Brian Sternthal (1990), "Ease of message processing as a moderator of repetition effects in advertising." *Journal of Marketing Research*, 345-353.

Aquino, Karl, Dan Freeman, Americus Reed II, Vivien KG Lim, and Will Felps (2009), "Testing a social-cognitive model of moral behavior: the interactive influence of situations and moral identity centrality," Journal of personality and social psychology, 97(1), 123.

Agrawal, Nidhi, and Adam Duhachek (2010), "Emotional compatibility and the effectiveness of antidrinking messages: A defensive processing perspective on shame and guilt," *Journal of Marketing Research,* 47 (2), 263–273.

Aronson, Joshua, Geoffrey Cohen, and Paul R. Nail (1999), *Self-affirmation theory: An update and appraisal*. In E. Harmon Jones and J. Mills (Eds.), Cognitive dissonance theory: Revival with revisions and controversies, 127–147) Washington, DC: American Psychological Association.

Bailey, Pamela (2013), "GMOs Are Nothing to Fear," *US News*, November 4.

Bargh, John A., Shelly Chaiken, Rajen Govender, and Felicia Pratto (1992), "The Generality Of The Automatic Attitude Activation Effect," *Journal of Personality and Social Psychology*, 62(6), 893.

Bassili, John N. (1996), "Meta-Judgmental Versus Operative Indexes of Psychological Attributes: The Case of Measures of Attitude Strength," *Journal of personality and social psychology*, 71(4), 637.

Bauer, Martin W., Matthias Kohring, Agnes Allansdottir, and Jan Gutteling (2001), "The dramatisation of biotechnology in elite mass media," In Gaskell, G., & Bauer, M. W. (Eds.), *Biotechnology 1996–2000: the years of controversy,* 33 – 52.

Bizer, George Y. et al. (2006), "Memory-based versus on-line processing: Implications for attitude strength," *Journal of Experimental Social Psychology, 42*(5), 646-653.

Botti, Simona, and Sheena S. Iyengar (2006), "The dark side of choice: When choice impairs social welfare," *Journal of Public Policy & Marketing*, 25(1), 24–38.

Brehm, Jack W. (1966), "A Theory of Psychological Reactance," New York: Academic Press.

Brehm, Jack W., and John Sensenig (1966), “Social Influence as a Function of Attempted and Implied Usurpation of Choice,” *Journal of Personality and Social Psychology,* 4(6), 703.

Brehm, Sharon S., and Marsha Weinraub (1977), “Physical Barriers and Psychological Reactance: 2-Yr-Olds' Responses to Threats to Freedom,” *Journal of Personality and Social Psychology, 35*(11), 830.

Carroll (2002), “The Government's Food Pyramid Correlates to Obesity, Critics Say,” *Wall Street Journal,* June 13.

Carroll, Ryall and Beth Vallen (2014), "Compromise and attraction effects in food choice," *International Journal of Consumer Studies,* 38(6), 636–641.

Chernev, Alexander (2011), “The dieter's paradox,” *Journal of Consumer Psychology, 21*(2), 178-183.

Clarkson, Joshua J., Derek D. Rucker, and Zakary L. Tormala (2008), “A New Look at the Consequences of Attitude Certainty: The Amplification Hypothesis,” *Journal of Personality and Social Psychology,* 95 (4), 810–25.

Clee, Mona A., and Robert A. Wicklund (1980) “Consumer Behavior and Psychological Reactance,” *Journal of Consumer Research, 6(*4), 389-405.

Cohen, Ben and Jerry Greenfield (2013), “The Right to Know if You're Eating Genetically Modified Food,” *CNN News,* November 1.

Dillard, James Price, and Lijiang Shen (2005) “On the nature of reactance and its role in persuasive health communication,” *Communication Monographs, 72*(2), 144–168.

Dholakia, Ruby Roy, and Brian Sternthal (1977), "Highly credible sources: persuasive facilitators or persuasive liabilities?," *Journal of Consumer Research,* 223–232.

Elbel, Brian, Rogan Kersh, Victoria L. Brescoll, and L. Beth Dixon (2009), "Calorie labeling and food choices: a first look at the effects on low-income people in New York City," *Health Affairs,* 28(6), 1110–1121.

Elshiewy, Ossama, Steffen Jahn, and Yasemin Boztug (2016), “Seduced By the Label: How the Recommended Serving Size on Nutrition Labels Affects Food Sales,” *Journal of the Association for Consumer Research,* 1 (1), 104–114.

Erceg-Hurn, David M., and Lyndall G. Steed (2011), “Does exposure to cigarette health warnings elicit psychological reactance in smokers?” *Journal of Applied Social Psychology, 41*(1), 219-237.

Etgar, Michael and Goodwin, Stephen A. (1982), "One-Sided Versus Two-Sided Comparative Message Appeals for New Brand Introductions," *Journal of Consumer Research*, 8, 460–464.

Fazio, Russell H., and Mark P. Zanna (1978), "Attitudinal Qualities Relating to the Strength of the Attitude-behavior Relationship," *Journal of Experimental Social Psychology*, *14*(4), 398-408.

Feldman, Jack M. and John G. Lynch, Jr. (1988), "Self-Generated Validity and Other Effects of Measurement on Belief, Attitude, Intention and Behavior," *Journal of Applied Psychology*, 73 (August), 421– 435.

Festinger, Leon (1957), "A Theory of Cognitive Dissonance. Stanford," CA: Stanford University Press.

Finucane, Melissa L., and Joan L. Holup (2005), "Psychosocial and cultural factors affecting the perceived risk of genetically modified food: an overview of the literature," *Social Science & Medicine*, 60 (7), 1603-1612.

Fishbein, Martin, and Icek Ajzen (1975), *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*, Reading, MA: Addison-Wesley.

Fitzsimons, Gavan J. (2000), "Consumer Response to Stockouts," *Journal of Consumer Research*, 27(2), 249-66.

Fitzsimons, Gavan J. (2008), "Death to Dichotomizing," *Journal of Consumer Research*, 35(1), 5–8.

Fitzsimons, Gavan J., and Donald R. Lehmann (2004), "Reactance to Recommendations: When Unsolicited Advice Yields Contrary Responses," *Marketing Science 23(1),* 82–94.

Forgas, Joseph P., Joel Cooper, and William D. Crano (2011), "The Psychology of Attitudes And Attitude Change", *Psychology Press*, 2011.

Fox, Maggie (2015), "There's No Need to Label GMO Plants, FDA Says," *NBC News,* November 23.

Frewer, Lynn J., Susan Miles, and Roy Marsh (2002), "The Media and Genetically Modified Foods: Evidence in Support of Social Amplification of Risk," *Risk analysis,* 22 (4), 701-711.

Frewer, Lynn J., Chaya Howard, and Richard Shepherd (1996), "Effective Communication about Genetic Engineering and Food," *British Food Journal,* 4 (5), 48-52.

Funk, Cary and Lee Rainie (2015), “Public and Scientists’ Views on Science and Society,” *Pew Research Center*, January 29.

Gal, David (2016), “Is Regulating Food Intake According to Hunger Healthy? The Relation between Pre-Meal Hunger and Post-Meal Blood Glucose”, *Journal of the Association for Consumer Research,* 1 (1), 15–24.

Goldberg, Jeanne P., Martha A. Belury, Peggy Elam, Susan Calvert Finn, Dayle Hayes, Roseann Lyle, Sachiko St Jeor, Michelle Warren, and Jennifer P. Hellwig (2004), "The Obesity Crisis: Don’t Blame It on The Pyramid," *Journal of the American Dietetic Association,* 104(7), 1141–1147.

Golden, Linda L. and Mark I. Alpert (1987), “Comparative Analysis of the Relative Effectiveness of One- and Two-Sided Communication for Contrasting Products,” *Journal of Advertising*, *16*(1), 18–68.

Grynbaum, Michael M. (2014), “New York’s Ban on Big Sodas Is Rejected by Final Court,” *New York Times,* June 26.

Hanks, Andrew S., David R. Just, and Brian Wansink (2014), “A Pilot Study Evaluating the Cafeteria Consequences of Eliminating Flavored Milk,” *PLOS ONE,* April 16.

Hansen, Jochim, Susanne Winzeler, and Sascha Topolinski (2010), “When the Death Makes You Smoke: A Terror Management Perspective on the Effectiveness of Cigarette On-Pack Warnings,” *Journal of Experimental Social Psychology,* 46(1), 226–228.

Haws, Kelly, and Cait Poynor (2008), “Seize the Day! Encouraging Indulgence for the Hyperopic Consumer,” *Journal of Consumer Research,* December, 680–691.

Hayes, Andrew F. (2013), *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Hayes, Andrew F., and Kristopher J. Preacher (2014), “Statistical Mediation Analysis with a Multicategorical Independent Variable,” *British Journal of Mathematical and Statistical Psychology,* 67, 451–470.

Henrich, Joseph, Steven J. Heine, and Ara Norenzayan (2010), "Most people are not WEIRD." *Nature*, 466(7302), 29.

Herman, C. Peter, and Janet Polivy (1980), *Restrained eating*. In A.B. Stunkard (Ed.) Obesity, 208-225. Philadelphia: Saunders.

Herman, C. Peter, and Janet Polivy (1984), *A boundary model for the regulation of eating*. In A. J. Stunkard & E. Stellar (Eds.), Eating and its disordered, 141–156. New York: Raven Press.

Higgins, E. Tory (1989), "Self-discrepancy Theory: What Patterns of Self-beliefs Cause People to Suffer," *Advances In Experimental Social Psychology*, May 1;22:93-136.

Hofmann, Wilhelm, Wolfgang Rauch, and Bertram Gawronski (2007), "And Deplete Us Not into Temptation: Automatic Attitudes, Dietary Restraint, and Self-Regulatory Resources as Determinants of Eating Behavior," *Journal of Experimental Social Psychology, 43*(3), 497–504.

Holden, Stephen S., and Natalina Zlatevska (2015), "The partitioning paradox: The big bite around small packages," *International Journal of Research in Marketing*.

Hong, Sung-Mook, and Salvatora Faedda (1996), "Refinement of the Hong Psychological Reactance Scale," *Educational and Psychological Measurement*, 56 (1), 173–182.

Hyman, Herbert H., and Paul B. Sheatsley, (1947), "Some Reasons Why Information Campaigns Fail," *Public Opinion Quarterly*, 11(3): 412-423.

Irmak, Caglar, Beth Vallen, and Stefanie Rosen Robinson (2011), "The Impact of Product Name on Dieters' and Nondieters' Food Evaluations and Consumption," *Journal of Consumer Research*, 38(2), 390–405.

Jonas, Eva et al (2009), "Culture, Self, and the Emergence of Reactance: Is There a "Universal" Feedom?," *Journal of Experimental Social Psychology* 45.5, 1068–1080.

Kamins, Michael A., and Henry Assael (1987), "Two-Sided Versus One-Sided Appeals: A Cognitive Perspective on Argumentation, Source Derogation, and the Effects of Disconfirming Trial on Belief Change," *Journal of Marketing Research*, 23 (March), 29–39.

Kamins, Michael A., Meribeth J. Brand, Stuart A. Hoeke, and John C. Moe (1989), "Two-sided versus One-Sided Celebrity Endorsements: The Impact on Advertising Effectiveness and Credibility," *Journal of Advertising*, 18(2), 4–10.

Keller, Punam Anand, and Lauren G. Block (1997), "Vividness Effects: A Resource-Matching Perspective," *Journal of Consumer Research,* 24 (3), 295 – 304.

Kimbrell, Andrew (2013), "The Case for Labeling GMOs," *US News*, November 4.

Krishna, Aradhna, Maureen Morrin, and Eda Sayin (2014), "Smellizing Cookies and Salivating: A Focus on Olfactory Imagery," *Journal of Consumer Research*, *41*(1), 18–34.

Krosnick, Jon A., and Robert P. Abelson (1992), "The Case for Measuring Attitude Strength in Surveys," *Questions about questions: Inquiries into the cognitive bases of surveys*, 177–203.

Krosnick, Jon A., David S. Boninger, Yao C. Chuang, Matthew K. Berent, and Catherine G. Carnot (1993), "Attitude Strength: One Construct or Many Related Constructs?," *Journal of Personality and Social Psychology*, 65 (6), 1132 – 1151.

Krosnick, Jon A., and Wendy A. Smith (1994), "Attitude strength." *Encyclopedia of human behavior* 1 (1), 279– 289.

Kunda, Ziva (1987), "Motivated inference: Self-serving Generation and Evaluation of Causal Theories," *Journal of Personality and Social Psychology*, 53(4), 636.

Lamberton, Cait (2013), "A Spoonful of Choice: How Allocation Increases Satisfaction With Tax Payments," *Journal of Public Policy & Marketing, 32*(2), 223–238.

Levav, Jonathan, and Rui (Juliet) Zhu (2009), "Seeking Freedom through Variety," *Journal of Consumer Research, 36* (4), 600–610.

Liberman, Akiva and Shelly Chaiken (1992), "Defensive Processing of Personally Relevant Health Messages," *Personality and Social Psychology Bulletin*, 18, 669-679.

Lavine, Howard, Joseph W. Huff, Stephen H. Wagner, and Donna Sweeney (1998) "The Moderating Influence of Attitude Strength on The Susceptibility to Context Effects In Attitude Surveys," *Journal of Personality and Social Psychology*, 75(2), 359.

Lusk, Jayson (2013), *The Food Police: A Well-fed Manifesto about the Politics of Your Plate.* Random House LLC.

Markus, Hazel Rose, and Barry Schwartz (2010), "Does Choice Mean Freedom and Well-Being?," *Journal of Consumer Research*, 37(2), 344-355.

May, Caroline (2012), "NYC 'Food Police' Caught in an Ad Lie," *The Daily Caller*, Jan. 25.

Menon, Geeta, Priya Raghubir, and Nidhi Agrawal (2007), "Health Risk Perceptions and Consumer Psychology," in The Handbook of Consumer Psychology, ed. Curt Haugtvedt,

Meredith, Lisa S., et al (2007), "Trust Influences Response To Public Health Messages During A Bioterrorist Event," *Journal of Health Communication, 12*(3), 217–232.

Nielsen, Jesper, and Stewart Shapiro (2009), "Coping With Fear Through Suppression And Avoidance Of Threatening Information," *Journal of Experimental Psychology*: *Applied*, 15(3):258.

Papies, Esther K., Wolfgang Stroebe, and Henk Aarts (2008), "Healthy cognition: Processes of Self-regulatory Success in Restrained Eating," *Personality and Social Psychology Bulletin* 34 (9), 1290-1300.

Peeples, Lynne (2012), "GMO debate heats up: Critics Say Biotech Industry Manipulating Genes, And Science", *The Huffington Post*, September 24.

Peters, John C., Jimikaye Beck, Jan Lande, Zhaoxing Pan, Michelle Cardel, Keith Ayoob, and Hames Hill (2016), "Using Healthy Defaults In Restaurants To Improve Nutritional Choices," *Journal of the Association for Consumer Research,* 1 (1), 92 – 103.

Peterson, Robert A. (2001), "On the Use of College Students in Social Science Research: Insights From A Second-Order Meta-Analysis," *Journal of Consumer Research, 28*(3), 450–461.

Petty, Richard E., John T. Cacioppo, and David Schumann (1983), "Central and peripheral routes to advertising effectiveness: The moderating role of involvement," *Journal of Consumer Research*, 135-146.

Pham, Nguyen, Naomi Mandel, and Andrea C. Morales (2016), "Messages from the Food Police: How Food-Related Warnings Backfire among Dieters," *Journal of the Association for Consumer Research,* 1 (1), 175 – 190.

Pinholster, Ginger (2012), "AAAS Board of Directors: Legally Mandating GM Food Labels Could "Mislead and Falsely Alarm Consumers," *American Association for the Advancement of Science*, October 25.

Pomerantz, Eva M., Shelly Chaiken, and Rosalind S. Tordesillas, "Attitude strength and resistance processes," *Journal of personality and social psychology*, 69 (3), 408 – 419.

Raghubir, Priya, and Geeta Menon (1998), "Aids And Me, Never The Twain Shall Meet: The Effects Of Information Accessibility On Judgments Of Risk And Advertising Effectiveness," *Journal of Consumer Research*, 25(1), 52-63.

Rohrbaugh, Michael J., Varda Shoham, Sarah Trost, Myra Muramoto, Rodney M. Cate, and Scott Leischow (2001), "Couple Dynamics of Change-Resistant Smoking: Toward a Family Consultation Model," *Family process*, *40*(1), 15–31.

Rozin, Paul, Michele Ashmore, and Maureen Markwith (1996), "Lay American Conceptions of Nutrition: Dose Insensitivity, Categorical Thinking, Contagion, and The Monotonic Mind," *Health Psychology*, *15*(6), 438.

Scott, Maura L., Stephen M. Nowlis, Naomi Mandel, and Andrea C. Morales (2008), "The Effects of Reduced Food Size and Package Size on the Consumption Behavior of Restrained and Unrestrained Eaters," *Journal of Consumer Research,* 35 (October), 391–405.

Shoham, Varda, Sarah E. Trost, and Michael J. Rohrbaugh (2004), *From State to Trait and Back Again: Reactance Theory Goes Clinical* (pp. 167-185). Hillsdale, NJ: Lawrence Erlbaum Associates.

Silvia, Paul J. (2006), "A Skeptical Look at Dispositional Reactance," *Personality and Individual Differences*, *40*(6), 1291–1297.

Simonson, Itamar (1989), "Choice Based on Reasons: The Case of Attraction and Compromise Effects," *Journal of Consumer Research*, 158–174.

Sinha, Rajiv K., and Naomi Mandel (2008), "Preventing Digital Music Piracy: The Carrot or The Stick?," *Journal of Marketing*, *72*(1), 1–15.

Sjöberg, Lennart (2002), "Attitudes Toward Technology And Risk: Going Beyond What Is Immediately Given," *Policy Sciences,* 35(4), 379-400.

Slovic, Paul (1987), "Perception of Risk," *Science*, 236 (4799), 280–285.

Steele, Claude M (1988*), The Psychology of Self-Affirmation: Sustaining the Integrity of The Self.* In Advances in Experimental Social Psychology, ed. L Berkowitz, 21:261–302. New York: Academic.

Spiller, Stephen (2013), "Mediation Practicum – On Using Hayes (2003) PROCESS Macro, Indirect Effects, and Bootstrapping," in *NA – Advances in Consumer Research,* Vol. 41, ed. Simona Botti and Aparna Labroo, Duluth, MN: Association for Consumer Research.

Stewart, David W., and Ingrid M. Martin (1994), "Intended and Unintended Consequences of Warning Messages: A Review and Synthesis of Empirical Research," *Journal of Public Policy & Marketing,* 1-19.

Stossel, John (2012), "The Food Police," *FoxBusiness.com,* April 25.

Stroebe, Wolfgang, Guido M. van Koningsbruggen, Esther K. Papies, and Henk Aarts (2013), "Why most dieters fail but some succeed: a goal conflict model of eating behavior," *Psychological Review*, *120*(1), 110.

Swann, William B., Brett W. Pelham, and Thomas R. Chidester (1988), "Change Through Paradox: Using Self-Verification to Alter Beliefs." *Journal of personality and social psychology,* 54 (2), 268.

Tormala, Zakary L., and Richard E. Petty (2002), “What Doesn't Kill Me Makes Me Stronger: the Effects of Resisting Persuasion on Attitude Certainty,” *Journal of Personality and Social Psychology*, *83*(6), 1298.

Toncar, Mark, Jane S. Reid, and Cynthia E. Anderson (2007), “Effective Spokespersons in a Public Service Announcement: National Celebrities, Local Celebrities and Victims,” *Journal of Communication Management*, 11 (3), 258–75.

Tybout, Alice M., Bobby J. Calder, and Brian Sternthal (1981), "Using Information Processing Theory To Design Marketing Strategies," *Journal of Marketing Research*, 73-79.

Van Ittersum, Koert and Brian Wansink (2016), “The Behavioral Science of Eating: Encouraging Boundary Research that has Impact,” *Journal of the Association for Consumer Research*, 1 (1), 5–14.

Vohs, Kathleen D., and Todd F. Heatherton (2000), “Self-regulatory Failure: A Resource-Depletion Approach,” *Psychological Science, 11*(3), 249–254.

Wang, Y. Claire, Klim McPherson, Tim Marsh, Steven L. Gortmaker, and Martin Brown (2011), “Health and Economic Burden of the Projected Obesity Trends in the USA and the UK,” *The Lancet, 378*(9793), 815–25.

Wansink, Brian (2002), "Changing eating habits on the home front: Lost lessons from World War II research," *Journal of Public Policy & Marketing, 21*(1), 90–99.

Wellman, Justin A., and Andrew L. Geers (2009), “Rebel without a (conscious) cause: Priming a nonconscious goal for psychological reactance,” *Basic and Applied Social Psychology*, *31*(1), 9–16.

Wendlandt, Mark, and Ulf Schrader (2007), “Consumer reactance against loyalty programs,” *Journal of Consumer Marketing, 24*(5), 293–304.

Wilson, Timothy D., Sara D. Hodges, and Suzanne J. LaFleur (1995), "Effects Of Introspecting About Reasons: Inferring Attitudes From Accessible Thoughts," *Journal of Personality and Social Psychology*, 69(1), 16.

Zhao, Xinshu, John G. Lynch, and Qimei Chen (2010), “Reconsidering Baron and Kenny: Myths and truths about mediation analysis,” *Journal of Consumer Research, 37*(2), 197–206.

APPENDIX A

ESSAY 1: LIST OF QUESTIONS IN THE PRETEST

1. This message is credible.
2. This message is one-sided.
3. This message is biased.
4. This message is extreme.
5. This message is positive.
6. This message is realistic.
7. This message is ambiguous.
8. This message is relevant to me.
9. I agree with this message.
10. When I read the message, I feel that my freedom to choose food is constrained.
11. I want to argue with this message.

APPENDIX B

ESSAY 1: LIST OF WORDS IN STUDY 1A

10 trials	rock, secret, village, noon, folder, table, willing, umbrella, light, general
20 unhealthy foods words	cheesecake, French fries, butter, dessert, pudding, sugar, candies, cakes, muffins, brownies, pies, ice cream, chocolate, cookies, pizza, bacon, pastry, chips, lasagna, burgers
20 healthy foods words	carrot, salad, fruit, vegetable, spinach, broccoli, beets, cucumber, celery, tomato, asparagus, apple, oatmeal, orange, tuna, mushroom, peach, tofu, zucchini, chicken
20 non-food words	computer, house, keyboard, pen, elevator, account, advice, attitude, economy, waiting, purpose, office, chance, design, employee, puppy, friends, arrivals, summer

APPENDIX C

ESSAY 2: SAFETY CLAIM AND NEUTRAL MESSAGE IN STUDY 1A

Neutral message:

"Demand for food is influenced by a number of forces, including population growth, income levels, urbanization, lifestyles, and preferences. Almost 80 million people are likely to be added to the world's population each year during the next quarter century, increasing world population by 35 percent from 5.7 billion in 1995 to 7.7 billion by 2020.

More than 95 percent of the population increase is expected in developing countries, whose share of global population is projected to increase from 79 percent in 1995 to 84 percent in 2020. Over this period, the absolute population increase will be highest in Asia, but the relative increase will be greatest in Sub-Saharan Africa, where the population is expected to increase by 80 percent by 2020."

Safety claim:

“Foods derived from GMO crops have undergone more testing than any other food in history. Before entering the marketplace, they are assessed using guidelines issued by several international scientific agencies.

Foods derived from GMO plants are safe. Major issues and safety concerns on the biosafety of foods derived from GMO plants have been addressed. International agencies such as the Food and Agriculture Organization and the American Society of Toxicology have reviewed these health issues and have come to an agreement that GMO foods are safe for human health.”

APPENDIX D

ESSAY 2: ATTITUDE STRENGTH MEASURES

1. How easily does your attitude come to mind when you encounter issues about GMO foods? (1 = not at all to 5 = extremely)

2. About how often do you have thoughts about GMO foods? (1 = never to 5 = always)

3. How important would you say the issues of GMO foods are to you personally? (1 = not at all to 5 = extremely)

4. How much do you personally care about the issues related to GMO foods? (1 = not at all to 5 = extremely)

5. How well informed are you about GMO food issues? (1 = not at all to 5 = extremely)

6. How much do the issues of GMO foods directly affect you? (1 = not at all to 5 = extremely)

APPENDIX E

ESSAY 2: SAFETY CLAIM, RISK CLAIM, AND NEUTRAL MESSAGE IN STUDIES 1B AND 2

Neutral message:

Plant Pollination By Insects

Pollination is the process whereby plants receive pollen from other plants of the same species so that they can reproduce by forming seeds. Most crops grown for their fruits, nuts, seeds, and hay require pollination by insects. The main insect pollinators, by far, are bees.

Studies have shown that bees make excellent pollinators because most of their life is spent collecting pollen, a source of protein that they feed to their developing offspring. When a bee lands on a flower, the hairs all over the bees' body attract pollen grains through electrostatic forces. Stiff hairs on their legs enable them to groom the pollen into specialized brushes or pockets on their legs or body, and then carry it back to their nest.

Safety claim:

The Truth About GMOs: They Are Safe to Eat

Independent researchers and international scientific agencies (e.g., the Food and Drug Administration) have suggested that genetically modified (GMO) foods do not pose risks to our health or the environment that are any different from the risks posed by the non-GMO crops.

GMO foods are among the most extensively studied scientific subjects in history. Animal studies show that GMO feed does not have a negative effect on the animals, and that they are about as nutritionally equivalent as animals who are not fed GMO crops. Human studies show that GMO foods do not pose any human health concern and that they are as safe as those foods produced through traditional breeding.

Risk claim:

The Truth About GMOs: They Are Not Safe to Eat

Numerous health problems increased after genetically modified (GMO) foods were introduced around twenty years ago. The American Academy of Environmental Medicine (AAEM) urges doctors to prescribe non-GMO foods for all patients.

They cite animal studies showing organ damage, gastrointestinal and immune system disorders, accelerated aging, and infertility. Human studies show how foods can leave material behind inside us, possibly causing long-term problems. Genes inserted into GMO soy, for example, can transfer into the DNA of bacteria living inside us, and the toxic insecticide produced by GMO corn was found in the blood of pregnant women and their unborn fetuses.

APPENDIX F

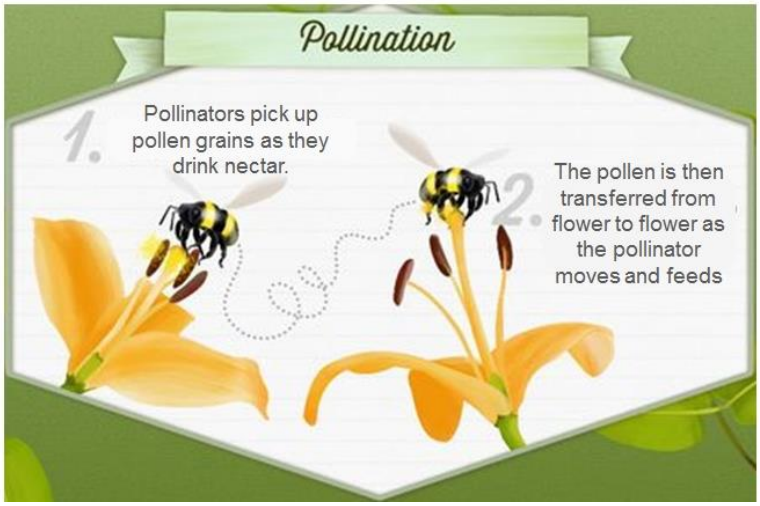
ESSAY 2: SAFETY, BENEFIT, AND NEUTRAL INFOGRAPHICS

Plant Pollination by Insects

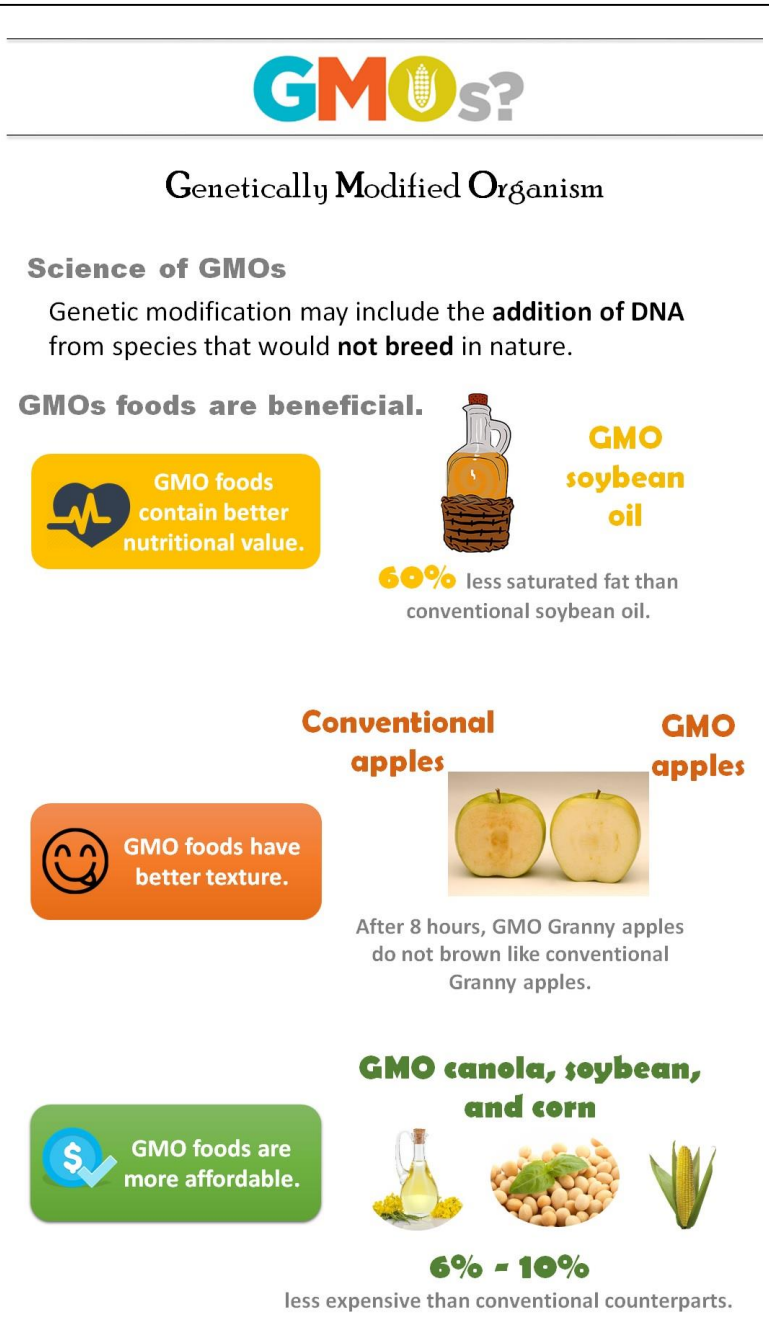
Plant Pollination

The process whereby plants receive pollen from other plants of the same species so that they can reproduce by forming seeds.

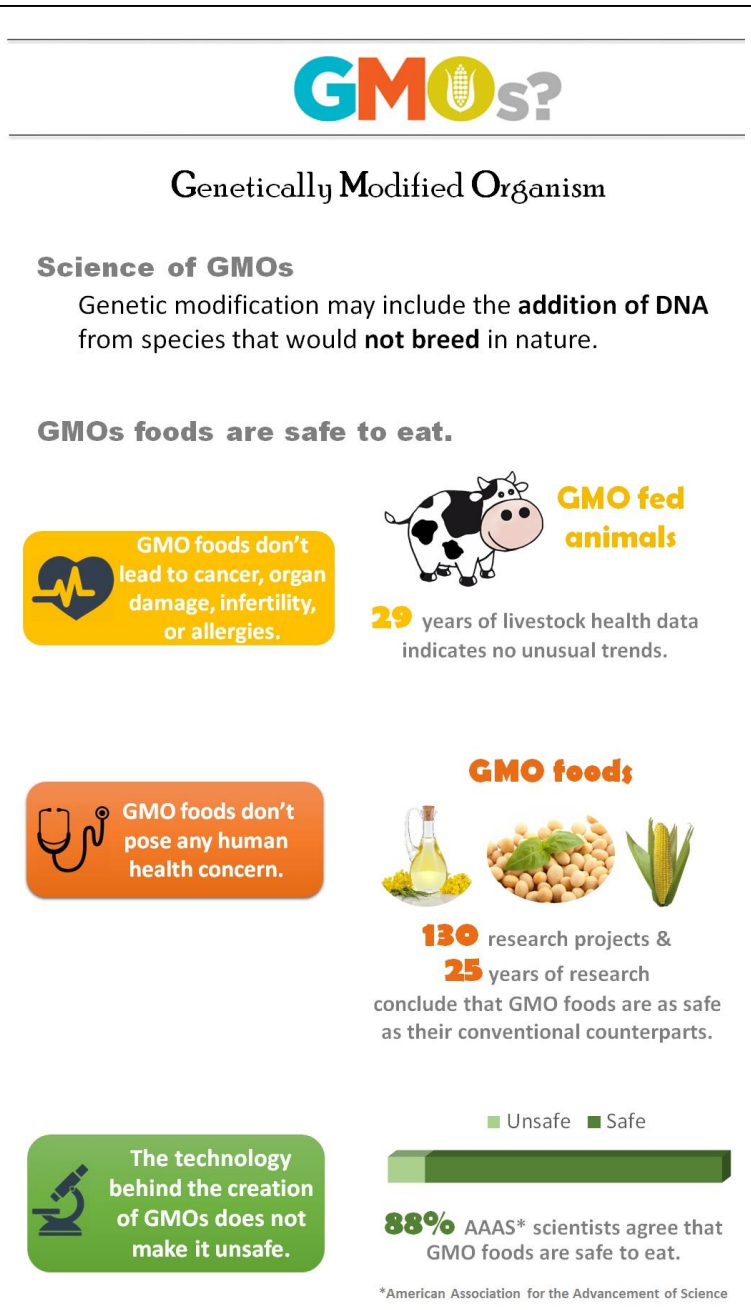
Main insect pollinators: Bees



Neutral infographic used in study 3



Benefit infographic used in study 3



Safety infographic used in study 3

FIGURE 1

ESSAY 1 – STUDY 1A RESULTS: NUMBER OF POSITIVE THOUGHTS ABOUT UNHEALTHY FOODS AS A FUNCTION OF DIETARY RESTRAINT AND FOOD MESSAGE

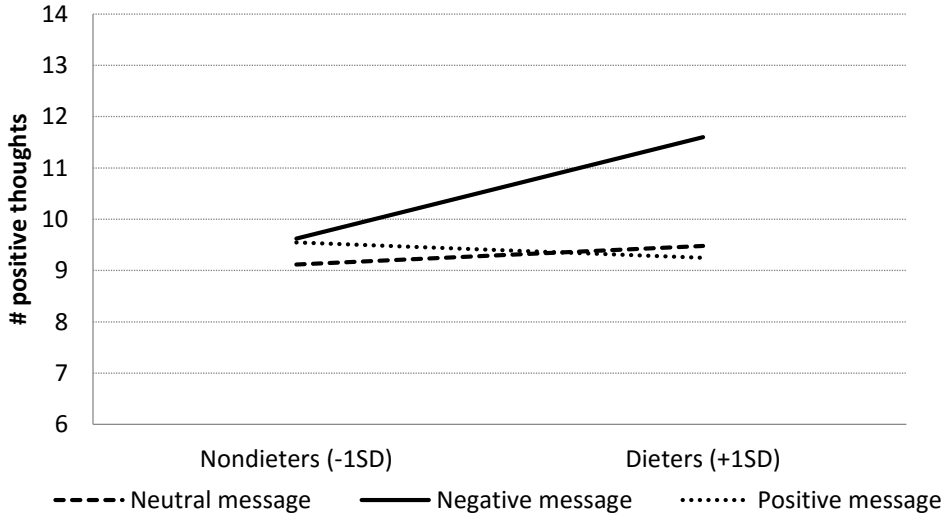


FIGURE 2

ESSAY 1 – STUDY 1B RESULTS: AMOUNT OF COOKIES CONSUMED AS A FUNCTION OF DIETARY RESTRAINT AND FOOD MESSAGE

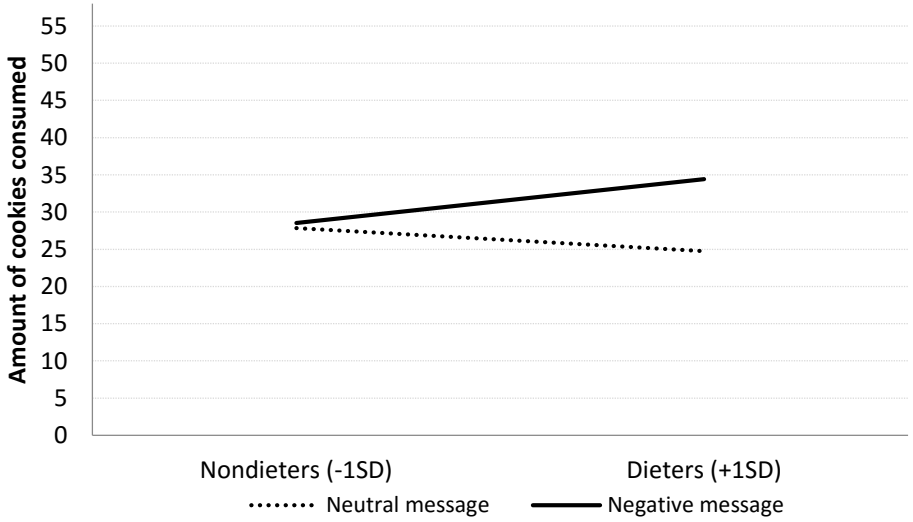


FIGURE 3

ESSAY 1 – STUDY 2 RESULTS: SITUATIONAL REACTANCE AS A FUNCTION OF DIETARY RESTRAINT AND FOOD MESSAGE

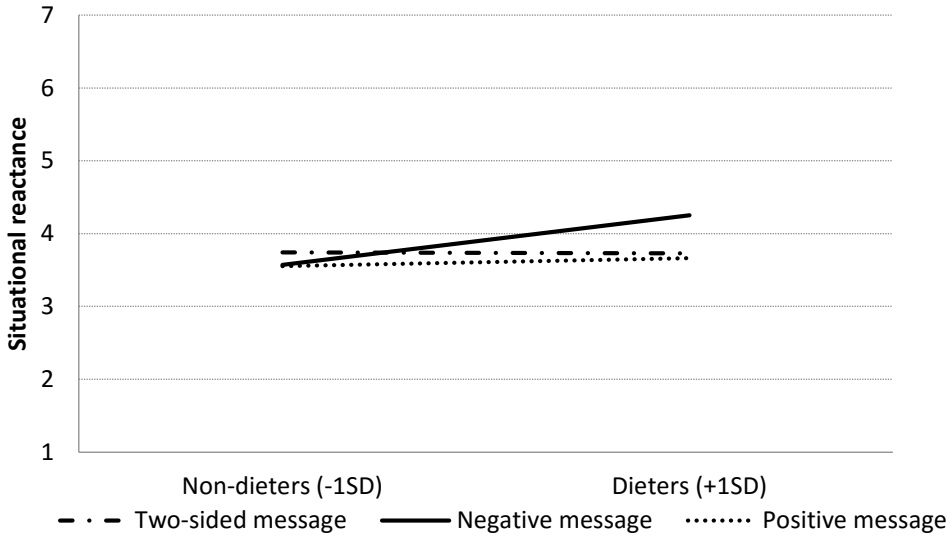


FIGURE 4

ESSAY 1 – STUDY 2 RESULTS: NUMBER OF UNHEALTHY CHOICES AS A FUNCTION OF DIETARY RESTRAINT AND FOOD MESSAGE

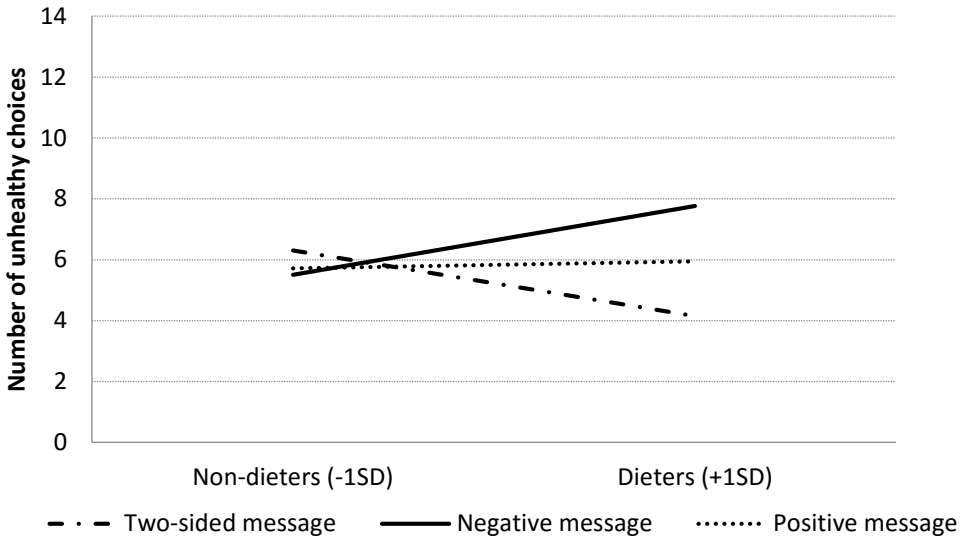


FIGURE 5

ESSAY 2 – STUDY 1A RESULTS: INTENTIONS TO CONSUME GMO FOODS IN THE NEXT WEEK AS A FUNCTION OF ATTITUDE STRENGTH AND GMO MESSAGE

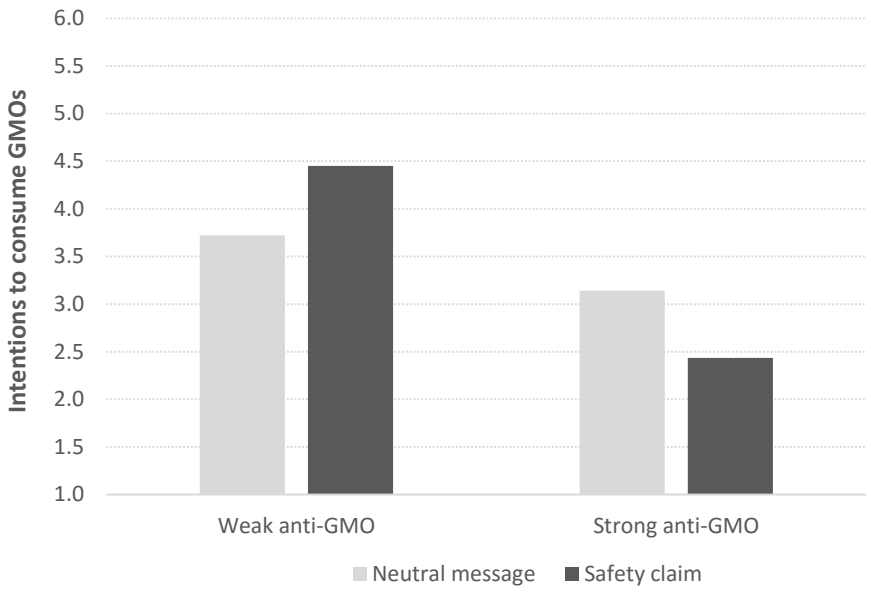


FIGURE 6

ESSAY 2 – STUDY 1B RESULTS: WILLINGNESS TO PAY MORE TO AVOID GMOS AS A FUNCTION OF ATTITUDE STRENGTH AND GMO MESSAGE

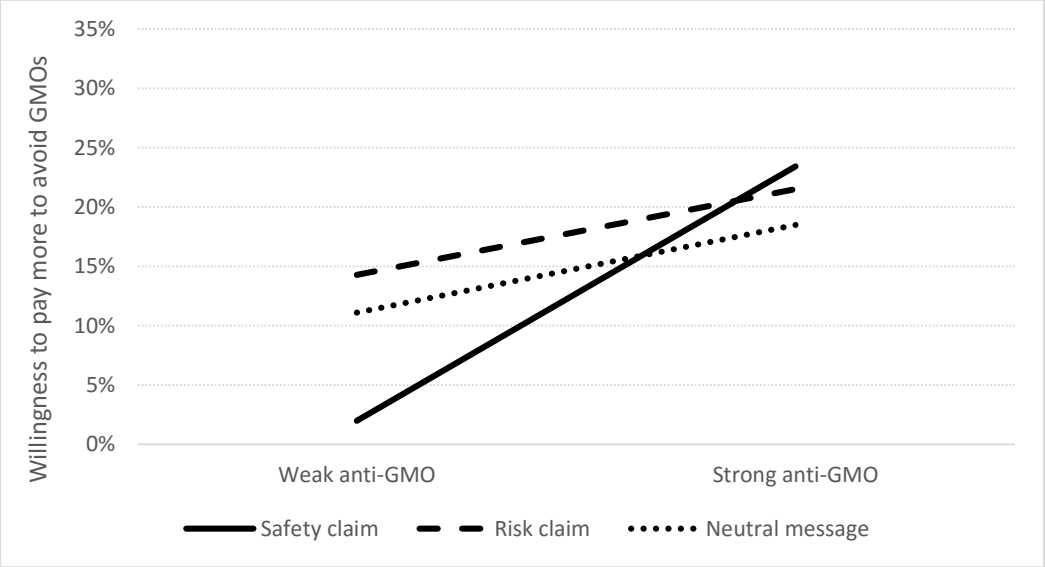


FIGURE 7

ESSAY 2 – STUDY 2 RESULTS: WTP MORE FOR PRODUCTS MADE WITH NON-GMO INGREDIENTS AS A FUNCTION OF ATTITUDE STRENGTH AND GMO MESSAGE

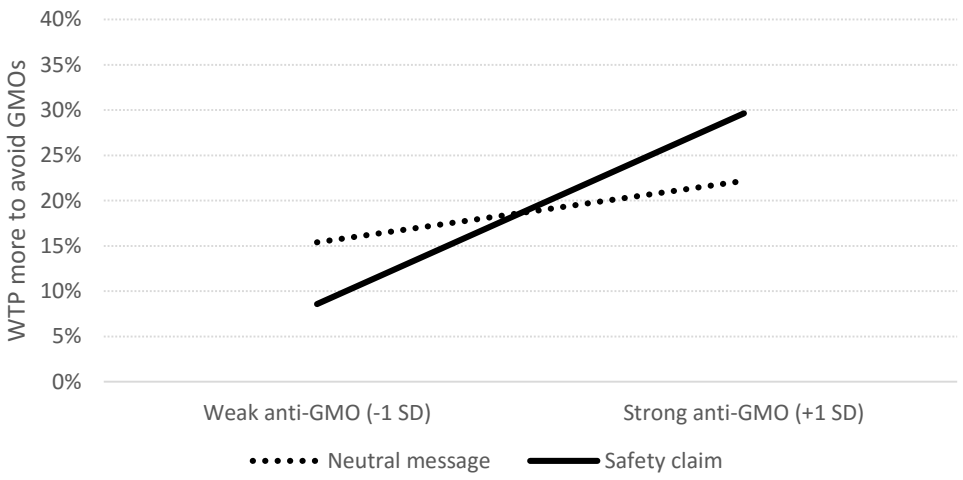


FIGURE 8

ESSAY 2 – STUDY 2 RESULTS: PERCEIVED RISK AS A FUNCTION OF ATTITUDE STRENGTH AND GMO MESSAGE

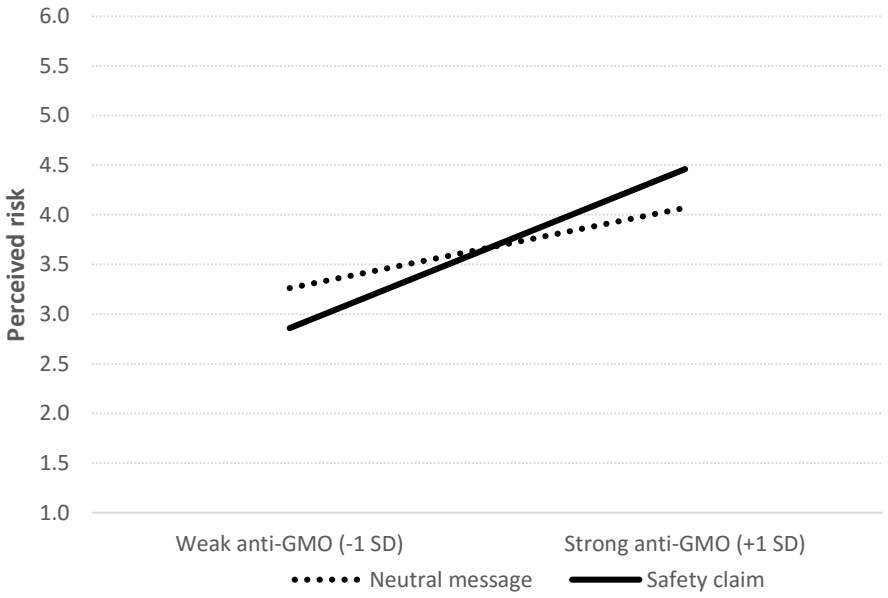


FIGURE 9

ESSAY 2 – STUDY 3 RESULTS: GMO EVALUATION AS A FUNCTION OF ATTITUDE STRENGTH AND GMO MESSAGE